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TABLE OF CONTENTS

Page

PREFACE

This volume of the Cooperative Research Report contains the reports of the Advisory Committee on Fishery Management in 1987.

After the May 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 the report to the North Atlantic Salmon Conservation Organization (NASCO). The second part of the report to the NEAFC was issued after the October-November meeting. In order to distribute the advice to managers as fast as possible, the reports were issued in sections and distributed immediately after they 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.

Reports are also included to the Government of Norway on harp and hooded seals in the Greenland Sea and to the Commission of the European Communities on European eels.

Copenhagen, January 1988
Emory D. Anderson
Secretary to ACFM

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1986/1987

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Mr M. J. Holden, Observer, Commission of the European Communities

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

[1] Was represented by Mr H. Sparholt for first three days of May 1987 meeting.
[2] Did not attend May 1987 meeting.
[3] Attended the May 1987 meeting in place of the regular member.

MEMBERS OF THE ADVISORY COMMITTEE ON FISHERY MANAGEMENT

1987/1988

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[1] Did not attend October/November 1987 meeting.
[2] Attended the October/November 1987 meeting in place of the regular member.

REPORTS OF THE ADVISORY COMMITTEE ON FISHERY MANAGEMENT

MAY AND OCTOBER/NOVEMBER 1987

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 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 five years in the basic criteria on which ACFM bases its advice. ACFM still considers that the biological advice provided should not be seen in isolation from economic considerations and welcomes 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 achieving viable management.

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

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 precautionay TACs to reduce the danger of excessive efforts 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 on implementation of TACs 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 TACs 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 fishing mortality should be reduced to one of the biological reference points $F_{0.1}$ or F_{max} as quickly as possible, or (in some cases) towards these points.

Quality of the Data Base

In last year's report, ACFM expressed its concern that the data bases for assessments had been deteriorating for a number of important stocks and stressed the need for an improvement. The data from the fisheries in 1986 show that this situation has not changed significantly. ACFM is especially concerned about the lack of reliable catch data for a number of stocks. This may be caused by unreported catches, misreporting of catches by area, not having catches appropriately split into divisions, and inadequate sampling of landings in mixed fisheries. This not only makes assessments unreliable and, in some cases, impossible to carry out, but also implies that TACs for these fisheries cannot be effectively enforced.

Biological Reference Points

ACFM noted the proposal by the Methods Working Group in 1984 for the biological reference points F_{med} and F_{high}, which are intended to provide guidelines for levels of fishing mortality at which it is probable (in the case of F_{med}) and doubtful (in the case of F_{high}) that recruitment will, in the long-term, be sufficient to sustain a stable stock.

The values of F_{med} and F_{high} may be calculated very simply from stock and recruitment scatter diagrams and plots of biomass per recruit which are generally provided by ICES working groups. The procedure is simply to draw lines through the origin of the scatter plot which leave about 10% (in the case of F_{high}) and 50% (in the case of F_{med}) of the points above the line. The slopes of these lines correspond to values of recruitment per unit biomass, and the reciprocals of these values are estimates of the spawning biomass per recruit (an estimate of survival) which must be maintained for the stock to be sustainable. The fishing mortalities (conditional on the assumed exploitation pattern) to which these biomass-per-recruit values correspond may be determined from the plot of the relationship between these quantities and yield the estimates of F_{high} and F_{med}. Estimates based on percentiles are used rather than means because they are less sensitive to the actual size of extreme year classes.

F_{high} thus corresponds to a level of F at which survival is so low that recruitment (per unit biomass) is insufficient to maintain the stock in about nine years in ten. Whilst it cannot necessarily be taken as an estimate of the F at which collapse will occur, it is a level for which the available data provide very little evidence that it could be maintained indefinitely. It is, therefore, not a target or option level of F, but, on the contrary, a level which is probably dangerous to approach or maintain.

F_{med}, on the other hand, is a level for which there is sufficient evidence that it should be sustainable (assuming, of course, that the underlying environmental or ecological conditions to which the data relate are maintained). Below or in the vicinity of F_{med}, there should, therefore, be undue cause for concern about sustainability, and F_{med} could, therefore, in some circumstances, serve as a target for management, though many other factors (yield, exploitable biomass, etc.) are, of course, also relevant.

ACFM found F_{med} in particular to be a useful quantity in providing guidance in preparing management options, and reference to it will be found in this report where appropriate. ACFM also stresses that biological reference points are intended to provide guidance concerning management options, and that no single reference point can possibly serve as a universal target for management.

ACFM advice is, however, based on the evaluation of as many relevant factors as possible, including levels of F in relation to biological reference points, spawning stock size in relation to historic levels, trends and recent levels of recruitment, and the precision of the assessments. Different factors dominate in different situations.

REPORT TO THE NORTH-EAST ATLANTIC FISHERIES COMMISSION

1. REVIEW OF NOMINAL CATCHES IN NEAFC AREA, 1977-1986

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 negligible in some cases and constituting important parts of the total removal from other stocks.

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 TACs. Estimates of catches landed as by-catches, especially from the industrial fisheries, are included in the assessments wherever data allow it 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. STOCKS IN NEAFC REGION 1

2.1 North-East Arctic Cod

Source of information: Arctic Fisheries Working Group report, September 1987 (C.M.1988/Assess:5).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC[3]	390	-	<434	<380	150	170	<446	<645	-	-	-
Agreed TAC[3]	390	300	300	300	220	220	400	560	-	-	-
Actual landings[3]	380	399	364	290	278	308	426	-	1,197	278	665
Sp. stock biomass	169	151	374	329	292	322	293	351[1]	680	151	354
Recruitment (age 3)	142	164	179	176	393	666	1,000	430[1]	1,819	112	569
Mean F(5-10,u)	0.72	0.82	0.73	0.72	0.85	0.71	0.65	-	0.93	0.50	0.68

[1]Predicted or assumed. [2]Over period 1965-1984. [3]Coastal cod not included. Weights in '000 t, recruitment in millions.

Catches: Landings were declining from 1981 to 1984 when they reached the lowest level in 39 years (Tables 2.1.1 and 2.1.2). Subsequently, landings have increased rapidly in response to improved recruitment. In 1986, Norway and USSR accounted for 89% of the landings.

Data and assessment: Analytical assessment based on catch-at-age data. VPA tuned using trawl and acoustic survey and commercial CPUE data. Recruitment estimated by combination of data from 16 index series.

Fishing mortality: Declining from 1984 to 1986 (Figure 2.1), but is expected to increase by 23% in 1987 and will then be at F_{med} (0.80) which is considerably higher than F_{max} (0.35). The revised assessment implies higher fishing mortality in recent years than previously estimated, because of reductions in the estimates of recent recruitment and growth rates.

Recruitment: After a series of poor year classes, recruitment has improved considerably with 1983 as an outstanding year class. The estimated sizes of the 1982-1984 year classes are, however, reduced from last year's assessment, and the 1985-1987 year classes are estimated to be below average. These revisions are partly due to more thorough analysis of all available data, but also partly caused by a probable increase in natural mortality in these year classes, due to cannibalism.

State of stock: Both total biomass and spawning stock biomass are increasing from their historic low levels in the early 1980s, but this trend will be reversed in the early 1990s. Reduction in fishing mortality is necessary to avoid a decline back to the very low biomass levels of recent years. The growth of recent year classes has been lower than average, and the forecast is based on estimated weights at age which are uncertain.

Forecast for 1988: Assuming F(87) = 0.80 , Catch(87) = 545,000 t, SSB(88) = 540,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.17	197	1,052	SSB increasing
B	F_{max}	0.35	383	933	SSB increasing
C		0.51	530	840	SSB increasing
D	F(87)	0.80	759	703	SSB increasing, continued high F

Continued fishing at current levels of fishing mortality will lead to high catches in 1988 and an increase in SSB to a record high level in 1989, followed by a decline in catches in 1990 and in spawning stock biomass in 1991.

Recommendation: Fishing mortality should be gradually decreased towards F_{max}. A reduction to F_{max} in 1989 can be achieved without significant reduction in landings. A reduction in fishing mortality to 0.51 in 1988 would be an appropriate first step, corresponding to a TAC of 530,000 t.

Special comments: ACFM has pointed out in its 1985 and 1986 reports that the good recruitment from the 1982-1984 year classes offers the possibility of rebuilding the spawning stock by reducing fishing mortality while increasing catches. The medium-term forecast illustrating this possibility has been revised using the new (lower) estimates of recruitment (see table above) based on a more efficient analysis of available data than was possible before.

For this stock, a projection of catch and biomass has been made up to 1993 to evaluate the effects of six different long-term strategies for management. The results are given in the text table below.

It should be stressed that these calculations are intended to guide the choice of medium-term strategy for this stock and should not be taken as firm catch predictions beyond 1988. They will be subject to revision in the light of new information on the size of the most recent year classes and their growth rates which are not yet known. The general pattern of trade-off between catches, fishing mortality, and stock size should, nevertheless, remain valid.

	1988				1989				1990			
Option	Stock biom.	Spawn. stock biom.	F	Catch	Stock biom.	Spawn. stock biom.	F	Catch	Stock biom.	Spawn. stock biom.	F	Catch
A	1,961	540	0.51	530	2,219	840	0.35	530	2,410	1,210	0.35	646
B			0.59	600	2,141	797	0.44	600	2,237	1,091	0.36	600
C			0.65	643	2,093	771	0.50	652	2,122	1,012	0.35	550
D			0.70	682	2,049	747	0.60	735	1,976	915	0.53	705
E			0.80	759	1,966	703	0.65	744	1,858	841	0.50	628
F			0.80	759	1,966	703	0.80	869	1,728	752	0.80	608

	1991				1992				1993			
Option	Stock biom.	Spawn. stock biom.	F	Catch	Stock biom.	Spawn. stock biom.	F	Catch	Stock biom.	Spawn. stock biom.	F	Catch
A	2,323	1,368	0.35	632	2,040	1,275	0.35	563	1,805	1,175	0.35	484
B	2,183	1,252	0.36	600	1,934	1,180	0.35	530	1,735	1,107	0.35	464
C	2,111	1,191	0.35	560	1,906	1,151	0.35	518	1,721	1,092	0.35	458
D	1,770	928	0.46	565	1,546	852	0.40	451	1,420	824	0.35	368
E	1,735	896	0.35	441	1,649	928	0.35	436	1,548	930	0.35	408
F	1,372	631	0.80	621	1,063	478	0.80	481	871	381	0.80	380

Weights in '000 t.

The options are:

A = reduction to F_{max} in 1989, with Catch(88) = Catch(89) = 530,000 t.

B = reduction to F_{max} (approximately) in 1990, keeping the catch at 600,000 t.

C = reduction to F_{max} in 1990, decreasing F by 0.15 per year.

D = reduction to F_{max} in 1993, decreasing F by 15% per year.

E = reduction to F_{max} in 1991, with F(88) = F(87), then decreasing F by 0.15 per year.

F = keeping F at the 1987 level.

Any of the options (A-E) which achieves such a reduction leaves a substantially larger SSB in 1993 than option F, which maintains the high 1987 level of fishing mortality throughout. The gain in SSB is largest for options A-C which reduce F most rapidly, to reach F_{max} (0.35) by 1990. Options D and E achieve lower gains in SSB, since they involve slower reductions in F and allow higher catches in the immediate future, with lower catches in the medium term. Option B maintains a constant catch (600,000 t per year) for 1988-1991, whilst option D maintains the steadiest reduction in F over the period (15% per year).

2.2 North-East Arctic Haddock

Source of information: Arctic Fisheries Working Group report, September 1987 (C.M.1988/ Assess:5).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	75	110	110	77	20	50	100	160	-	-	-
Agreed TAC	75	110	-	-	-	50	100	250	-	-	-
Actual landings	88	77	47	22	17	41	96	-	320	17	129
Sp. stock biomass	64	141	102	66	52	50	113	192[1]	303	52	163
Recruitment (age 3)	19	6	9	5	7	355	591	162[1]	1020	5	143
Mean F(4-7,u)	0.56	0.60	0.48	0.38	0.29	0.37	0.36	-	0.84	0.26	0.54

[1]Predicted or assumed. [2]Over period 1965-1984. Weights in '000 t, recruitment in millions.

Catches: Landings declined from 1980 to 1984 to the lowest level on record (Tables 2.2.1 and 2.2.2) but have increased sharply in the most recent years and are expected to be at more than 10 times the 1984 level in 1987. In 1986, Norway and USSR accounted for 97% of the landings.

Data and assessment: Analytical assessment based on catch-at-age data and on combined Norwegian and USSR survey results. Indices of stock numbers from surveys were used for estimating recruitment of the 1983-1986 year classes at age 3.

Fishing mortality: Has decreased in recent years (Figure 2.2) and is expected to decrease by 14% from 1986 (0.36) to 1987 (0.31). The level will then be below F_{max} (0.39) and about 10% above F_{med} (0.28).

Recruitment: After a series of poor year classes, which recruited to the fishery in the 1980-1984 period, recruitment was good in 1985 and 1986. The 1987 recruitment is estimated to be slightly higher than the 1965-1984 average and the 1985-1987 year classes, which are recruiting in 1988-1990, appear to be poor.

State of stock: The spawning stock biomass decreased continuously since 1981 to the lowest level on record in 1985 followed by an increase above the 1965-1984 average in 1987. A further considerable increase is expected in the 1988-1990 period due to the contribution to the spawning stock of the abundant 1982 and 1983 year classes.

Forecast for 1988: Assuming F(87) = 0.31, Catch(87) = 210,000 t, SSB(88) = 364,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.15	128	567	SSB increasing
B	F(87)	0.31	240	484	SSB increasing
C	F_{max}	0.39	296	443	SSB increasing

Continued fishing at current (1987) levels of fishing mortality will lead to a slight decline in both total and spawning stock biomass and hence catches by 1990 compared to the 1988 level.

Recommendation: Fishing mortality should not be allowed to rise from the present level (Option B). By reducing fishing mortality, the current high level of catches and spawning stock biomass can be maintained over a longer period, thereby alleviating the effects of the recruitment of poor year classes in 1988, 1989, and 1990.

2.3 North-East Arctic Saithe

Source of information: Arctic Fisheries Working Group report, September 1987 (C.M.1988/Assess:5).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	122	123	130	130[3]	103[3]	85[3]	74[3]	<90	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	145	175	168	157	159	107	70	-	262	107	190
Sp. stock biomass	183	150	158	159	190	217	212	221[1]	572	150	352
Recruitment (age 1)	253	188	153	206	139	200	200	200[1]	471	139	299
Mean F(3-8,u)	0.48	0.49	0.44	0.39	0.44	0.33	0.24	-	0.52	0.13	0.37

[1]Predicted or assumed. [2]Over period 1965-1984. [3]Catch at F_{max}. Reduction to this level as quickly as possible is recommended. Weights in '000 t, recruitment in millions.

Catches: Landings have declined rapidly after 1984 from the relatively stable level around 160,000 t to the lowest level on record in 1986 (Table 2.3). This decline can be attributed to a considerable reduction in fishing effort in 1985 and 1986. No further decline is expected in 1987. In 1986, 94% of the catches were taken by Norway.

Data and assessment: Analytical assessment based on catch-at-age data and indices of fishing effort for Norwegian trawlers and purse seiners. Estimates of recruitment were not available.

Fishing mortality: Has been declining after 1984 (Figure 2.3) following the trend in fishing effort and is expected to be about 20% above $F_{0.1}$ in 1987 and well below F_{max}.

Recruitment: The level of recruitment in recent years has only been about 2/3 of the long-term average. There is so far no reliable evidence of improvement. Four recruiting year classes (age 1) are assumed to be of average size in the projection.

State of stock: The spawning stock biomass is increasing, but is still at a low level. The increase will stop in 1989 if fishing mortality exceeds F_{max} in 1988.

Forecast for 1988: Assuming F(87) = 0.17, Catch(87) = 70,000 t, SSB(88) = 249,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.14	66	285	SSB increasing
B	F(87)	0.17	83	274	SSB increasing
C	F_{max}	0.24	112	255	Increase in SSB halted

Continued fishing at current levels of fishing mortality will lead to an increase in catches in 1988 and in spawning stock biomass in 1989. Further development is largely dependent on recruitment.

Recommendation: Fishing mortality should not be allowed to rise from the present (1987) level (Option B).

2.4 Redfish in Sub-areas I and II

Total redfish landings in Sub-areas I and II have decreased continuously from 132,000 t in 1982 to about 53,000 t in 1986 (Table 2.4.1). This decrease is mainly due to a reduction of the USSR fishery in both Divisions IIa and IIb (Tables 2.4.3 and 2.4.4) while Sub-area I catches increased (Table 2.4.2).

The proportion of the *Sebastes mentella* catch was almost stable at a level of about 80% in the 1977-1983 period and decreased thereafter gradually to 43% in 1986 (Table 2.4.5).

2.4.1 Sebastes mentella in Sub-areas I and II

Source of information: Arctic Fisheries Working Group report, September 1987 (C.M.1988/ Assess:5).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	81	70	70	70	70	85	85	70[3]	-	-	-
Agreed TAC	91	70	70	100	90	85	85	85	-	-	-
Actual landings	79	82	115	105	73	63	23	-	146	73	98
Sp. stock biomass	118	176	199	158	102	78	56	56[1]	199	102	142
Recruitment (age 6)	163	99	42	32	131	63	185	144[1]	574	32	215
Mean F(10-15,u)	0.24	0.31	0.43	0.67	0.77	0.65	0.31	-	0.77	0.24	0.47

[1]Predicted or assumed. [2]Over period 1977-1984. [3]Precautionary TAC, based on recent catches. Weights in '000 t, recruitment in millions.

Catches: Landings have been declining since 1982 (Table 2.4.5, Figure 2.4.1) and are expected to be reduced to a very low level in 1987 due to reduced CPUE and fishing effort.

Data and assessment: Analytical assessment based on catch-at-age data and the relationship of total effort to fishing mortality. Recruitment estimates obtained from survey results.

Fishing mortality: Stable in the 1978-1981 period at about F_{max}, increased to a very high level in 1984, decreased thereafter, and is expected to be below $F_{0.1}$ in 1987.

Recruitment: Has been at a low level in the 1981-1983 period but appears to be improving.

State of stock: Spawning stock biomass has been rapidly declining since 1982, but the decline was halted in 1987 and some increase is expected in 1988. The biomass is low compared to earlier years.

Forecast for 1988: Assuming F(87) = 0.13, Catch(87) = 9,000 t, SSB(88) = 63,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.14	11	69	SSB increasing
B	F_{max}	0.27	20	61	SSB decreasing
C	F(86)	0.31	22	59	SSB decreasing

Continued fishing at current (1987) level of fishing mortality, which is close to $F_{0.1}$, will lead to increase in spawning stock biomass.

Recommendation: Fishing mortality should not exceed $F_{0.1}$, corresponding to a TAC in 1988 of 11,000 t (Option A).

2.4.2 Sebastes marinus in Sub-areas I and II

Source of information: Arctic Fisheries Working Group report, September 1987 (C.M.1988/ Assess:5).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	19	19	14	15[2]	15[2]	15[2]	15	-[3]	-	-	-
Agreed TAC	19	19	14	17	17	15	15	-	-	-	-
Actual landings	23	21	16	19	28	29	30	-	40	16	26

[1]Over period 1977-1984. [2]Precautionary TAC. [3]Recommended a precautionary TAC on the basis of recent catches. Weights in '000 t.

Catches: Catches decreased continuously from about 49,000 t in 1976 to 16,000 t in 1982 followed by a gradual increased to 30,000 t in 1985-1986 (Table 2.4.5).

Data and assessment: Catch-at-age data are available, but are considered unreliable. In the absence of a reliable analysis, a SHOT forecast was made.

Fishing mortality: Unknown.

Recruitment: Unknown.

State of stock: In the absence of an analytical assessment, the only information available is survey results. These indicate a 40% reduction in both stock abundance and biomass in the Barents Sea from 1986 to 1987. In the Svalbard/Bear Island area, the survey results indicate a reduction in stock abundance and biomass of about 75% and 50%, respectively, from 1984 to 1985, while the 1986 survey showed no substantial difference from the level estimated for the preceding year in that area.

Forecast for 1988: For continued fishing at the current level of exploitation, a catch of 28,000 t for 1988 was calculated using a SHOT forecast assuming a catch of 25,000 t in 1987.

Recommendation: In view of the reduced stock size indicated by the survey results, a reduction in exploitation from the current level is advisable. This could be achieved by maintaining and adhering to the 1985-1986 TAC of 15,000 t in 1988.

2.5 Greenland Halibut in Sub-areas I and II

Source of information: Arctic Fisheries Working Group report, September 1987 (C.M. 1988/ Assess:5).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	14	12	12	17	17	20	20	-[3]	-	-	-
Agreed TAC	14	12	12	17	17	20	20	-	-	-	-
Actual landings	13	15	17	22	22	20	23	-	29	13	20
Sp. stock biomass	31	66	67	81	79	84	89	84[1]	81	31	54
Recruitment (age 3)	33	39	35	26	21	30	30	30[1]	39	21	30
Mean F(7-11,u)	0.22	0.17	0.29	0.32	0.29	0.25	0.23	-	0.45	0.17	0.30

[1]Predicted or assumed. [2]Over period 1977-1984. [3]Recommended a precautionary TAC on the basis of recent catches. Weights in '000 t, recruitment in millions.

Catches: Decrease from the stable 1972-1976 level of about 37,000 t to 13,000 t in 1980, followed by a gradual increase. Landings were stable at 20,000 - 23,000 t in 1983-1986, but are expected to increase to 26,000 t in 1987. In 1986, Norway and USSR accounted for 87% of the landings (Tables 2.5.1-2.5.4).

Data and assessment: Analytical assessment based on catch-at-age data and the relationship of fishing mortality and total effort.

Fishing mortality: Has been variable, but mostly higher than F_{max} (Figure 2.5). Increase expected in 1987.

Recruitment: Relatively poor 1980 and 1981 year classes may be followed by stronger 1982 and 1983 year classes, but the evidence is so far not convincing and has not been used in the assessment. Average recruitment (age 3) has been used for four year classes in the projection.

State of stock: Spawning stock biomass has been increasing to the level prevailing in the early 1970s and is nearly three times the low level of 1979-1980. A slight decrease is expected in 1988. Fishing in excess of F_{max} (about the 1986 level) may lead to a further decrease.

Forecast for 1988: Assuming F(87) = 0.32, Catch(87) = 26,000 t, SSB(88) = 80,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.11	10	91	SSB increasing
B	F_{max} = F(86)	0.23	19	82	SSB increasing slightly

Continued fishing at current (1987) levels of fishing mortality will lead to a gradual decrease in spawning stock biomass.

Recommendation: Fishing mortality should be reduced towards F_{max}, i.e., the 1986 level to avoid a decrease in the spawning stock biomass.

2.6 Stocks off East Greenland

2.6.1 East Greenland cod (Sub-area XIV)

2.6.1.1 Advice from the May 1987 ACFM meeting

Source of information: Report of the Working Group on Cod off East Greenland, 28 January - 3 February 1987 (C.M.1987/Assess:10).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	12	6	6	4	4	-	12	4	6.2
Agreed TAC	-	-	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Actual landings	12[3]	16[3]	27[3]	13	8	2	5	-	27	2	14
Sp. stock biomass	51	55	49	27	25	16	40	37[1]	55	16	44
Mean F(5-10,u)	0.21	0.21	1.40	0.53	0.40	0.13	0.14	-	1.40	0.13	0.50

[1]Predicted or assumed. [2]Over period 1980-1986. [3]Including discards. Weights in '000 t.

Catches: Catches have decreased sharply from the high level in 1982 to 1985 with a moderate increase in 1986 (Table 2.6.1). 84% of the catches were taken in the first half of the year, 14% in December and only 2% in the period July-November.

Data and assessment: The stock estimates are derived from the bottom trawl survey by the Federal Republic of Germany, catch-in-numbers data, and certain assumptions and estimates on migration.

Fishing mortality: Fishing mortality is mainly affecting cod from age 5 onwards and decreased continously since 1981 to the present low level.

Recruitment: At present, 37% of the stock abundance consists of young cod of the 1984 and 1985 year classes which will remain below exploitable size in 1987.

State of stock: There has been a downward trend in spawning stock biomass since 1981, but this trend has been reversed in 1986 due to increased immigration from West Greenland.

Forecast for 1987: (Figure 2.6.1.1)

1987					1988
Total stock biomass	Spawning stock biomass	Management option	$F_{(5-10)}$	Catch	Spawning stock biomass[1]
48	37	TAC = 4.0	0.10	4	32
		F(86)	0.14	5	31
		TAC = 11.5	0.33	11.5	26

[1]The calculated SSB does not include immigrants from West Greenland in 1988. Estimates of stock size refer to 1 January. Weights in '000 t.

Recommendation: In November 1986, ACFM, based on preliminary results from the bottom trawl survey in autumn 1986, recommended a preliminary TAC for 1987 of 4,000 t. The preliminary analysis presented to ACFM at that time was based only on length distributions and indicated that the 1984 and 1985 year classes made up about half the survey biomass in autumn 1986. The detailed analysis in January-February 1987 by the Working Group based on age composition data and including estimates of immigrants from West Greenland resulted in an estimate of 37% of the stock abundance for these two year classes.

Based on the management objective to not allow the spawning stock to decline again in order to make at least some recruitment possible from the East Greenland spawning stock to both the East and West Greenland cod stocks, ACFM recommends that the level of exploiploitation in 1987 should not be increased. The corresponding TAC is 5,000 t.

Special comments: In the East Greenland area, the stock situation is very complicated. The state of the stock is, to a large extent, affected by factors which are very difficult to estimate and to predict, i.e., immigration of cod from West Greenland (depending on the stock situation in that area), emigration of mature cod to Icelandic spawning grounds, and drift of larvae from Iceland. The role of a local spawning stock can still not be fully evaluated and recruitment estimates from it are not obtainable. Under these circumstances, VPA and yield-per-recruit calculations to determine management objectives and safe biological limits are not possible.

2.6.1.2 Advice from the October/November 1987 ACFM meeting

Source of information: Provisional assessment, ACFM Working Paper, November 1987.

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recommended TAC	-	-	12	6	6	4	4	5	12	4	6.2
Agreed TAC	-	-	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Actual landings	12[3]	16[3]	27[3]	13	8	2	5	7[1]	27	2	14
Sp. stock biomass	51	55	49	27	25	16	40	33[1]	55	16	44
Mean F(5-10,u)	0.21	0.21	1.40	0.53	0.40	0.13	0.14	0.22[1]	1.40	0.13	0.50

[1]Predicted or assumed. [2]Over period 1980-1986. [3]Including discards. Weights in '000 t.

Catches: Catches have decreased sharply from the high level in 1982 to 1985 with a moderate increase in 1986 and 1987 (Table 2.6.1).

Data and assessment: The stock estimates are derived from the bottom trawl survey by the Federal Republic of Germany, catch-in-numbers data, and certain assumptions and estimates on migration.

Fishing mortality: Fishing mortality is mainly affecting cod from age 5 onwards and decreased continously since 1981 to the present low level which is comparable to the pre-1982 situation.

Recruitment: At present, 68% of the stock abundance of cod at East Greenland as estimated in the 1987 autumn survey consists of young cod of the strong 1984 and 1985 year classes. The 1985 year class, accounting for 30% of the population, will remain virtually below exploitable size in 1988.

State of stock: There has been a downward trend in spawning stock biomass since 1981, but this trend has been reversed in 1986. Due to immigration from West Greenland, SSB increased by a factor of 2.5 in that year. The slight reduction in 1987 is caused by fishing and emigration of mature fish. Total biomass at the beginning of 1988 is estimated as 60,000 t.

Forecast for 1988: (Figure 2.6.1.2)

	1988				1989
Management option	$F_{(5-10)}$	Total stock biomass	Spawning stock biomass	Catch	Spawning stock biomass[1]
TAC = 5	0.10	60	32	5	34
F(88) = F(87)	0.22			10	31
TAC = 11.5	0.25			11.5	30

[1]The calculated SSB does not include immigrants from West Greenland in 1989.
Estimates of stock size refer to 1 January. Weights in '000 t.

Continued exploitation on the 1987 level would maintain the spawning stock at about the present level.

Recommendation: Based on the management objective to not allow the spawning stock to decline again in order to make at least some recruitment possible from the East Greenland spawning stock to both the East and West Greenland cod stocks, ACFM recommends that the level of exploitation in 1988 should not be increased.

Special comments: In the East Greenland area, the stock situation is very complicated. The state of the stock is, to a large extent, affected by factors which are very difficult to estimate and to predict,i.e., immigration of cod from West Greenland (depending on the stock situation in that area), emigration of mature cod to Icelandic spawning grounds, and drift of larvae from Iceland. The role of a local spawning stock can still not be fully evaluated and recruitment estimates from it are not obtainable. Under these circumstances, VPA and yield-per-recruit calculations to determine management objectives and safe biological limits are not possible.

The final advice for 1988 will be given in May 1988 when the report of the Working Group on Cod Stocks off East Greenland has been evaluated by ACFM.

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

Source of information: Provisional Report of NAFO Scientific Council, January 1987 (NAFO SCS Doc.87/01).

Recent catches (tonnes) are shown in the text table below:

Country	1978	1979	1980	1981	1982	1983	1984	1985[1]	1986[1]
Denmark	-	-	702	581	740	204	443	353	500
Faroe Islands	-	-	4,233	713	737	443	668	674	727
France	-	-	50	353	414	291	500	642	780
Greenland	-	-	200	1,004	1,115	1,467	2,250	2,596	5,781
Iceland	363	485	614	125	-	43	742	1,784	1,030
Norway	-	800	2,461	2,016	1,896	1,727	2,128	2,051	1,997
Total	363	1,285	8,260	4,792	4,902	4,175	6,731	8,100	10,815
Advised TAC	-	-	-	-	4,200	4,200	4,200	5,000	...
Effective TAC[2]	-	-	-	8,000	4,500	5,725	5,245	6,090	7,225

[1]Provisional data.
[2]On western side of midline only.

This stock has been assessed by the Scientific Council of NAFO, and management advice for 1987 has been passed to managing bodies in the Provisional Report of the Scientific Council, January 1987.

It was noted by the Scientific Council that new information indicated conflicting trends in catch rates of different fishing fleets. In view of the variation which is believed to exist among these fleets relevant to increased efficiency of fishing, the Council could not fully evaluate the catch rate data. Data from research vessel surveys in 1985 and 1986 indicated that recent catches have not adversely affected the stock, but the available data were not sufficient to allow the Council to advise a precise TAC for 1987 in this region.

2.7 Redfish in Sub-areas V and XIV

2.7.1 Sebastes marinus in Sub-areas V and XIV

Landings of redfish from Sub-areas V and XIV amounted to 123,000 t in 1985 and 124,000 t in 1986. Catches of *Sebastes marinus* in these areas were 80,000 t in 1985, and a preliminary split of the 1986 redfish landings between *S. marinus* and *S. mentella* indicates approximately the same catch in 1986. Preliminary catch data for 1987 indicate stable catches in Division Va (mainly *S. marinus* fishery) but a declining trend in Division Vb (mainly *S. mentella*). No information is available for the 1987 catches in Sub-area XIV.

These catch levels are similar to those projected for 1986 and 1987 assuming continuation of the current exploitation level as preferred by ACFM.

2.7.2 Sebastes mentella "traditional fishery" in Sub-areas V and XIV

Catches of *Sebastes mentella* from the traditional fisheries in Sub-areas V and XIV amounted to 43,000 t in 1985. In 1986, the provisional catch data split indicates a *S. mentella* catch of 44,000 t. These catches are at about the level of the precautionary TAC recommended by ACFM.

2.7.3 Sebastes mentella "oceanic type" in Sub-areas XII and XIV

Since 1982, there has been a fishery for *Sebastes mentella* "oceanic type" in the international waters in the Irminger Sea (Sub-areas XII and XIV). Catches have been larger than those from the traditional fishery, ranging between 50,000 t and 70,000 t. The preliminary catch in 1986 amounted to 69,000 t.

Due to a lack of any data for an assessment, ACFM has never been in the position to give any advice on this stock.

2.8 Greenland Halibut in Sub-areas V and XIV

Landings of Greenland halibut from Sub-areas V and XIV have been stable during 1982-1985, between 30,000 and 34,000 t. In 1986, the landings amounted to 32,000 t which is 4,000 t more than the assumed level used in the assessment of this stock. The preliminary catch in Division Va for the period January-June 1987 is 34,000 t compared to 22,000 t for the same period in 1986. The main difference in these catch figures derives from the May landings which almost doubled from approximately 12,000 t in 1986 to more than 22,000 t in 1987. This was due to an extension of the fishery to deeper waters in the main fishing area. The expected catch in 1987 will be 42,000 t. Unfortunately, no age composition data have yet been worked up for these 1987 landings. Advice on this stock, therefore, has to be deferred until the ACFM meeting in May 1988 when new data will be available.

2.9 Icelandic Saithe (Division Va)

Landings of saithe were 56,000 t in 1985. In 1986, the landings of 66,000 t were 4,000 t higher than those assumed in the catch projections for 1987 and 1988. Preliminary catch figures for 1987 indicate a total catch of 75,000 t which is about 10,000 t above the catch level preferred by ACFM assuming low recruitment in recent years.

The higher catches in 1987 are due to better-than-expected recruitment of the 1983 year class. This good recruitment has been confirmed by the 1987 groundfish survey carried out by Iceland.

2.10 Demersal Stocks at the Faroe Islands

2.10.1 Faroe saithe (Division Vb)

The advice given by ACFM in November 1986 was based on an assumed catch of 35,000 t in 1986. Final data for 1986 show a total catch of 41,000 t. No data on fishing effort were available to ACFM, and it is, therefore, not possible to show whether the increase in catches is due to increased stock size or increased fishing effort.

2.10.2 Faroe Plateau cod (Sub-division Vb1)

The assessment of the Faroe Plateau cod stock given by ACFM in November 1986 was based on preliminary data for 1986. Final data for 1986 are now available and these, together with catch-at-age data for the first half of 1987, formed the basis for a tentative assessment of the stock. The new assessment indicates that the 1984 year class is very low and that fishing mortality in 1985 and 1986 is higher than previously assumed.

The catch predictions for 1987 and 1988 given by ACFM in November 1986 may be too optimistic. Assuming *status quo* fishing mortality, the catches in 1987 and 1988 were predicted to be 31,000 t and 29,000 t, respectively.

Preliminary data on catches suggest a total catch of 25,000 t in 1987. Using this estimate and the new assessment, catches in 1988 are expected to be in the order of 23,000 t.

2.10.3 Faroe haddock (Division Vb)

Catches in 1986 and preliminary data on catches in 1987 are in good agreement with the values used in the ACFM assessment in November 1986.

2.11 Atlanto-Scandian Herring

2.11.1 Icelandic spring-spawning herring

In 1986, there were no signs of the recovery of the Icelandic spring-spawning herring stock, and the fishery was based entirely on summer spawners.

2.11.2 Icelandic summer-spawning herring (Division Va)

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March-April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	45	40	50	50	50	50	65	-	-	-	-
Agreed TAC	50	42	50	52.5	50	50	65	-	-	-	-
Actual landings	53	40	57	59	50	49	65	-	65	0.3	31
Sp. stock biomass	207	178	184	244	289	322	318	385[1]	322	11	146
Recruitment (1-ring)	242	1291	277	237	400	953	350	400[1]	1291	34	339
Mean F(4-14,w)	0.30	0.26	0.40	0.25	0.18	0.16	0.24	-	1.58	0.01	0.33

[1]Predicted or assumed. [2]Over period 1969-1986. Weights in '000 t, recruitment in millions.

Catches: Stable up to 1985, increasing in 1986 (Table 2.11.2).

Data and assessment: Analytical, based on catches and acoustic surveys. Acoustic surveys in 1986 underestimated stock because of distribution close to the shore, so assessment tuned to previous surveys.

Fishing mortality: Rather stable at around $F_{0.1}$ level. Increased on older age groups in 1986.

Recruitment: High recruitment of 1-ringers in 1981 and 1985. Recruitment in 1987 assumed to be average.

State of stock: Spawning stock increased from its lowest level of 11,000 t in 1972 and has now levelled off at 320,000 t (Figure 2.11.2.1).

Forecast for 1987:

Option	Basis	F(87)	Predicted SSB(87) ('000 t)	Predicted catch (87) ('000 t)	Predicted SSB(88) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.22	385	70	400	Continued increase in SSB

Continued fishing at current levels of fishing mortality will lead to an increase in spawning stock biomass in 1988 and an increased catch in 1987 (Figure 2.11.2.2).

Recommendation: ACFM prefers that fishing mortality should be maintained at the $F_{0.1}$ level corresponding to a TAC in 1987 of 70,000 t.

2.11.3 Norwegian spring-spawning herring

Source of information: Atlanto-Scandian Herring and Capelin Working Group report, October 1987 (C.M.1988/Assess:10).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	0	0	0	0	38	50	150	150	150	0	48.5
Agreed TAC[3]	9.3	9.3	12	21	38	60	126	115	126	9.3	48.8
Actual landings	17.6	13.7	16.7	23.1	53.5	81.0	135.6	-	135.6	13.7	57.7
Sp. stock biomass	518	547	552	615	637	563	477	472[1]	637	472	548
Recruitment (age 3)	422	392	630	97	65	77	7,000	235[1]	7,000	65	1,115
Mean F(4-16,w)	0.02	0.02	0.02	0.03	0.09	0.16	0.30	-	0.30	0.02	0.09

[1]Predicted or assumed. [2]Over period 1980-1987. [3]National quotas.
Weights in '000 t, recruitment in millions.

Catches: Catches kept at a low level until 1984, but have increased in later years (Table 2.11.3).

Data and assessment: Analytical assessment, catch at age (VPA) and abundance estimates based on tagging and acoustic surveys.

Fishing mortality: Fishing mortality kept at low level until later years.

Recruitment: Extremely low except for the 1983 year class (Figure 2.11.3).

State of stock: Depleted, but slowly recovering.

Forecast for 1988: Assuming F(87) = 0.08, Catch(87) = 120,000 t, SSB(88) = 1,382,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A		0	0	1,490	Spawning stock increased
B	F(87)	0.08	120	1,378	Spawning stock status quo
C		0.10	150	1,351	Spawning stock slightly decreased
D		0.14	200	1,304	Spawning stock slightly decreased

Continued fishing at current levels of fishing mortality will lead to a decline in the stock.

Recommendation: ACFM noted that the 1983 year class would not rebuild the spawning stock biomass to the preferred level of 2.5 million t regardless what catch option is chosen and, in view of the expected poor recruitment from the 1984-1987 year classes, advises that the spawning biomass will decline after 1988. ACFM recommends, therefore, that fishing mortality should be kept at around the 1987 level corresponding to a TAC in 1988 in the range of 120,000-150,000 t.

Special comments: Estimates of the size of the 1983 year class have a major effect on the stock prediction and TAC advice for 1988. These estimates are based on acoustic methods and are subject to considerable uncertainty.

2.11.4 Distribution of the Norwegian spring-spawning herring

ACFM in 1985 addressed a similar but broader question posed by NEAFC.

Since then, only the oceanic component of the 1983 year class has been found to be distributed outside Norwegian coastal waters. In the period autumn 1983 to May-June 1986, this component was found distributed over wide areas in the southern Barents Sea in the EEZ of both Norway and the USSR. In the early summer of 1986, this herring component migrated out of the Barents Sea and has since been found to be distributed on the coastal banks of western Norway (between 63^0N and 69^0N). There are no indications yet whether it will resume any of the migration patterns observed prior to 1970.

2.12 Capelin

2.12.1 Barents Sea capelin

Source of information: Atlanto-Scandian Herring and Capelin Working Group report, October 1987 (C.M.1988/Assess:10).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	1,600	1,900	1,600	2,300	1,100	1,000	0	0	2,300	0	1,188
Agreed TAC	1,600	1,900	1,700	2,300	1,400	1,100	120	0	2,300	0	1,265
Actual landings	1,649	1,987	1,759	2,309	1,477	851	123	0	2,309	0	1,269
Sp. stock biomass	119	1,767	582	122	251	344	52	-	1,767	52	462
Recruitment (age 2)	384	411	307	425	372	257	3	2[1]	425	2	270

[1]Predicted or assumed. [2]Over period 1980-1987. Weights in '000 t, recruitment in billions.

Catches: Drastic decline in catches in most recent years (Table 2.12.1).

Data and assessment: Analytical assessment based on survey data and catch-at-age data.

Fishing mortality: Not used in assessment.

Recruitment: Extremely low since 1985.

State of stock: Depleted.

Forecast for 1988: Assuming F(87) = 0, Catch(87) = 0, SSB(88) not measurable.

Recommendation: No catch in 1988.

Special comments: ACFM points out that the decline of this stock cannot be explained by fishing alone, but may be partly due to changes in the Barents Sea ecosystem and increased predation by cod.

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

2.12.2.1 Advice from the May 1987 ACFM meeting

Source of information: Working paper.

Catches and TACs are shown for recent years in the text table below.

1983/1984			1984/1985			1985/1986			1986/1987		
Pred. TAC	Agreed TAC	Catch	Pred. TAC	Agreed TAC	Catch	Pred. TAC	Agreed TAC	Catch	Pred. TAC	Agreed TAC	Catch
375	640	570	-	920	892	700	1,280	1,307	1,100	1,290	1,332

Weights in '000 t.

The fishery and ACFM advice for the 1986/1987 season

In February 1986, an acoustic survey was carried out on the distribution and abundance of immature capelin of the 1984 and 1983 year classes which constituted the fishable stock in the 1986/1987 season. On the basis of the results of that survey a TAC of 800,000 t was set for the July-November 1986 period.

In October 1986, a new acoustic stock abundance estimate was obtained. Based on the results of this survey, ACFM recommended that the TAC for December 1986 - February 1987 be 300,000 t. This was added to the TAC of 800,000 t already set for the July-November 1986 period, and the 70,000 t caught by the Faroese and Danish vessels under Greenlandic license prior to the October survey, giving a total TAC for the 1986/1987 season of 1,170,000 t.

In January 1987, the mature stock component was surveyed again. In this survey, the total amount of capelin maturing to spawn in 1987 was estimated to be about 1,015,000 t. As about 400,000 t of the TAC allocated for the season remained to be taken, these results indicated that another 120,000 t could be added to the TAC for the 1986/1987 season and yet preserve the targeted spawning stock size of 400,000 t.

The total catch from the capelin stock in the Iceland-East Greenland-Jan Mayen area in the 1986/1987 season amounted to 1,332,000 t (Table 2.12.2).

Management advice for the summer-autumn 1987 season

At its meeting in November 1986, ACFM recommended deferring the advice on a TAC for the 1987 summer-autumn season until the 1987 May meeting, as it was expected that additional information on the immature capelin of the 1984 and 1985 year classes on which the fishery will be based would be available from surveys in January-February 1987.

On April 28-29, a group of scientists from Greenland, Iceland, and Norway met at the Marine Research Institute, Reykjavik in order to evaluate the latest results from the January-February 1987 acoustic survey of immature capelin of the 1985 and 1984 year classes, and to advise on TACs for the summer-autumn 1987 season. Immature capelin were mainly recorded west of 18°W. In that area, drift ice covered the outer part of the distribution, particularly in the case of the 1985 year class. The total abundance estimates of the immatures by age groups are compared with corresponding values from previous surveys in the text table below:

Age	1987		1986		1985	
	N x 10^9	Tonnes	N x 10^9	Tonnes	N x 10^9	Tonnes
2	40.9	216.5	72.4	332.0	58.7	271.7
3	11.5	133.0	52.5	524.6	18.6	195.9

Since there was no way to judge how much the immature capelin of the 1985 year class were underestimated by the January/February 1987 survey, other methods of estimating their abundance were considered. Numbers from the August and October 1986 acoustic surveys were used in four different ways to project the numbers for the 1985 year class to August 1987. Resulting TAC values based on these projections were 304,000, 501,000, 504,000, and 1,072,000 t.

For all the TAC calculations, an assumption was made for the maintenance of a remaining target spawning stock of 400,000 t.

ACFM noted that the above procedure had been used for the first time for forecasting the abundance of the fishable stock of capelin in the Iceland-East Greenland-Jan Mayen area. For that reason and with reference to the highly variable results, ACFM stresses the need to proceed with caution until further information is obtained. Therefore, ACFM advises that the TAC for the period July-November 1987 should not in any case exceed 500,000 t.

Advice on a TAC for the period December 1987 - March 1988 will be given at the 1987 November meeting of ACFM when new stock abundance estimates from the October 1987 acoustic survey will be available.

2.12.2.2 Advice from the October/November 1987 ACFM meeting

Source of information: Atlanto-Scandian Herring and Capelin Working Group report, October 1987 (C.M.1988/Assess:10).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC[3]	863	440	366	0	375	300	700	1,100	1,100	0	518
Agreed TAC[3]	-	-	-	0	640	920	1,280	1,290	1,290	-	-
Actual landings[3]	963	680	626	0	573	892	1,307	1,332[1]	1,332	0	796
Sp. stock biomass	300	160	140	260	440	460	450	420[1]	460	140	329
Recruitment (age 2)	65	73	48	150	140	225	80	-	225	48	112

[1]Predicted or assumed. [2]Over period 1980-1987. [3]The figures in the TAC table refer to a fishing season ending in the year indicated, starting in August and ending in March. Weights in '000 t, recruitment in billions.

Catches: Catches have varied according to agreed TAC recommendations and state of stock (Table 2.12.2).

Data and assessment: Analytical assessment based on acoustic survey and catch-at-age data.

Fishing mortality: Not estimated.

State of stock: Highly variable due to the short life span.

Forecast for 1988: Summer and autumn seasons: Deferred until May 1988.

Recommendation: TAC recommendations for the 1988 summer/autumn seasons deferred until May 1988.

Special comments: At its meeting in May 1987, ACFM decided to defer until November 1987 its advice on TAC for the period December 1987 - March 1988 when a new stock abundance estimate from the October 1987 acoustic survey would be available.

Due to a very westerly distribution of adult capelin and ice cover over the western limit of the distribution area, the results of the October 1987 acoustic survey are considered to provide underestimates of both the juvenile and adult components.

A new Icelandic acoustic survey is planned for November 1987 when the capelin are expected to have returned to their usual wintering areas. After completion of this survey, scientists from Greenland, Iceland, and Norway will evaluate the survey results and advise on a TAC for the period December 1987 - March 1988. This advice will be reported to the relevant management bodies and ACFM.

Since 1979, the main management aim has been to preserve a spawning stock of 400,000 t. Based on this target spawning stock size, a preliminary TAC for the 1988/1989 season of about 625,000 t has been calculated using the acoustic estimates of 1-group capelin in August 1987.

However, as additional information on immature capelin of both year classes may be obtained from the acoustic surveys of the stock in November 1987 and in January-February 1988, and in view of the short August data series, ACFM recommends that the advice on a TAC for the 1988 summer and autumn season should be deferred until spring 1988.

3. STOCKS IN NEAFC REGION 2

3.1 Herring Stocks South of 62^0N

3.1.1 General considerations on the exploitation of herring stocks

Over the past 20 years, a number of herring stocks in the ICES area have decreased to low levels as a result of high levels of fishing mortality and lower-than-average recruitment. In at least the majority of these stocks, recruitment has recently improved and the stocks have made some recovery towards historical average levels. This is thus an opportune time to give advice designed to mitigate the worst effects of recruitment failure in the future.

For several stocks of herring, it is possible to identify periods of relatively stable stock size in which recruitment fluctuated without trend around a long-term average level. The stock size during these periods can thus be looked upon as a "safe" level at which average levels of recruitment are likely to be maintained, albeit with fluctuations from year to year.

The other advantage of maintaining the stock at this level is that it establishes a buffer stock which provides a hedge against recruitment fluctuations, thereby reducing the large fluctuations in advised catch levels in heavily exploited stocks in which the recruiting year class is a prominent part of the catch.

The size of buffer stock to be maintained is a management choice depending on the degree of risk management bodies are prepared to take. Within certain limits, however, the greater the buffer stock, the longer the period of poor recruitment that can be bridged.

One way of maintaining a buffer stock is to set a constant TAC at a level that is not expected to allow erosion of the stock below the buffer level. This approach has the advantage of providing foreseeable catch levels. It should be stressed, however, that there are annual variations in recruitment in all stocks and there have also been periods of low recruitment in many stocks extending over several years. Hence, no constant level of TAC can be maintained indefinitely unless it is set at such a low level that it would unnecessarily limit catches during periods of good recruitment.

The alternative to a constant TAC is to manage the fisheries at a stable level of fishing mortality rate that will, on average, be compensated by recruitment and thus maintain the stock at around the desired buffer level. Because of fluctuations in recruitment, this strategy will result in fluctuations in advised catch levels, but if the buffer stock is maintained at the appropriate level and contains a sufficient number of age groups, then these fluctuations will remain within a tolerable range.

At this year's Herring Working Group meeting, revised values of natural mortality rates on each age group of herring, based on estimates for the North Sea provided by the Multispecies Working Group, were used in the assessments of all herring stocks south of 62^0N. The change in values used has little effect on short-term projections, but it does change, to some extent, the results of long-term assessments. In particular, it is estimated that the effect of exploitation of juvenile herring (0- and 1-ringers) depends on the age group exploited and on the time of the year at which they are caught (affecting their mean weight in the catches). These effects are detailed where appropriate under relevant stocks. It is, however, clear that any exploitation of juvenile herring (herring that have not yet matured to spawn) will reduce spawning stock biomass per recruit.

ACFM wishes to draw to the attention of the managers the fact that herring spawning stock biomasses in the option tables given in this report are calculated for spawning time which, depending on the stock, occurs at different times during the period September-December. In interpreting the values given for 1989, it has to be remembered that they also reflect the effect of fishing for the previous part of that year at the same level of fishing mortality as in the preceding year.

Consistency of TAC advice on herring stocks

In response to the request for consistency in advice on the management of herring stocks from the Commission of the European Communities, ACFM wishes to explain why the advice given for the different stocks may not always appear to be uniform.

In providing management options for each stock, ACFM takes into account a number of considerations, including the levels of current fishing mortality in relation to biological reference points, and the current size of the spawning stock and level of fishing mortality in relation to historically sustainable levels. Since different stocks are in different phases of development in relation to the historic performance of the stock and since biological reference points differ between stocks, it is not possible to adhere exactly to the same criteria in recommending TACs. Nevertheless, in this report, the basis for the TAC advice for each stock is explained.

3.1.2 Herring in Divisions IVa,b

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	0	0	0	62	95	166	235	600	-	-	-
Agreed TAC	-	-	-	72	-	-	500	560	-	-	-
Actual landings	21	99	167	244	272	467	493	-	493	10	231
Sp. stock biomass	153	177	268	422	720	728	796	913[1]	796	99	304
Recruitment (2-ring)	246	416	996	1877	4183	3421	3799	4343	4183	188	1603
Mean F(2-6,u)	0.03	0.17	0.06	0.20	0.34	0.55	0.48	-	1.07	0.01	0.44

[1]Predicted or assumed. [2]Over period 1972-1986. Weights in '000 t, recruitment in millions.

Catches: Large increase in 1985 with small increase in 1986 (Table 3.1.2) to a level close to long-term mean for this area (530,000 t from 1947-1964). Large catches of 0-group from 1981-1983 reduced to low level in 1985-1986. Catches of 1-ring juveniles increased to an estimated 118,000 t in 1986 taken in trawl and purse seine fisheries.

Data and assessment: Analytical assessment based on catches in Divisions IVa and IVb and estimates of spawning stock size from larvae production and acoustic survey estimates. Recruitment estimated from IYFS.

Fishing mortality: Increased progressively up to 1985; slightly reduced in 1986. Current level higher than that recommended for long-term management.

Recruitment: After 10 poor year classes in total North Sea (Figure 3.1.2.1), the 1981-1984 year classes are at pre-1970 average. The 1985 year class is a strong one. The 1986 year class assumed to be at long-term average.

State of stock: Continuing slow recovery; large increase in 1984 followed by small increase in 1985 and 1986 (Figure 3.1.2.2).

Forecast for 1988: Assuming F(87) = 0.43, Catch(87) = 560,000 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch (88) ('000 t) Total	1-ring	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.14	1,526	225	35	1,950	Reduction in catch; rapid increase in SSB
B	F_{med}	0.35	1,345	500	81	1,481	Stabilization of catch; continued growth in SSB
C	F86	0.48	1,241	654	109	1,207	Temporary increase in catch; reversal of trend in SSB

Continued fishing at current levels of fishing mortality will lead to a halt in the recovery of the stock and a decrease in 1989; the increased catch in 1988 is very unlikely to be sustainable.

Recommendation: The fishing mortality in 1988 should be reduced to the level (0.35) that is likely to sustain a spawning stock biomass of 1.5-2 million t, corresponding to catch in 1988 of 500,000 t. Existing regulations (sprat box closure, 20-cm minimum landing size, by-catch regulations) designed to protect 0-group and small 1-ring herring should be maintained. The spawning area closures in Division IVb should be maintained.

Special comments:

1. The 1987 assessment of this stock is significantly different from that carried out in 1986, when the stock size in 1985 was estimated to be 1,085,000 t compared with a revised estimate of 720,000 t. This change in interpretation is due partly to a change in the assessment methodology and partly to the fact that it is now thought likely that the acoustic estimates of stock size and the catches in Division IVa include considerable quantities of herring that spawn in Division IVb. For the same reason, the fishing mortality rate in 1986 is now estimated to be higher (0.48) than predicted in 1986 (0.37).

2. Since 1983, there has been a major reduction in catches of 0-group herring largely as a result of enforcement of the sprat fishery closure in an area along the Danish west coast. In 1986, the catch of 1-ring juvenile herring increased, but a considerable proportion of these fish were caught in the latter half of the year both in trawl fisheries using a regulation 32-mm mesh size and in purse seine fisheries, and many of them were above the 20-cm minimum landing size. Calculations that take into account the new values of natural mortality in herring indicate that exploitation of these larger 1-ring herring has no measurable effect on potential yield from a year class. This is not, however, the case with 0-group and the smaller 1-ring herring, and ACFM, therefore, considers that the existing regulations to protect the smaller juvenile herring are an effective way of ensuring that recruitment is not reduced and that the full potential of the stock can be realized.

3. While estimates of recruitment to the entire North Sea stocks are obtained from the young fish survey, projections for this management unit have to rely on assumptions about the proportion of recruits that will join the Divisions IVa,b and IVc, VIId stocks, respectively. In the absence of reliable methods to predict this division, the assumption is made that it will be in proportion to the respective size of the two spawning stocks.

4. The appearance of the strong 1985 year class provides an opportunity to create a buffer stock without having to reduce present catch levels to any significant extent. ACFM stresses that such an opportunity seldom arises. A spawning stock of around 1.5-2 million t, at which level recruitment was historically reasonably stable, would be capable of buffering the normal fluctuations in recruitment. The appropriate level of fishing mortality to maintain this stock level, so long as recruitment maintains its historic average level, is around 0.30-0.35. At this level of exploitation, the expected maximum long-term level of catch is around 500,000 t. The more complete analysis of long-term potential for this stock carried out by this year's Herring Working Group thus supports the advice given by ACFM in 1986.

3.1.3 Herring in Divisions IVc, VIId (Downs herring)

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	20[3]	60[3]	36[3]	49	62	42	11[2]	-	-	-
Agreed TAC	-	20	72	73	55	90	70	40	-	-	-
Actual landings	43	42	69	64	46	70	51	-	70	1	33
Sp. stock biomass[4]	-	96	146	150	133	124	127	-	-	-	-
Recruitment	←			No information			→	-	-	-	-
Mean F(2-6,u)	←			No information		→	0.6[5]	-	-	-	-

[1]Over period 1972-1986. [2]For period up to 30 June. [3]For period October-March. [4]Acoustic survey estimates at end of year. [5]Acoustic survey estimates. Weights in '000 t.

Catches: Fluctuating catches at relatively low level well below average for period prior to 1955; recently limited by restricted markets. 19,500 t not officially reported in 1986 (38% of total). Catches less than agreed TAC in every year since 1982.

Data and assessment: No analytical assessment because catches of this stock in Divisions IVa,b not quantified. Information on recent trends in spawning stock from larvae surveys and acoustic surveys.

Fishing mortality: No information on recent trends, but appears to be at a high level in 1986 due to exploitation in both Divisions IVc and VIId and areas further north.

Recruitment: No quantitative information, but 1986 catches heavily dependent on recruiting 1982 and 1983 year classes.

State of stock: Still at depleted level compared with period prior to 1955. Acoustic surveys indicate relatively stable SSB from 1981-1986. Larvae surveys indicate major increase in 1980 and 1981, a decrease in 1982, followed by an increase in 1986.

Forecast for 1988: Precise catch predictions not possible (see special comments).

Continued fishing at current levels of fishing mortality will lead to little chance of recovery at present levels of recruitment.

Recommendation: In view of the present high level of fishing mortality and low stock size in comparison with earlier periods, the catch in Divisions IVc and VIId should be reduced below recent levels in both 1987 and 1988. The final advice for the TAC in 1987 is now 10,000 t for the whole year and 20,000 t for 1988. If the agreed TAC of 40,000 t is taken in 1987, then the 1988 TAC should be 15,000 t.

Special comments: Although precise catch predictions are not possible, approximate calculations based on broad assumptions about the likely level of fishing mortality generated on this stock in Divisions IVa,b are likely to be a better guide to TAC advice than precautionary TACs based on recent catches. It is clear that the present fishing mortality rate (0.6) is higher than the optimum which is 0.35 for herring in Divisions IVa,b. If Downs herring are exploited in the northern areas for the middle six months of the year, it is unlikely that they suffer a higher mortality than that on the Divisions IVa,b stock over the same period. In 1987, this is estimated to be roughly 60% of 0.43, i.e., 0.26. If the size of the Downs herring stock is equal to the acoustic survey estimate and if recruitment to the Downs stock is 10% of total North Sea recruitment, then an estimated 32,000 t of Downs stock will be taken in Divisions IVa,b in 1987 even with no fishery in Divisions IVc and VIId. To reduce total fishing mortality on this stock to 0.35 in 1987, the maximum additional catch that could be taken in Divisions IVc and VIId is 9,000 t. At the same level of fishing mortality, the total catch in 1988 would be 51,000 t of which an estimated 33,000 t might be taken in Divisions IVa,b, leaving 18,000 t available for Divisions IVc and VIId.

If, on the other hand, the agreed TAC of 40,000 t is taken in Divisions IVc and VIId in 1987, the total catch in 1988 at a fishing mortality of 0.35 would be 43,000 t of which 28,000 t might be taken in Divisions IVa,b, leaving 15,000 t available for Divisions IVc and VIId. Because of the high catch in 1987, this alternative would result in a slower rate of growth in the spawning stock.

While these catch forecasts are approximate, it is clear that the catches taken in Divisions IVc and VIId need to be reduced considerably below their present levels if the fishing mortality is to be reduced to the appropriate level. Allowing for approximations and assumptions made in the calculations, appropriate TAC levels for 1987 and 1988 are 10,000 t and 20,000 t, respectively. If the agreed TAC for 1987 is taken, then the TAC for 1988 should be no higher than 15,000 t. If 25% of the 1987 TAC is transferred to Divisions IVa,b according to the management regulation, then the TAC in 1988 could be increased proportionately to around 17,000 t.

This assessment indicates that the catches of herring in Division IVa,b might contain 32,000 t of Downs stock in 1987 and 28,000-33,000 t in 1988. Since Downs stock fish caught in Divisions IVa,b are already included in the assessment and predictions for those areas, it is not appropriate to add these tonnages to any TAC set for Divisions IVa,b.

3.1.4 Herring in Sub-divisions 22-24 and Division IIIa

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20). Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC (IIIa)[3]	-	-	40	40[4]	40[4]	80	132	112	-	-	-
Agreed TAC (IIIa)[3]	-	-	60	59	58	117	-	138	-	-	-
Actual landings (Baltic)[5]	143	158	151	152	191	211	164	-	211	243	167
Actual landings (IIIa)[6]	82	172	158	198	233	242	217	-	242[7]	69[7]	157[7]
Sp. stock biomass	163	162	187	196	227	274	262	306[1]	274	162	210
Recruitment (2-ring)	1.58	3.16	1.99	2.58	3.55	2.79	3.14	2.87[1]	3.55	1.58	2.68
Mean F(1-6,u)	0.52	0.78	0.72	0.52	0.70	0.70	0.63	-	0.78	0.52	0.65

[1]Predicted or assumed. [2]Over period 1980-1986. [3]Adult herring fishery in Division IIIa only. [4]TAC for 1 Sep-31 Aug. [5]Includes Sub-divisions 22-24, 2-group and older from Division IIIa, and transferred amounts from North Sea. [6]Including landings of juvenile herring in mixed clupeoid fishery. [7]Over period 1977-1986. Weights in '000 t, recruitment in billions.

Catches: Sub-divisions 22-24: Fairly stable. A decrease in 1986 (Table 3.1.4.1) due to diversion of effort and low prices.

Division IIIa: Slight decrease after peak catch in 1985 (Table 3.1.4.2) due to decrease in Kattegat. Approximately 130,000 t taken in small-mesh trawl fishery or as by-catches of juveniles in human consumption fishery. Approximately 19,000 t of herring caught in North Sea transferred to Division IIIa/Western Baltic assessment.

Data and assessment: Sub-divisions 22-24: Analytical assessment of 2-group and older.

Division IIIa: Biological sampling of adult catches adequate, but sampling of industrial landings (60% of total herring landed) almost non-existent. Acoustic surveys in Division IIIa underestimated adult stock.

Fishing mortality: Slight decrease from 1985 to 1986 (Figure 3.1.4). Still 3 times $F_{0.1}$.

Recruitment: Steady increase in recruitment to stock during last 10-15 years.

Division IIIa: 0-group very abundant in 1986 acoustic surveys and this year class also abundant in young fish surveys in 1987, mostly autumn spawners, probably of North Sea origin. Abundance of 2-ringers in 1987 IYFS indicated good 1985 year class in Division IIIa/Western Baltic spring-spawning stock.

State of stock: Increasing; due to decreasing fishing mortality and fair recruitment.

Forecast for 1988: Assuming F(87) = 0.63, Catch(87) = 184,000 t, SSB(88) = 328,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.63	196	336	
B	$F_{0.1}$	0.19	72	461	

Continued fishing at current levels of fishing mortality will lead to increasing spawning stock size.

Recommendation: The fishing mortality should not be allowed to increase from the status quo level. The TAC for mixed clupeoids in Division IIIa should be set at not more than 80,000 t in 1988.

Special Comments:

1. The assessment of the spring-spawning stock known to migrate between the Western Baltic and Division IIIa was carried out on data from Division IIIa and Sub-divisions 22, 23, and 24.

   Insufficient data on the numbers at age and racial composition of catches of juvenile herring in Division IIIa prevented an assessment of the exploitation level on the youngest age groups, and the combined assessment was based on catch data for 2-ring and older spring-spawning herring. In view of the marked difference in seasonality of the fisheries in Division IIIa and the Western Baltic, the assessment was made on a half-year basis.

   Racial investigations of the vertebral number of herring caught in the eastern part of the North Sea showed that in the last part of May and in June, July, August, and September, all 3-group and older herring were of Skagerrak-Kattegat and Western Baltic stock origin. Therefore, a proportion of the catch in the eastern part of the North Sea was included in the assessment of the combined stock. The amount transferred was 6,968 t in 1984, 17,386 t in 1985, and 19,654 t in 1986.

2. To provide the management bodies with separate catch options for Sub-divisions 22-24 and for Division IIIa, ACFM has calculated the proportion of the catch in the combined area that will be taken in the two areas assuming that the relative levels of fishing mortality and exploitation pattern in the two management areas remain the same as in recent years. For the status quo option given above, the share of the catch in the two areas in 1987 and 1988 will be as follows (in '000 t):

Year	Total catch in combined area	Predicted catch in Sub-divisions 22, 23, 24	Predicted catch in adult herring fishery in Division IIIa
1987	184	88	96
1988	196	97	99

   To the catch predicted in Sub-divisions 22, 23, and 24 should be added the amount of 0- and 1-group herring caught as by-catch in the consumption herring fishery, which was 7,700 t in 1986.

3. In 1986 and 1987, TACs of 80,000 t have been adopted for the fishery for mixed clupeoids in Division IIIa. In 1986, landings in this fishery were around 120,000 t.

   As pointed out by ACFM in its 1986 report, it is not possible to predict catch options for this fishery because the age groups of herring and sprat involved recruit at approximately the time the fishery starts each year. However, ACFM considers that adherence to a TAC of 80,000 t would be a significant step towards controlling the catches of juvenile herring in this area and recommends that the TAC be set at this level again in 1988.

   As in 1985, the monitoring of this fishery in 1986 was totally inadequate and ACFM is thus not able to evaluate the effect the fishery has had on the stocks of herring involved. Since it is likely that this fishery may have a significant effect on recruitment to both the North Sea stocks and indigenous spring-spawning stocks, ACFM must stress the importance of a reinstatement of adequate biological sampling in this fishery.

3.1.5 Celtic Sea and Division VIIj herring

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC[3]	6	6	6[5]	6[5]	13	13	17	18	-	-	-
Agreed TAC[4]	6	6	8[5]	8[5]	13	13	17	18	-	-	-
Actual landings[6]	9	17	10	22	20	16	13	-	22	7	14
Sp. stock biomass	28	30	47	81	91	106	107	90[1]	107	28	58
Recruitment (1-ring)	139	386	691	1041	908	776	195	-	1041	138	406
Mean F(2-7,w)	0.58	0.88	0.59	0.55	0.35	0.19	0.15	-	0.88	0.15	0.50

[1]Predicted or assumed. [2]Over period 1970-1986. [3]VIIj, VIIg, and VIIa north to 52°30'N for 1 Apr-31 Mar. [4]VIIg-k and VIIa north to 52°30'N. [5]1 Oct-31 Mar. [6]Calendar year. Weights in '000 t, recruitment in millions.

Catches: Catch in 1986 (Tables 3.1.5.1 and 3.1.5.2) less than recommended TAC for first time in period 1980-1986. Decrease due to lack of demand.

Data and assessment: No fishery-independent data since 1985. Assessment matched to larvae surveys up to 1985 and must be treated with considerable reservation.

Fishing mortality: Decrease in 1985 and 1986 to relatively low level. Constant fleet size in last three seasons and no change in seasonal fishing pattern.

Recruitment: The 1980-1983 year classes (1-ringers in 1982-1985) were above average. 1984 year class may be poor according to scarcity in 1986 catches. In the projection, recruitment of 2-ringers in 1987 assumed equal to geometric mean.

State of stock: Recovered by 1985 to average level in period 1958-1971 before stock collapse (Figure 3.1.5).

Forecast for 1988: Based on mature stock (2-ringers and older). Assuming F(87) = 0.21, Catch(87) = 18,000 t (TAC).

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.15	87	13	89	Stabilization of SSB

Continued fishing at current levels of fishing mortality will lead to reduction in catch and stabilization of SSB.

Recommendation: In view of the provisional nature of the assessment, it is not appropriate to provide a range of options. ACFM recommends that fishing mortality should not be allowed to increase, corresponding to 13,000 t in 1988.

Special comments: The fishery for this stock is increasingly directed at shoals immediately before or at spawning. Since individual boats' catch levels cannot easily be controlled when fishing on spawning grounds, high levels of discarding are likely to result, generating excessive levels of fishing mortality. To provide protection of spawning fish, consideration should be given to selective prohibition of fishing on at least one of the main spawning grounds each season.

3.1.6 Herring in Division VIa (north)

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	0	70	70	58	53	30	37-45	38-55	70	0	46
Agreed TAC	0	70.0	70.0	70.0	64.0	56.5	51.9	49.7	70.0	0	54.6
Actual landings	0.3	51.4	92.4	63.5	75.2	44.9	82.3	-	92.4	0.3	58.6
Sp. stock biomass	195	194	196	172	297	326	351	304[1]	351	172	247
Recruitment (2-ring)	635	331	730	405	1584	738	906	220[1]	1584	331	761
Mean F(2-7,u)	<0.01	0.27	0.46	0.39	0.35	0.20	0.26	-	0.46	0.20	0.28

[1]Predicted or assumed. [2]Over period 1980-1986. Weights in '000 t, recruitment in millions.

Catches: Increased in 1986 by about 86% above the 1985 level (Table 3.1.6). TAC exceeded by about 60%, high unallocated catches about 50% of the total. Reopening of the fishery in 1981 after closure in mid-1978.

Data and assessment: Catch and biological data of good quality. VPA based on larvae abundance indices.

Fishing mortality: Two years after reopening of the fishery, fishing mortality increased to the level of 0.46, followed by a continuous decrease to the lowest level in this series. The 1986 increase in fishing mortality reflects the high catches taken in 1986 despite the increased stock biomass.

Recruitment: High level in recent years. In 1987, poor recruiting year class (1984) expected, assumed to be of the same order as the smallest on record since 1970, i.e., 220 million. For the prediction years 1988 and 1989, the 1973-1982 geometric mean of the number of 2-ringers from the VPA (430 million) was used.

State of stock: Recovery of the stock once the fishery was closed in mid-1978, but halted with the reopening of the fishery in 1981 (Figure 3.1.6). Further increase in the spawning stock biomass in the 1984-1986 period due to the good 1981 and 1983 year classes.

Forecast for 1988: Assuming F(87) = 0.18, Catch(87) = 50,000 t.

1988					1989		
Management option	Stock biom.	SSB[1]	F(2-7)	Catch	Stock biom.	SSB[1]	Consequences and implications
$F_{0.1}$	365	296	0.166	46	360	291	(see special comments)
F(86)	365	278	0.260	69	334	253	

[1]SSB calculated at spawning time, i.e., 1 September (see Section 3.1.1). Stock biomass calculated at 1 January = SSB at 1 January. Weights in '000 t.

Recommendation: To maintain the spawning stock at the present level, fishing mortality has to be reduced to the level of $F_{0.1}$ in 1988. The corresponding catch is 46,000 t.

<u>Special comments</u>: Continued fishing at the 1986 level of exploitation would reduce the size of the spawning stock by more than 25% at the 1989 spawning season compared to last year in the assessment and by more than 15% from the level projected for 1987. In evaluating this management option, it has to be kept in mind that the 1986 level of fishing mortality is generated by a catch grossly exceeding the TAC which was set to maintain the 1985 level of exploitation.

The projected spawning stock biomass for 1987 of 300,000 t is already reduced from the level of the two preceding years and still below the level prevailing in the years immediately before the rapid decline in SSB which finally required the closure of the fishery. It should, therefore, not be allowed to decline further, particularly in view of the expected poor 1984 year class. This management objective can be achieved by reducing the level of exploitation to the $F_{0.1}$ level.

3.1.7 Clyde herring (Division VIa)

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	2.5	2.5	2.5	-	3.07	3.5	-	-	-
Agreed TAC	-	-	2.5	2.5	3.0	3.0	3.4	3.5	-	-	-
Actual landings	2.1	2.1	2.5	2.8	3.2	3.0	3.4	-	7.8	2.0	3.7
Sp. stock biomass	8.7	10.6	11.9	15.2	18.4	18.2	16.6	14.3[1]	18.4	5.2	10.0
Recruitment (2-ring)	23.5	27.3	50.3	52.1	57.6	34.2	24.7	24.7[1]	57.6	9.4	27.5
Mean F(2-6,u)	0.18	0.25	0.28	0.21	0.23	0.28	0.24	-	0.60	0.18	0.37

[1]Predicted or assumed. [2]Over period 1970-1986. Weights in '000 t, recruitment in millions.

Catches: Increased TAC and landings in 1986 (Table 3.1.7). Discards amounted to almost 15% of total catch, i.e., half the proportion discarded in 1985.

Data and assessment: Landings, discard data, and effort data used in analytic assessment.

Fishing mortality: Fluctuating between 0.2 and 0.3.

Recruitment: 1982 and 1983 year classes (2-ringers in 1985 and 1986) relatively poor after three good year classes (Figure 3.1.7). No independent estimates of recruitment. Recruitment of 2-ringers in 1987 and 1988 assumed equal to geometric mean (24.7 million).

State of stock: Relatively stable.

Forecast for 1988: Assuming F(87) = 0.25, Landings(87) = 3,500 t, Discard level as in 1986.

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t) Landings	Discards	Predicted SSB(89) ('000 t)	Consequences/implications
A	F0.1	0.16	14.6	2.1	0.4	14.9	Large reduction in catch, little change in mature population
B	F(86)	0.24	13.5	3.2	0.5	13.0	Small reduction in catch, stable population

Continued fishing at current levels of fishing mortality will lead to a slight stabilization in the mature population.

Recommendation: Management of the Clyde herring fishery should be consistent with that in adjacent areas. Fishing mortality should be maintained at the present level corresponding to a TAC in 1988 of 3,200 t. To protect the indigenous spring-spawning stock, no fishing for herring should take place in the Firth of Clyde in the period January-March.

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

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	7[3]	7[3]	11	12	12	14	17	18	-	-	-
Agreed TAC	-	-	11	12	12	14	17	17	-	-	-
Actual landings	30	25	19	33	27	23	29	-	39	15	27
Sp. stock biomass	108	94	91	75	102	74	51	39-50[1]	161	51	106
Recruitment (2-ring)	297	154	184	176	447	99	69	171[1]	447	69	216
Mean F(2-7,u)	0.38	0.32	0.27	0.51	0.33	0.37	0.60	-	0.60	0.14	0.32

[1]Predicted or assumed. [2]Over period 1970-1986. [3]Division VIIb only. Weights in '000 t, recruitment in millions.

Catches: Increase in 1986 to 29,000 t (Table 3.1.8) of which 11,800 t not allocated to country. Catch considerably higher than recommended and agreed TACs every year since this stock unit was adopted.

Data and assessment: Considerable doubts about assessment. Changes in stock size shown by larvae surveys difficult to reconcile with catch data. No recruitment surveys and catches of 1-ringers not a reliable indication of year-class strength.

Fishing mortality: Increased to rather high level in 1986 when new type of vessel entered fishery (Figure 3.1.8).

Recruitment: Good 1981 year class followed by two poor year classes. Recruitment of 2-ringers in 1987 and 1988 assumed to be geometric mean (171 million).

State of stock: Decrease in spawning stock to lowest recorded in period since 1970.

Forecast for 1988: Based on two alternative levels of catch in 1987. Assuming F(87) = 0.37, Catch(87) = TAC of 17,000 t.

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.15	60	8	71	Reduced catch/some recovery of stock
B	Same SSB	0.39	51	18	52	SSB at 1986 level in 1989
C	F(86)	0.60	44	25	39	Continued decrease in stock

Assuming F(87) = 0.75, Catch(87) = 29,000 t (same as 1986).

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.15	48	6	61	Reduced catch/some recovery of stock
B	Same SSB	0.28	44	11	52	SSB at 1986 level in 1989
C	F(86)	0.60	35	20	35	Continued decrease to very low level

Continued fishing at current levels of fishing mortality will lead to continued decrease in stock.

Recommendation: While ACFM has some doubts about the reliability of the assessment, the spawning stock is almost certainly at a rather low level. Fishing mortality should be reduced to a level that will allow some increase in spawning stock from the 1986 level. The corresponding catch in 1988 should be lower than 18,000 t if the TAC is taken, or lower than 11,000 t if the 1987 catch is at the same level as in 1986.

3.1.9 Irish Sea herring (Division VIIa)

Source of information: Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	3.8	3.0	4.0	5.0	6.3	4.3	-	-	-
Agreed TAC	-	-	3.8	3.0	4.0	5.0	6.3	4.5	-	-	-
Actual landings	10.6	4.4	4.9	3.9	4.1	9.2	7.4	-	38.6	3.9	14.5
Sp. stock biomass	5.7	8.1	13.3	19.8	26.6	21.9	25.0	32.8[1]	33.8	5.7	18.1
Recruitment (1-ring)	163	219	244	280	169	220	358	283[1]	668	140	295
Mean F(2-7,u)	1.01	0.47	0.31	0.17	0.14	0.34	0.25	-	1.01	0.14	0.59

[1]Predicted or assumed. [2]Over period 1972-1986. Weights in '000 t, recruitment in millions.

Catches: Increased in 1985 and decreased in 1986 (Table 3.1.9). Almost 20% of 1986 catch not allocated to country. TACs exceeded in every year since 1982.

Data and assessment: Analytical assessment based on catch data and United Kingdom fishing effort data. No fishery-independent data on stock size or recruitment. Some doubts about assessment.

Fishing mortality: Decreased in 1986.

Recruitment: No reliable estimates of recruitment. Assumed to be at geometric mean (283 million 1-ringers).

State of stock: The spawning stock has recovered from the high catches in 1985 and is continuing to increase from its lowest level in 1980 (Figure 3.1.9).

Forecast for 1988: Assuming F(87) = 0.14 , Catch(87) = 5,400 t (= TAC + 20%).

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.16	37	7.2	40	Rapid increase in SSB
B	F(86)	0.25	34	10.5	35	Continued recovery of SSB and considerable increase in catch

Continued fishing at current levels of fishing mortality will lead to continued recovery of SSB.

Recommendation: Fishing mortality should not rise above the 1986 level, corresponding to a TAC of 10,500 t in 1988. If more stability in catches is required, an increase in TAC in 1987 could be considered but any increase should be reflected in an equal reduction in the TAC for 1988. The spawning area and nursery area closures applied by the management body in 1986 should continue.

3.2 Industrial Fisheries in the North Sea and Adjacent Waters

3.2.1 Data deficiencies

The problems of obtaining biological samples from a major part of the Danish industrial landings again in 1986 hampered the collection of proper age, length, and weight data. This was especially the case in the sprat fishery in Division IIIa and in the North Sea.

ACFM stressed the need for continuous time series of catch data and biological data, both in respect to single-species and multi-species assessments.

3.2.2 Trends in the industrial fishery in the North Sea

The total industrial landings from the North Sea by the fishery for sandeel, Norway pout, and sprat are shown in Table 3.2.2. The data show an overall declining trend from about 1.8 million t in 1974 to 1.1 million t in 1986. However, the total catch in 1986 increased 10% compared to the low 1985 catch. The reduction in landings in 1974-1986 was caused primarily by the severe fall in the sprat landings from a peak level of 600,000 t in the mid-1970s to 16,000 t in 1986. Landings of Norway pout were relatively low in 1985 and 1986, i.e., 200,000 t and 175,000 t, respectively, and this caused total landings to decline in 1985-1986 compared to 1981-1984.

Landings of sandeel were the only fishery which could offset the declining trend in landings in 1986. Landings of 850,000 t in 1986 are the highest on record. Landings of sandeel have varied between 500,000-800,000 t in 1974-1985.

Landings of protected species - haddock, whiting, and saithe

Landings of protected species have shown a declining trend since 1974. Average landings of protected species in the period 1974-1977 varied around 170,000 t and dropped to an average level of 75,000 t in the period 1978-1982. A further reduction occurred after 1983, and since then about 30,000 t of protected species has been caught as a by-catch.

The 20% reduction in by-catch from 1985 to 1986 may partly be related to reduced effort in the Norway pout/blue whiting fishery. Landings of protected species consist mainly of whiting (18,000 t), whereas landings of haddock (2,300 t) and saithe (1,400 t) were relatively low in 1986.

Landings of herring

Landings of herring in the small-meshed fishery for sprat, sandeel, and Norway pout decreased from 63,000 t in 1985 to 40,000 t in 1986. Landings are thus considerably lower than the peak level of around 150,000 t in 1982 and 1983.

Landings of herring included in Table 3.2.2 refer particularly to catches taken in the small-meshed trawl fishery, whereas landings of herring for reduction taken by 32-mm trawls and purse seiners are not included.

3.2.3 Trends in the industrial fishery in Division IIIa

Landings from Division IIIa of 185,000 t in 1986 (Table 3.2.3) remain close to the 10-year average. The catches by species show similar trends as in the North Sea, i.e., relatively high sandeel catches and low sprat and Norway pout catches. Catches of herring (103,000 t) in 1986 were 12% lower than in 1985. The majority of the herring are taken in the mixed fishery for sprat and herring.

3.2.4 Norway pout in Division IIIa

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Catches: The provisional landings in 1986 were 6,000 t, and a further reduction from the 1985 landings of 10,000 t (Table 3.2.4). The landings in 1985 and 1986 are the lowest on record and are only 35% and 20%, respectively, of the average landings in the period 1971-1984.

3.2.5 Norway pout in Sub-area IV

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	471.1	235.7	359.7	422.9	354.9	196.5	174.4	-	471.1	174.4	319.5
Sp. stock biomass	-	-	-	-	-	-	-	-	-	-	-
Recruitment (age 1)[2]	4081	1375	4315	2331	3925	2109	1949	3273	4813	1375	2950
Mean F	-	-	-	-	-	-	-	-	-	-	-

[1]Over period 1977-1986. [2]IYFS index. Weights in '000 t.

Catches: Catches have fluctuated around 350,000 t between 1977-1984. The catches decreased to 197,000 t in 1985 and further to 174,400 t in 1986 (Table 3.2.5).

Data and assessment: Catch-at-age data and fishing effort data were available from Denmark and Norway. Trawl surveys provide indices of recruitment. The assessment gave inconclusive results which could not be resolved in the light of the relatively short time series on fishing effort. The analysis indicates, however, that fishing mortality decreased in 1985 and 1986 and that the low catch in these years is due to the combined effect of a reduction in stock size and reduced fishing effort.

Recruitment: Information on recruiting year classes was available from IYFS and English groundfish surveys. The 1986 year class, which will form a large part of the 1987 catch, is estimated by the IYFS to be considerably higher than the low 1984 and 1985 year classes. The 1986 year class is close to the average of the 1974-1983 year classes.

State of stock: Although there is no firm basis for the assessment, it suggests that there has been no detectable overall trend in stock size since 1974.

Forecast for 1987: The method which ACFM has used to predict catches assumes that fishing intensity has been approximately constant for a number of years. Recent effort data show that fishing intensity is reduced and this may add uncertainty to the method.

The estimated catch in 1987 is about 275,000 t provided fishing effort remains constant.

No prediction of catches in 1988 is available.

3.2.6 Norway pout in Division VIa

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Catches: Landings of Norway pout in Division VIa for 1971-1985 are given in Table 3.2.6. Catch data were not available for 1986.

3.2.7 Sandeel in Division IIIa

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Catches: Catches have been quite variable in this area without any apparent trend. The 1986 catch was 67,300 t, the highest in the period 1977-1986 (average of 31,900 t), and was a 10-fold increase from the very low 1985 catch (Table 3.2.7).

3.2.8 Sandeel in the southern North Sea

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	401.2	378.9	479.2	419.0	532.8	513.5	457.4	-	577.2	355.9	450.7
Sp. stock biomass	456	431	284	852	416	732	338	-	852	284	505
Recruitment (age 0)	158	866	129	748	225	695	162	-	866	128	429
Mean F(1-4)	0.59	0.54	0.37	0.56	0.54	0.89	0.34	-	0.89	0.31	0.52

[1]Over period 1977-1986. Weights in '000 t, recruitment in billions.

Catches: Although there has been a small upward trend since 1979, the catch in 1986 was about 11% down on 1985 (Tables 3.2.8.1 and 3.2.8.2).

Data and assessment: Catch-at-age data are available and fishing effort data are available for 1982-1986. An estimated relation between stock size and catch per unit effort is used to estimate stock size in the last data year. No recruitment estimates are available.

Fishing mortality: No discernible trend. Fairly stable apart from a high value in 1985.

Recruitment: Large yearly fluctuations. No discernible trend can be identified.

State of stock: The stock size showed an upward trend in the 1970s, but has varied around a constant high level in the 1980s.

Forecast for 1988: No prediction available.

3.2.9 Sandeel in the northern North Sea

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17)

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	292.0	138.1	74.4	78.2	91.9	79.7	375.1	-	384.6	74.4	183.6
Sp. stock biomass	259.0	125.0	71.0	69.0	106.0	132.0	67.0	-	259.0	67.0	125.9
Recruitment (age 0)	59	55	68	94	43	133	108	-	160	43	91
Mean F(1-4)	1.02	0.86	0.55	0.49	0.77	0.68	2.72	-	2.72	0.20	0.90

[1] Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: Catches were low in the period 1982-1985, only about 36% of the catches during 1977-1981 (Tables 3.2.8.1 and 3.2.8.2). In 1986, catches were back up to the 1977-1981 level and close to the highest on record. The high 1986 catches were taken in the southeastern part of the northern assessment area.

Data and assessment: Catch-at-age data and fishing effort data were available from Denmark and Norway. The biomass in 1986 was estimated from the identified biomass and catch-per-unit-effort relationship.

Fishing mortality: Fishing mortality shows considerable variation, generally at a higher level in the southern North Sea. Fishing mortality is estimated to have been at a high level in 1986.

Recruitment: The 1980-1984 year classes were all below average, except for the 1983 year class which was of average size. The 1985 year class which formed the basis for the 1986 fishery was close to the mean size of the 1973-1979 year classes.

State of stock: Total biomass varied around 400,000 t in the 1970s but dropped to half this level in 1981-1985 because of low recruitment. The biomass increased in 1986. The spawning stock was, however, at a low level in 1986 since the biomass was dominated by the 1-group.

Forecast for 1988: No prediction available.

3.2.10 Sandeel in the Shetland area

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/Assess:17).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	25.4	46.7	52.0	37.0	32.6	17.2	14.0	-	52.0	13.4	28.8
Sp. stock biomass	34.7	38.1	38.0	42.4	57.0	60.4	54.4	-	60.4	24.7	41.1
Recruitment (age 0)	49.9	74.3	81.6	55.5	31.5	16.5	33.0	-	81.6	16.5	46.2
Mean F(2-5)	0.34	0.51	0.45	0.25	0.32	0.14	0.19	-	0.51	0.14	0.32

[1] Over period 1977-1986. Weights in '000 t, recruitment in billions.

Catches: Steady decline in catches since the peak in 1982. Catches in 1986 is at the same level as in mid-1970s when the fishery developed (Tables 3.2.8.1 and 3.2.8.2).

Data and assessment: Catch-at-age data and fishing effort data are available for the vast majority of the catches.Fishing effort declined markedly in 1985 and 1986 from the 1980-1984 level. Fishing mortalities by age group for the last data year are estimated from fishing mortality-effort relationships. No recruitment estimates are available.

Fishing mortality: A general decline has been observed since the peak level in 1981.

Recruitment: Recruitment showed an increasing trend from 1974-1982. Since then, there has been a general decline from the high recruitment level in the beginning of the 1980s. The 1985 and 1986 year classes are estimated to be at the same level as in 1974-1975.

State of stock: The increasing recruitment in the 1970s caused the stock size to increase in this period. The reversed trend in recruitment since 1982 has led to reduced stock size in recent years. The spawning stock is expected to decline further in 1987 and 1988.

Forecast for 1988: No prediction available.

3.2.11 Sandeel in Division VIa

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/Assess:17).

Catches: Catches continued to increase to 25,500 t in 1986. The fishery has been developing since 1981. Before 1980, virtually no catches were taken (Table 3.2.11).

3.2.12 Sprat in Division IIIa

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	86.8	79.4	51.2	29.5	40.1	29.0	19.8	-	100.6	19.8	59.2
Sp. stock biomass	-	-	-	-	-	-	-	-	-	-	-
Recruitment (age 1)[2]	4960	2809	1577	1173	4141	2077	684	-	5713	684	3066
Mean F	-	-	-	-	-	-	-	-	-	-	-

[1]Over period 1977-1986. [2]Recruitment index from IYFS. Weights in '000 t.

Catches: Catches of sprat have been declining since 1979 (Table 3.2.12). The 1986 catch is the lowest since 1974. Sprat catches in Division IIIa are taken both in a directed fishery for human consumption and in the industrial fishery for herring and sprat. Additional information on this fishery is given in the section on Division IIIa herring in this ACFM report.

Data and assessment: Recruitment estimates are provided by IYFS. Qualitative information from acoustic surveys aimed at herring in Division IIIa. No age composition is available and no assessment is made.

Recruitment: Except for 1984, all recruiting year classes have been below average in the 1980s. Some improvement observed in 1987 compared to the very low recruitment in 1986.

State of stock: Landing statistics, IYFS indices, and acoustic estimates indicate that the stock is at a low level.

Forecast for 1987: The catch in 1987 is estimated to be 32,000 t, provided fishing effort remains constant.

3.2.13 Sprat in Sub-area IV

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	323.4	209.1	152.7	88.2	77.2	50.2	16.4	-	379.6	16.4	197.7
Sp. stock biomass	-	-	-	-	-	-	-	-	-	-	-
Recruitment (age 1)[2]	1402	886.0	183.0	512.0	347.0	659.0	68.0	809.0	1474.0	68.0	591.5
Mean F	-	-	-	-	-	-	-	-	-	-	-

[1]Over period 1977-1986. [2]Index of 1-group in Division IVb, IYFS. Weights in '000 t.

Catches: Steady decline in catch since 1979. The 1986 catch was the lowest recorded since 1950. The catches are taken in the southeastern area of Division IVb and in Division IVc (Table 3.2.13).

Data and assessment: Recruitment estimates from IYFS. No data on catch at age from the most important fishing area (Division IVb east) in 1985 and 1986. No data on fishing effort. ACFM did not attempt to make an analytical assessment because of the lack of catch-at-age data.

Recruitment: The recruitment was high in the period 1975-1980. In the beginning of the 1980s, a series of weak year classes have been observed. The IYFS in 1987 showed improved recruitment.

State of stock: Although no analytical assessment is available, all indications of stock size show that it has been declining to a very low level in 1986.

Forecast for 1987: The method which ACFM has applied in recent years to estimate catches has overestimated them. This is probably due to a reduction in fishing mortality in the sprat stock partly caused by management measures aimed at protection of juvenile herring, i.e., sprat box closure. The lack of catch-at-age data did not permit a revision of the methods used in the past and ACFM did not attempt to estimate catches in 1987.

The improved recruitment by the 1986 year class may, however, increase catches in 1987 provided fishing effort remains constant.

Recommendation: In order to protect any recruiting year class, ACFM recommends that the catches in 1987 are kept at the lowest practical level, and ACFM prefers a TAC = 0.

Special comments: Landings of sprat from the North Sea were only 16,000 t in 1986 compared to 50,000 t in 1985. Sprat landings from the North Sea have declined since 1979 and the low 1986 landings are the lowest since 1950. Sprat catches in 1986 were taken in Division IVb east and in Division IVc (Thames Estuary).

Due to the serious problems in obtaining biological samples from the Danish industrial fishery in 1986, no reliable catch-at-age data for the North Sea landings could be constructed for 1986. Therefore, an analytical assessment could not be made.

An acoustic survey was carried out in November 1986 in the North Sea. The survey showed concentrations of predominantly 1986 year class in the western part of the North Sea. Due to the imprecision of acoustic surveys at the present low stock sizes and the relatively large survey grid in coastal areas, the survey result can be taken only as an indication of the poor state of the sprat stock.

The IYFS survey showed higher catches in 1987 than in 1986. The 1-group estimate in 1987 was about 11 times higher than the 1-group estimate in 1986, and the 1987 recruitment is of the same order of magnitude as in the period 1976-1980 when catches were high.

A draft report from the Sprat Biology Workshop held in Bergen, November 1986 was discussed.

The Workshop examined the available material on stock separation and concluded that, at present, there was no basis for a change from the present management of sprat in Division IIIa, the North Sea, and the Channel as separate stocks.

The Workshop provided a comprehensive description of the changes in abundance and distribution of sprat since the early 1960s. It is clear that a significant decrease in spawning stock size and in recruitment occurred in the northwestern North Sea between 1978 and 1980. In the central North Sea, there is evidence of a progressive decline in the population some years later, with a concurrent shift in the centre of abundance towards the southern and southeastern North Sea. In the Skagerrak and Kattegat, a series of weak year classes in the 1980s also resulted in a marked stock decline in this area.

The increase and subsequent decrease in sprat abundance apparently occurred almost simultaneously over a large area reaching from the North Sea via Skagerrak/Kattegat into the Baltic. This led the Workshop to suspect that the fisheries were unlikely to be the major cause of the stock decline. Evidently, environmental changes in the North Sea took place during the period of reduced sprat abundance, and although the Workshop was unable to identify the relationship, it was felt that the observed stock fluctuations are likely to be linked to longer-term environmental changes.

Although it was not possible to estimate the stock size of sprat in the North Sea in 1986, all indicators show a very low sprat stock.

The improved recruitment observed in the IYFS indicates, however, that stock size will increase in 1987.

ACFM has, in recent years, attempted to predict catches using a short-cut estimate. This estimate has tended to overestimate catches in 1983, 1984, 1985, and 1986. Fishing effort has been reduced in these years by the introduction of sprat boxes and increased enforcement of by-catch rules.

Observation of a component of small sprat which probably was underestimated in the IYFS survey in 1987 gave additional uncertainty to the catch estimate. ACFM, therefore, refrained from giving an estimate of the 1987 catch, but points to good recruitment of the 1986 year class, which will increase catches in 1987 provided fishing mortality remains constant.

ACFM recommended in 1985 and 1986 that catches should be kept at the lowest practicable level. This was to protect any new recruiting year class and thereby increase the likelihood of an increase in stock size. The stock size is estimated to have been very low in 1986 and it has not yet been confirmed that the 1986 year class will reverse the downward trend in stock size.

3.2.14 Sprat in Division VIa

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/Assess:1).

Catches: Catches have shown a less steep decline in the 1980s compared to the North Sea. Catches in 1986, however, dropped significantly (Table 3.2.14).

3.2.15 Sprat in Divisions VIId,e

Source of information: Industrial Fisheries Working Group report, March 1987 (C.M.1987/ Assess:17).

Catches: Fairly steady decline since the peak in 1980. The 1986 catch is at an historic low level (Table 3.2.15).

Data and assessment: Catch-at-age data were available for the UK fishery in the Lyme Bay area. Recruitment data were not available.

Forecast for 1988: No prediction is available. Inspection of the age composition data suggests continuing low catches in the immediate future.

3.3 Demersal Stocks in Division IIIa

3.3.1 Cod in the Kattegat

Source of information: Division IIIa Demersal Stocks Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	16.4	16.4	15.0	15.0	12.0	12.0	-[3]	<13	-	-	-
Agreed TAC	-	-	16.4	16.4	16.0	16.0	17.0	15.5	-	-	-
Actual landings	13.5	15.3	12.5	12.8	11.9	12.7	9.1	-	20.1	9.1	13.9
Sp. stock biomass	27.8	21.9	15.1	13.7	14.6	15.4	8.8	4.9[1]	29.9	8.8	19.9
Recruitment (age 1)	14.4	17.2	20.3	19.9	10.9	6.9	33.6	12.7[1]	33.6	6.9	18.0
Mean F(3-6,u)	0.81	0.95	1.42	1.23	1.37	1.49	1.75	-	1.75	0.66	1.16

[1]Predicted or assumed. [2]Over period 1976-1986. [3]Precautionary TAC based on recent catch levels. Weights in '000 t, recruitment in millions.

Catches: Catches decreased from around 18,000 t in the 1970s to around 13,000 t in the early 1980s. There was a further decrease in 1986 to 9,000 t (Table 3.3.1). Danish by-catches in the industrial fishery (500-2,000 t) not included.

Data and assessment: Analytical assessment of catch-at-age data using CPUE data and recruitment indices.

Fishing mortality: Increasing since 1979. Reached a very high level in 1986 (Figure 3.3.1).

Recruitment: Varying without any marked trend. 1985 year class large, 1986 small.

State of stock: Stock is overexploited relative to normal biological reference points. Spawning stock is at its lowest level ever observed.

Forecast for 1988: Assuming F(87) = 1.75, Catch(87) = 9,000 t, SSB(88) = 18,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.4F(86)	0.70	8	20	Catches around the 1986 level, SSB kept on the 1988 level
B	0.6F(86)	1.05	11	17	
C	0.8F(86)	1.40	13	14	Decrease of SSB from 1988 level
D	F(86)	1.75	15	12	

Continued fishing at current levels of fishing mortality will lead to a continued low level of spawning stock biomass.

Recommendation: In view of the very low level of spawning stock size, ACFM recommends that fishing mortality be reduced in 1988.

3.3.2 Cod in the Skagerrak

Source of information: Division IIIa Demersal Stocks Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC[3]	17.5	16.0	16.0	16.0	20.0	20.0	-[4]	<21	-	-	-
Agreed TAC[3]	-	-	20.0	25.0	28.0	29.0	29.0	22.5	-	-	-
Actual landings[3]	24.0	28.9	26.1	21.8	19.9	16.6	20.1	-	28.9	15.5	21.9
Sp. stock biomass	26.9	27.6	30.5	21.5	17.0	18.0	18.0	8.0[1]	30.5	17.0	22.3
Recruitment (age 1)	31.1	14.0	17.1	20.0	13.8	9.2	31.7	11.4[1]	31.7	9.2	20.3
Mean F(3-6,u)	0.93	0.78	1.16	1.04	0.84	0.89	1.44	-	1.44	0.45	0.92

[1]Predicted or assumed. [2]Over period 1978-1986. [3]Not including Norwegian fjords. [4]Precautionary TAC based on recent catch levels. Weights in '000 t, recruitment in millions.

Catches: In the beginning of the 1970s, catches were around 10,000 t; they increased thereafter to above 20,000 t in the beginning of the 1980s (Table 3.3.2). Danish industrial by-catches (2,000-6,000 t) not included.

Data and assessment: Analytical assessment of catch-at-age data using CPUE data and recruitment indices.

Fishing mortality: A sharp increase from 1985 to 1986 (Figure 3.3.2).

Recruitment: The 1981-1984 year classes were all below average. 1985 year class estimated to be above average, 1986 year class estimated to be below average.

State of stock: Fished above the biological reference points F_{max} and F_{med}. SSB has decreased since 1982 and will reach a very low level in 1987.

Forecast for 1988: Assuming F(87) = 1.44, Catch(87) = 18,000 t, SSB(88) = 18,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.6F(86)	0.87	16	17	SSB kept at the 1988 level
B	0.8F(86)	1.15	19	13	
C	F(86)	1.44	22	10	SSB decreased from 1988 level

Continued fishing at current levels of fishing mortality will lead to a considerable decrease in spawning stock biomass.

Recommendation: The fishing mortality in 1988 should be reduced from the high 1986 level. ACFM recommends that the TAC be set separately for the Skagerrak and the Norwegian coastal areas; for the latter area, the TAC could be based on recent catch data.

3.3.3 Haddock in Division IIIa

Source of information: Division IIIa Demersal Stocks Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	6.6	4.5	7.0	7.0	7.0	-[2]	-[2]	-[2]	-	-	-
Agreed TAC	-	-	10.4	9.5	10.5	11.5	11.5	11.5	-	-	-
Actual landings	7.9	10.4	12.1	10.3	8.7	9.3	4.5	-	12.1	4.5	9.0

[1]Over period 1980-86. [2]Precautionary TAC based on recent catch levels. Weights in '000 t.

Catches: Decreased from over 9,000 t in 1985 to 4,500 t in 1986, which is the lowest recorded in the period 1975-1986 (Table 3.3.3).

Data and assessment: An attempt to do an analytical assessment was made using catch-at-age data for 1981-1986 and CPUE data for 1983-1986. The short time series and the variable sample sizes on which the CPUE data are based precluded an acceptance of the assessment.

Recruitment: The indices from the IYFS are available, but their validity is not known.

Recommendation: A precautionary TAC, based on recent catch levels, should be set for 1988.

3.3.4 Whiting in Division IIIa

Source of information: Division IIIa Demersal Stock Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	22.0	22.0	22.0	22.0	22.0	-[2]	-[2]	-[2]	-	-	-
Agreed TAC	-	-	22.15	22.15	22.15	22.15	22.15	17.0	-	-	-
Actual landings	22.7	24.0	14.1	12.6	14.0	13.4	16.4	-	49.1	12.6	20.2

[1]Over period 1976-1986. [2]Precautionary TAC based on recent catch level. Weights in '000 t.

Catches: The catch level in the 1980s was lower than in the late 1970s (Table 3.3.4).

Data and assessment: No data available on either catch at age or CPUE. No analytical assessment could be made.

Recruitment: The IYFS index for 1987 is high, suggesting a strong 1986 year class. This index has, however, so far not been a good predictor for the whiting catches.

Recommendation: A precautionary TAC, based on recent catch levels, should be set for 1988.

3.3.5 Plaice in the Kattegat

Source of information: Division IIIa Demersal Stocks Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	10.8	8.0	4.0	4.0	1.5	4.0	-[3]	-[3]	-	-	-
Agreed TAC	-	-	7.0	6.1	5.0	5.5	5.5	4.75	-	-	-
Actual landings	5.9	4.0	2.9	3.6	3.6	3.4	2.7	-	13.1	2.7	6.4
Sp. stock biomass	13.7	9.8	8.0	7.8	8.4	8.6	6.6	7.6[1]	30.0	6.6	14.2
Recruitment (age 1)	7.0	14.7	20.5	16.7	7.8	16.2	19.1	13.0[1]	54.2	7.0	19.1
Mean F(3-9,u)	0.63	0.56	0.44	0.57	0.87	0.40	0.48	-	0.87	0.40	0.57

[1]Predicted or assumed. [2]Over period 1976-1986. [3]Precautionary TAC based on recent catch levels. Weights in '000 t. Recruitment in millions.

Catches: The 1986 catch is the lowest in the 1980s. The level of catches in the 1980s is only 1/4 of the level in the 1970s (Table 3.3.5).

Data and assessment: Analytical assessment of catch-at-age data using CPUE data and recruitment indices.

Fishing mortality: A slight decrease from the early 1980s to the most recent years.

Recruitment: Both 1986 and 1985 year classes are estimated to be above the 1980-1984 average (13.3 million), but are still far below the average level for 1975-1980 (48.8 million).

State of stock: Spawning stock size has been fairly stable during the 1980s at a level about half the long-term average of 17,000 t (Figure 3.3.5). It reached its lowest level in 1986, but will increase slightly in 1988.

Forecast for 1988: Assuming F(87) = 0.48, Catch(87) = 3,300 t, SSB(88) = 8,700 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.6F(86)	0.29	2.5	9.2	SSB increased slightly
B	0.8F(86)	0.39	3.1	8.5	
C	F(86)	0.48	3.7	7.9	SSB remains low

Continued fishing at current levels of fishing mortality will lead to a continued low level of spawning stock biomass.

Recommendation: Fishing mortality is estimated to have been approximately constant and the reduction in stock size is caused by reduced recruitment. In order not to reduce the stock size below the present level (7,600 t), <u>ACFM recommends that fishing mortality is not allowed to increase above its present level</u>.

3.3.6 Plaice in the Skagerrak

Source of information: Division IIIa Demersal Stocks Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	14.0	14.0	7.0	7.0	7.0	9.0	-[2]	-[2]	-	-	-
Agreed TAC	-	-	10.0	10.0	10.0	12.0	14.5	14.5	-	-	-
Actual landings	9.6	8.2	7.9	7.7	9.5	12.3	13.1	-	13.5	7.7	10.5

[1]Over period 1976-1986. [2]Precautionary TAC based on recent catch levels. Weights in '000 t.

Catches: Total catch level uncertain (Table 3.3.6), mainly due to lack of data from the Netherlands. The Working Group assumed Dutch catches corresponding to their quota for the area.

Data and assessment: Catch-at-age and CPUE data available but difficult to interpret.

Recommendation: A precautionary TAC, based on recent catch levels, should be set for 1988.

3.3.7 Sole in Division IIIa

Source of information: Division IIIa Demersal Stocks Working Group report, March 1987 (C.M.1987/Assess:16).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC[2]	-	-	600	600	600	600	600	850	-	-	-
Actual landings	344	295	224	315	406	548	798	-	815	224	500

[1]Over period 1976-1986. [2]TAC set only by the EC. Weights in t.

Catches: A marked increase in 1985 and 1986 (Table 3.3.7). In the given figure for 1986 is an assumed Dutch catch of 150 t.

Data and assessment: Catch-at-age data only for 1984-1986, which is an insufficient time series for an analytical assessment. A longer series of recruitment indices enabled a short-cut estimation of catches in 1987-1988.

Fishing mortality: Has probably increased in 1986.

Recruitment: Good recruitment from the 1979, 1983, and especially the 1984 year class.

Recommendation: The large 1983 and 1984 year classes, if not immediately harvested, could provide higher catches for a number of years.

3.3.8 Pandalus borealis in Division IIIa and in the North Sea

Source of information: Pandalus Working Group report, February 1987 (C.M.1987/Assess:18).

Pandalus borealis is fished in the Farn Deep (Division IVb), in Division IVa on the Fladen Ground and along the Norwegian Deeps, and in the Skagerrak (Division IIIa). These four fisheries are, according to the present knowledge, exploiting different Pandalus stocks. The reported catches from Division IVa have consequently to be split between the two fisheries in that area. The split of Danish landings was based on logbook records and is different from the tentative split made in the 1984 report by the Working Group.

Division IIIa

The landings have shown an increasing trend since 1974 and reached 10,000 t in both 1985 and 1986 (Table 3.3.8.1). The same level was reported for 1962 and 1963 (Figure 3.3.8). The amounts of young shrimp discarded were estimated to be in the range of 5-10% (by weight) of the total shrimp catch. These estimates refer to the period 1970-1982 and showed that discarding rate varied with the year-class strength. The total fishing effort, as estimated from Danish and Swedish CPUE data, has increased by approximately 30% from 1982 to 1986 (Table 3.3.8.2). An assessment of the stock for the period May 1984-December 1986 was made on a quarterly basis. The VPA was tuned by quarterly indices of total effort. The analysis was made under the assumption that the coefficient of natural mortality is 0.75 per year. The assessment indicates that the stock size decreased by about 60% from 1985 to 1986 (last quarter). The available information on recruitment gives the impression that, except for the 1983 year class, all year classes during 1981-1986 have been below average.

The shrimp spawn as males in the autumn when they are 1 1/2 years old. One year later, most of them have changed sex and spawn as females. Their spawning is not, however, complete until the following spring when they shed their eggs/larvae hitherto carried under their bodies.

The present exploitation pattern resulting from a minimum mesh size of 30 mm (Danish and Swedish regulations) or 35 mm (Norwegian regulation) leads to a very high proportion (around 90%) in the catches of shrimp not having completed their first spawning as females.

Although ACFM is aware of the tentative nature of the present assessment, it finds that the information on

- historical catches
- development of total effort
- recent recruitment levels

strongly indicates that the Pandalus stock in Division IIIa is fished at a level that will lead to a severe drop in spawning stock size that could result in future recruitment being lower than the already low level observed in recent years. ACFM, therefore, recommends that the total catch in 1988 should be reduced significantly below the 1985-1986 level.

The Norwegian Deeps - Division IVa

The total landings declined from almost 3,000 t in the early 1970s to less than 1,000 t in 1978 and 1980. Thereafter, the total landings increased and reached 2,600 t in 1986. Total effort, as estimated from Danish and Swedish CPUE data, increased markedly from 1982 to 1985 but decreased slightly in 1986 (Table 3.3.8.3). The lack of Norwegian CPUE data from logbooks, however, makes these estimates less precise. The available data base did not allow an analytical assessment to be made.

The Fladen Ground - Division IVa

The landings from this Pandalus fishery have varied strongly during the period for which records are given. Landings were 635 t in 1982, more than 7,000 t in 1983, 4,000-5,000 t in 1984-1985, and 3,700 t in 1986 (Table 3.3.8.4). The variation probably originates from variation in stock size, an opportunistic fishing strategy, and from market vagaries. The large proportion of juvenile shrimp in the catches indicates a strong dependance on the recruiting year class. The mean length of shrimp fished on the Fladen Ground is consistently lower than for those caught in Division IIIa. If management bodies concerned would prefer a more stable catch, this could be achieved by a decrease in effort and/or an increase in mimimum mesh size.

By-catches in the fisheries for Pandalus borealis

Species composition in the catches/landings in most fisheries for Pandalus in the North Sea and in Division IIIa was reported, and the data can be found in Tables 7.1-7.15 in the Working Group report.

By-catch levels are generally varying in the range 20-80%. The bulk of the by-catch consists of species such as blue whiting and Norway pout; less than 10% of the by-catch comprise Annex 1/Annex 2 species.

Mesh size in the Pandalus fisheries

At its 1977 meeting, the Pandalus Working Group estimated the mean age at first capture for different mesh sizes (based on a selection factor and parameter values for the von Bertalanffy growth equation). These results show that a mean age of 3 years at first capture (20 mm CL) corresponds to a mesh size of 45 mm.

ACFM wishes to emphasize that an increase in the minimum mesh size to 35 mm will not reduce the catches of prespawning females and that a further increase in mesh size should be seriously considered.

3.4 Cod, Haddock, Whiting, and Saithe in the North Sea (Sub-area IV)

3.4.1 Roundfish in Sub-area IV: overview

3.4.1.1 Advice from the May 1987 ACFM meeting

The levels of exploitation on the cod, haddock, whiting and saithe stocks in the North Sea are very high. Fishing mortality rates exceed 1.0 on the most abundant age groups in each case. Fewer than one third of the fish survive from one year to the next. The fisheries are, therefore, very highly dependent on newly recruiting young fish. Accurate forecasting, therefore, requires very reliable estimates of the size of incoming year classes which can only be obtained from comprehensive and well-designed trawl surveys by research vessels. The assessment of these stocks is also made more difficult by the poor biological sampling of the industrial by-catches in recent years and the inadequate coverage of discard data.

With the current levels and pattern of exploitation, the precision of even the best available data is not generally sufficient to permit accurate forecasts to be made. This position can only be improved by reducing the level of exploitation on young fish.

The stock of cod has been fished down to a very low level and survival is so low that recruitment is insufficient to maintain the stock in most years. Fishing mortality must be reduced to give the stock a chance to recover. The 1985 year class is large, but data on its actual size have been conflicting. The most recent data indicate that it is about 40% larger than suggested by the earlier data, so the prognosis for the stock has improved since last year. This year class needs to be protected to the maximum extent possible until it has matured and can contribute to spawning, which it will not begin to do until 1988 and 1989.

The haddock and whiting stocks are subject to very large natural fluctuations, and in spite of very heavy exploitation, remain near their average levels over the past 20 years. In either case, however, a succession of two or three poor year classes would induce a critical situation.

The interpretation of the data for saithe is less straightforward, but it seems quite possible that this stock is now declining rapidly under increasing exploitation, and that its state may be worse than the present assessment suggests. Its status needs to be clarified by improvements to the data and their interpretation as a matter of urgency.

3.4.1.2 Advice from the October/November ACFM meeting

The maximum levels of fishing mortality recommended by ACFM for the North Sea roundfish stocks in 1988 imply a 30% reduction in F for cod relative to 1986 (TAC of 148,000 t), 22% for haddock (185,000 t), 40% for saithe (156,000 t), and no change for whiting (134,000 t).

If there was a completely mixed fishery for these stocks in the North Sea, there would clearly be a conflict of objectives. If no additional measures were taken at national or international levels to monitor and plan the fleets' activities, the indicated TACs could prove incompatible. If they are implemented in accordance with the recommendations as they stand, it is improbable that they will effectively limit the fishing mortalities in 1988. The effect of the 1987 TAC for cod provides an example.

In order to illustrate the issue, a joint projection has been carried out using the data and 1987 options for each stock as agreed by ACFM.

This exercise is based on aggregated data and is preliminary to the extent that the human consumption (HC) fishery is treated as a single uniform entity, thereby ignoring the ability of national or local fleets to actually direct their effort towards particular species. In addition, the additional interaction with fisheries for flatfish, which certainly occurs in practice, has not been included.

The calculation, therefore, exaggerates the acuity of the problem, but is presented here to warn managers that conflicts may arise to some degree. More precise data disaggregated by fleet and quarter exist and are used by the working groups. If managers are interested in obtaining analyses exemplified by this exercise, these data might be used to simulate the effects of various management decisions (including planning over the year) for the fishery in total, for each of its components, and for each stock.

The results given in Table 3.4.1 and Figures 3.4.1.1 and 3.4.1.2 are the expected total and human consumption landings under varying options of fishing mortality for the HC fishery in 1988 relative to current levels (a multiplier of 1.0 on the abscissa corresponds to status quo F), by-catch fishing mortalities in the industrial fisheries being maintained at their current level.

Although saithe requires the most drastic reduction, it may not be the most limiting factor since it is more amenable to effective directed fishing than the other species considered.

Various actual consequences could occur in practice:

1) The most favourable possibility is one in which the TACs are strictly enforced and the vessels are effectively redirected toward other targets for which the quota is not exhausted. Only to the extent that the natural co-occurence of the species on the grounds make some by-catches unavoidable will the objectives be not achieved as expected.

2) Alternatively, the TAC for cod might be strictly enforced but the vessels continue their normal operations toward haddock and whiting. Since the TAC is a limit on landings and not on actual catches, cod would continue to be caught and discarded. The same might in turn happen to haddock, up to the exhaustion of the TAC for whiting. As a result, the actual deaths due to fishing would be those predicted under the status quo option [F(88) = F(86)].

3) If case (1) applies, but redirection of the fleets is not fully feasible or successful, the result in terms of fishing mortality may be anything between a 30% reduction and no reduction.

4) If the TACs were not strictly enforced at all, the most likely result would be that fishing mortality remains at its current level, resulting in the catches calculated under the option of F(88)/F(86) = 1.0 in Figures 3.4.1.1 and 3.4.1.2.

ACFM notes that an agreed TAC for whiting at the maximum level envisaged in its advice of May 1987 would probably allow continued fishing for whiting after the TACs for other species have been reached, with associated incidental catches and discarding of these species.

3.4.2 Cod in Sub-area IV (North Sea)

3.4.2.1 Advice from the May 1987 ACFM meeting

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	<200	<220	<235	<220	<215	<259	<130	<125	259	130	211
Agreed TAC	200	220	235	240	215	250	170	125	250	170	219
Actual landings	264	301	273	233	206	192	157	-	301	157	232
Sp. stock biomass	160	173	167	134	114	104	95	110[1]	173	95	138
Recruitment (age 1)	800	271	556	276	552	93	730	410[1]	800	93	487
Mean F(2-8,u)	0.78	0.77	0.90	0.89	0.88	0.85	0.91	-	0.91	0.70	0.82

[1]Predicted or assumed. [2]Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: Estimated landings in 1986 of 157,000 t were the lowest in the last 20 years (Table 3.4.2) and the TAC was not taken. Catches in 1987 are likely to be tightly constrained by the agreed TAC.

Data and assessment: Analytical assessment of catch-at-age data using CPUE data, research survey data, and several recruit indices. Discard data not used.

Fishing mortality is high but is now estimated to have been stable near to 0.9 for the past five years. The exploitation pattern peaks on immature 2- and 3-year-old fish.

Recruitment has fluctuated strongly, and is normally insufficient to maintain the stock at current high levels of F. 1985 year class is large and now estimated to be 40% larger than previously thought.

State of stock: Spawning stock biomass has stabilized at the low level of about 100,000 t (Figure 3.4.2.1), compared with a suggested minimum level of 150,000 t. The stock is over-exploited relative to normal biological reference points.

Forecast for 1988: Deferred to November 1987.

Continued fishing at current levels of fishing mortality will lead to spawning stock size remaining at its current very low level until 1989 at least.

Recommendation: Fishing mortality should be reduced from the 1986 level by at least 30% immediately to allow the stock to recover. If the agreed TAC (125,000 t) for 1987 is maintained, the fishing mortality in 1984 will be reduced by about 60% from 1986. If the TAC for 1987 is revised, any increase should be kept to a minimum. A revised TAC for 1987 should certainly not exceed 200,000 t, as any increase in 1987 will lead to a reduction in the TAC for 1988 and delay the recovery of the stock. ACFM will give advice for 1988 in November, when more information about the fishery in 1987 and the size of the 1986 year class will be available.

Special comments: In November 1986, ACFM noted the decline in the spawning stock size to an historically low level and recommended a reduction in fishing mortality by at least 30% to permit the stock to recover. More recent data which have become available since then, particularly from the International Young Fish Survey, indicate that the 1985 year class is very strong (about 40% larger than previously estimated). The 1986 year class may also be not much less than average, rather than very weak as previously estimated. In addition, fishing mortality now appears to have stabilized at the high level of about 0.9, and spawning stock size appears to have stabilized at the historically low level of about 100,000 t. The stock is considered to be considerably over-exploited, particularly because recruitment is normally insufficient to maintain the stock at the current high level of F.

Fishing mortality needs to be reduced by about 30% to about 0.65 which should eventually permit the stock to recover and stabilize near 250,000 t, assuming average recruitment.

The sizes of the 1985 and 1986 year classes are still somewhat uncertain. This is important since these fish are expected to contribute no less than 90% of the catch in 1988. It would be most desirable to delay exploitation of the large 1985 year class until it has recruited to the spawning stock. These fish will still be immature 2-year-olds in 1987, and will double in weight between 1987 and 1988. Restricting their exploitation in 1987 will, therefore, lead to no net loss in the total catches over the two years, but will allow a substantially more rapid recovery of the spawning stock, as indicated in the table below.

This table illustrates the consequences on spawning stock biomass of different levels of exploitation in 1987 and 1988 and should not be considered as an option table for 1988.

1987				1988			1989
SSB	% reduction in F(86)	$\bar{F}(2\text{-}8)$	Catch	SSB	$\bar{F}(2\text{-}8)$	Catch	SSB
110	60	0.35	125	179	0.30	153	335
					0.40	194	300
					0.50	231	268
					0.65	280	227
	50	0.44	150	164	0.30	142	307
					0.40	181	275
					0.50	215	246
					0.65	261	209
	40	0.52	170	152	0.30	134	286
					0.40	170	256
					0.50	203	229
					0.65	246	195
	30	0.64	200	134	0.30	122	254
					0.40	155	227
					0.50	184	204
					0.65	224	173

Weights in '000 t.

ACFM, therefore, continues to advise that F should be immediately reduced from the 1986 level by at least 30% and maintained at that reduced level. Restricting the catch in 1987 to the agreed TAC of 125,000 t is now expected to result in the fishing mortality being reduced by 60%, rather than the 30% envisaged on the basis of the previous advice. Increasing the TAC for 1987 to as much as 200,000 t would allow the recommended minimum reduction in F whilst increasing fishing opportunity. ACFM points out, however, that about 75% of the catch in 1987 will be composed of the 1985 year class, so minimizing the catch in 1987 will result in a more rapid rebuilding of the spawning stock, amelioration of the present unsatisfactory exploitation pattern, and an increase in the potential catch in 1988.

ACFM, therefore, advises limiting any upward revisions in the TAC in 1987 to the lowest possible level in order to permit higher catches in and after 1988 and a rapid recovery of the spawning stock. More detailed information on the size of the 1986 year class will be available in the autumn of 1987, and ACFM will give final advice for 1988 at that time in the light of this and the likely size of catches in 1987.

3.4.2.2 Advice from the October/November 1987 ACFM meeting

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15) and working papers submitted to ACFM.

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	<200	<220	<235	<220	<215	<259	<130	125-200	259	130	211
Agreed TAC	200	220	235	240	215	250	170	175	250	170	219
Actual landings	264	301	273	233	206	192	157	-	301	157	232
Sp. stock biomass	160	173	167	134	114	104	95	106[1]	173	95	138
Recruitment (age 1)	800	271	556	276	552	93	572	268[1]	800	93	487
Mean F(2-8,u)	0.78	0.77	0.90	0.89	0.88	0.85	0.91	-	0.91	0.70	0.82

[1]Predicted or assumed. [2]Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: Estimated landings in 1986 of 157,000 t were the lowest in the last 20 years (Table 3.4.2) and the TAC was not taken. Landings in 1987 are being constrained by the agreed TAC.

Data and assessment: Analytical assessment of catch-at-age data using CPUE data, research survey data, and several indices. Discard data not available for all fleets.

Fishing mortality is high but is now estimated to have been stable near 0.9 for the past five years. The exploitation pattern peaks on immature 2- and 3-year-old fish.

Recruitment has fluctuated strongly and is normally insufficient to maintain the stock at current high levels of F. 1985 year class is large, but that of 1986 is below average, and first estimates of that of 1987 suggest that it is poor.

State of stock: Spawning stock biomass has remained at the low level of about 100,000 t (Figure 3.4.2.2), compared with a suggested minimum level of 150,000 t. The stock is over-exploited relative to biological reference points (F_{max}, $F_{0.1}$, F_{med}).

Forecast for 1988: Assuming F(87) = 0.77, Catch(87) = 190,000 t, [Landings(87) = 175,000 t], SSB(88) = 106,000 t.

Option	Basis	F(88)	Predicted landings(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/Implications
A	$F_{0.1}$	0.12	36	226	Sharp reduction in catches, rapid increase in SSB
B	F_{max}	0.19	55	209	" " " "
C	0.5F(86)	0.46	116	156	Increase in SSB to suggested minimum level
D	0.7F(86)	0.64	148	128	20% increase in SSB from 1987/1988
E	0.9F(86)	0.82	176	106	No increase in SSB: may be outside safe biological limits

Continued fishing at current levels of fishing mortality will lead to spawning stock size remaining at its current very low level until 1989 at least.

Recommendation: ACFM maintains its advice that fishing mortality should be reduced from the 1986 level by at least 30%, corresponding to a TAC for 1988 of not more than 148,000 t. Measures to protect juvenile cod, including the seasonal requirement to use larger minimum mesh sizes in the cod box (Figure 3.4.2.3), should be maintained, and the minimum mesh size in the box should be increased to 120 mm. Extension of the use of 120-mm mesh to other areas and seasons should be considered for the future.

Special comments: ACFM noted in May that the sizes of the 1985 and 1986 year classes were still somewhat uncertain. New information is now available on the size of these year classes from the English and Scottish groundfish surveys. Both indicate that the 1985 year class is large, but not as large as estimated by the Working Group in March. Re-analysis of all available information, taking better account of the precision of the various indices, indicates that the best estimate of the size of the 1985 year class is 572 million, and that of the 1986 year class is 268 million.

No precise estimate of the size of the 1987 year class is yet available, but the English GFS 0-group index suggests that it is weak, and this is supported by qualitative information from the Dutch GFS and the Federal Republic of Germany shrimp by-catch data series. A value of 151 million was estimated from the available information and used for the forecast.

The fishery in 1987 has been restricted, at least for some fleets, by the revised agreed TAC of 175,000 t, but there have been reports of considerable discarding of cod caught as a by-catch as well as some misreporting. Even if the TAC was strictly observed, fishing mortality would not be reduced by as much as the TAC implies, because of discarding.

Revised calculations for 1987 indicate the following correspondence between fishing mortality and catch.

Assumption	F(87)	Catch(87) (t)
F(87) = 0.75F(86)	0.68	175,000
F(87) = 0.85F(86)	0.77	190,000
F(87) = F(86)	0.91	211,000

Restriction of the catch to the TAC level without discarding would thus now be expected to lead to a 25% reduction in F (compared with the 40% reduction estimated in May). Unrestricted fishing in 1987 at the 1986 level of F would lead to a catch of 211,000 t, implying discards of about 35,000 t if landings are restricted to the TAC.

ACFM considers that the true position in 1987 will be somewhere between these extremes, corresponding to a 15% reduction in F, with total discards of about 15,000 t.

Catch options based on this assumption have been calculated for 1988. These calculations indicate that the SSB remains at the low level of 106,000 t. A catch in 1988 of less than 176,000 t is required to achieve any rebuilding of the spawning stock, and ACFM maintains its previous advice that fishing mortality should be reduced by about 30% from its 1986 level corresponding to a TAC for 1988 not exceeding 148,000 t. This would allow an increase in SSB by 1989 of about 20% from its low level in 1987 and 1988. ACFM considers that option E of the forecast table may be outside safe biological limits.

ACFM reiterates its comments from its May 1987 report on this stock and the roundfish in Sub-area IV in general contained in Sections 3.4.1.1 and 3.4.2.1. In particular, ACFM repeats that:

> "With the current levels and pattern of exploitation, the precision of even the best available data is not generally sufficient to permit accurate forecasts to be made. This position can only be improved by reducing the level of exploitation on young fish.
>
> The stock of cod has been fished down to a very low level and survival is so low that recruitment is insufficient to maintain the stock in most years. Fishing mortality must be reduced to give the stock a chance to recover."

ACFM, therefore, stresses again the necessity of measures to protect juvenile cod, as proposed in its report of May 1986.

ACFM notes that the minimum mesh size is at last to be increased to 90 mm by the European Community on 1 January 1989, but advises that further increases in mesh size are needed in the cod fisheries to significantly reduce the exploitation of juvenile cod. A minimum estimate of the percentage of young fish retained by various mesh sizes is given in the text table below.

	Mesh size (mm)				
Age	80	90	100	120	140
1	46	18	6	1	0
2	100	99	97	67	21

This shows that almost all 2-year-old cod are retained by even the 100-mm mesh, and that an increase to at least 120 mm is required to allow a significant fraction of 2-year-old fish to escape.

ACFM notes the problems which arise when cod are taken as incidental catches in fisheries directed at other species after national quotas have been exhausted. Under current legislation, such catches have to be discarded. ACFM suggests that measures to manage national quotas should take account of such incidental catches in order to minimize the problem so far as possible.

ACFM recognizes that the repeated revision of the advice for 1988 has caused difficulties for managers and the industry, and advises that the present revision is due to the following factors:

* new information on the sizes of the 1985 and 1986 year classes,

* re-analysis of all available information taking more account of the precision of the various indices,

* availability of a first preliminary estimate of the size of the 1987 year class,

* mortality caused by discarding of cod in 1987.

On this occasion, all these lead to a revision of the forecast catches in the same direction (downwards).

3.4.3 Haddock in Sub-area IV (North Sea)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	90	140	200	170	172	209	239	120	-	-	-
Agreed TAC	69	140	180	181	170	207	230	140	-	-	-
Actual landings	121	147	185	172	138	165	168	-	185	97	147
Sp. stock biomass	145	228	285	239	187	232	225	213[1]	285	103	199
Recruitment (age 0)	14.6	30.0	18.9	64.9	20.6	31.4	58.4	40.7[1]	66.8	14.6	36.6
Mean F(2-6,u)	0.92	0.71	0.64	0.96	1.03	0.99	1.09	-	1.09	0.64	0.90

[1]Predicted or assumed. [2]Over period 1977-1986. Weights in '000 t, recruitment in billions.

Catches: Total landings in 1986 (Table 3.4.3) were well below the agreed TAC but greater than the revised prediction of 140,000 t made in 1986. Industrial by-catches are now at a low level (well below 10,000 t).

Data and assessment: Analytical assessment of catch-at-age data using CPUE and research survey indices of recruitment (especially IYFS). Discard data included. By-catch data poor for last 3 years.

Fishing mortality: F in the human consumption fishery is at the highest level in the last 20 years, but not much higher than earlier values. Juvenile fish are heavily exploited. Industrial by-catch F is estimated to have fallen, but estimate is uncertain because of poor sampling.

Recruitment: Fluctuates wildly without trend (Figure 3.4.3.1). 1983 year class was very strong, 1985 year class 25% below average, 1986 year class may be 40% above average. No evidence that recruitment is inadequate to sustain stock.

State of stock: The stock is very heavily exploited with high F on 1- and 2- group fish. Stock size is near average over 20 years and has been fairly stable for the past 5 years. Stock is almost entirely dependent on recruiting year classes. The increased mesh size should help to reduce discards.

Forecast for 1988: Assuming F(87) = 0.84, Landings(87) = 140,000 t, SSB(88) = 284,000 t.

Option	Basis	F(88)	Predicted landings(88) Total	H-C	Ind	Dis-cards	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.22	65	58	7	27	508	Sharp reduction in catches, rapid increase in SSB
B	0.6F(86)	0.65	154	148	6	75	386	
C	0.77F(86)	0.84	185	179	6	95	346	Recovery of stock size, improved catch rates

Continued fishing at current levels of fishing mortality will lead to continued heavy dependence on immature fish, with no long-term increase in stock size (Figure 3.4.3.2).

Recommendation: Fishing mortality needs to be reduced to reduce dependence on immature fish. The agreed TAC in 1987 will lead to a cut of 23%, and the resulting reduced level of F should be maintained in the future, corresponding to a TAC for 1988 not exceeding 185,000 t (including 6,000 t industrial by-catch).

Special comments: Revisions of the catch data and new information on year-class strengths have led to a significant upward revision of the estimates of the size of the stock and likely catches in 1987. However, the stock is very heavily exploited, and fishing mortality needs to be reduced. The TAC for 1987 (140,000 t) was agreed at a level higher than that recommended. In the light of the revised assessment, this TAC is now calculated to result in a reduction in F of about 23% in 1987, which will lead to increased stock sizes and catch rates over the next few years. ACFM considers that this reduction should be enforced and maintained for the immediate future.

3.4.4 Whiting in Sub-area IV (North Sea)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/ Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	150	120	200	125	102	118	135	127	-	-	-
Agreed TAC	105	150	170	170	149	160	135	135	-	-	-
Actual landings	139	147	106	105	99	68	74	-	180	68	122
Sp. stock biomass	478	465	342	309	244	234	294	368[1]	536	234	378
Recruitment (age 0)	24.3	24.1	20.6	29.9	33.8	41.5	73.4	46.6[1]	73.4	20.6	42.2
Mean F(2-6,u)	0.92	0.73	0.66	0.72	0.89	0.84	0.85	-	0.92	0.66	0.80

[1]Predicted or assumed. [2]Over period 1977-1986. Weights in '000 t, recruitment in billions.

Catches: Estimated landings in 1986 (Table 3.4.4) were well below those predicted, below the agreed TAC, and at an historically low level, mainly because of recent poor recruitment. There is a high rate of discarding in this fishery.

Data and assessment: Analytical assessment of catch-at-age data using CPUE and recruit survey indices. Industrial by-catch data of poor quality. Some discard data available and included, but incomplete.

Fishing mortality: Remains high, but shows no particular trend, is still lower than F_{med} (1.2), and within historic range. F due to industrial by-catch estimated to have declined, but quality of estimate uncertain.

Recruitment: Sizes of recent year classes uncertain because of conflicting evidence. Recruitment poor from 1980 to 1982, but appears to have improved, and 1986 may be strong (60% above average) (Figure 3.4.4.1).

State of stock: At a low level, but should recover as recruitment improves. Increased mesh size should help to reduce discards.

Forecast for 1988: Assuming F(87) = 0.85, Landings(87) = 106,000 t, SSB(88) = 500,000 t.

Option	Basis	F(88)	Predicted landings(88) Total	H-C	Ind	Dis-cards	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.22	67	33	33	24	615	Sharp reduction in catches, small increase in SSB
B	0.8F(86)	0.68	118	88	31	68	520	
C	F(86)	0.85	134	104	30	82	490	Recovery of catches and SSB

Continued fishing at current levels of fishing mortality will lead to some recovery in catches and biomasses provided the 1985 and 1986 year classes are as good as estimated Figure 3.4.4.2).

Recommendation: Fishing mortality should not be allowed to increase, corresponding to a TAC of not more than 134,000 t (including 30,000 t industrial by-catch) in 1988.

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

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	129	127	100	131	160	195	195	<198	-	-	-
Agreed TAC	129	127	125	158	180	200	240	173	-	-	-
Actual landings	123	127	169	173	198	193	162	-	198	116	158
Sp. stock biomass	249	226	186	185	143	105	106	178[1]	276	105	197
Recruitment (age 1)	155	185	333	554	252	242[1]	242[1]	242[1]	554	111	245
Mean F(3-6,u)	0.40	0.34	0.53	0.62	0.84	0.88	0.74	-	0.88	0.34	0.57

[1]Predicted or assumed. [2]Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: Estimated landings in 1986 (Table 3.4.5) were substantially less than the agreed TAC, but comparable with recent mean levels.

Data and assessment: The data are difficult to interpret. Analytical assessment of catch-at-age data. CPUE data are available but not used because of inconsistencies. F in 1986 was estimated as the average over 1983 and 1984. Recruit indices are not available, and discard data are not available.

Fishing mortality: Was low before 1980, but seems to have increased in recent years with a shift towards heavy exploitation on fairly young fish, and may still be underestimated if there is an increasing trend.

Recruitment: Only one independent estimate is available, but this was not used because only a short time series is available. This limits the possible precision of the forecasts. Average values were used for the 1984-1986 year classes.

State of stock: The stock size is estimated to be at a low level (Figure 3.4.5.1), and the forecast recovery in 1987 (due to the good 1982 year class) may be temporary. The level of exploitation is becoming high, and the reduction in F implied by the 1987 TAC should be maintained.

Forecast for 1988: Assuming F(87) = 0.53, Landings(87) = 173,000 t, SSB(88) = 195,000 t.

Option	Basis	F(88)	Predicted landings(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.4F(86)	0.29	112	256	
B	0.6F(86)	0.44	156	219	Expected recovery of SSB maintained
C	0.8F(86)	0.59	195	187	Expected recovery of SSB reversed

Continued fishing at current levels of fishing mortality will lead to a further decline in catches and stock size to historic low levels (Figure 3.4.5.2).

Recommendation: The fishing mortality should be reduced from that implied by the TAC for 1987 (0.53), corresponding to a TAC for 1988 not exceeding about 156,000 t.

3.5 Cod, Haddock, Whiting, and Saithe in Sub-areas VI and VII

3.5.1 Roundfish in Sub-areas VI and VII: overview

The state of the roundfish stocks west of Scotland is less certain that those in the North Sea, mainly because the levels of biological sampling of the catches are inadequate in certain countries, and because there are as yet no fishery-independent indices of recruitment for the area. The research vessel trawl surveys aimed at estimating the abundance of both young and adult fish in this area will become most useful and should be continued.

Levels of exploitation are also quite high in Division VIa, particularly on cod, where problems of interpretation of data may mean that the current level of fishing mortality is underestimated. The cod stock is already estimated to be at an historic low level and it is entirely possible that when a better assessment is available, it will lead to a recommendation for urgent conservation measures.

The haddock and whiting stocks in Division VIa are subject to lower and more variable exploitation than the cod and are estimated to be near their average levels over the last 20 years.

The haddock stock in Division VIb (Rockall) is of a very variable size, as it is maintained by occasional episodes of good recruitment. Surveys indicate that several recent year classes may be large, and these should begin to contribute to the fishery in 1987 or 1988.

Haddock in Divisions VIa and VIb are biologically two distinct stocks. The stock in Division VIa is reasonably well understood, but the Division VIb stock is very variable and subject to precautionary TACs. The practice of applying a single TAC to these stocks means that the Division VIa fishery is often unregulated. ACFM repeats its advice that separate TACs should be set for haddock in Divisions VIa and VIb.

In Sub-area VII (excluding Division VIIa), the quantity and quality of the data available for roundfish stocks are not generally good enough to permit the state of the stocks to be determined with much confidence, and catch forecasts of acceptable precision cannot, therefore, be made. In Divisions VIId,e and also in Divisions VIIf,g, the data for cod and whiting are gradually improving, and better assessments should be feasible in the near future. Precautionary TACs are at present in force for Sub-area VII, excluding Division VIIa (together with some other areas). For the future, it would be preferable if TACs were set separately for stocks for which assessments exist, but scientific research aimed at obtaining more information about stock definitions in the area would also be desirable.

3.5.2 Cod in Division VIa (West of Scotland)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/ Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	10.9	9.5	17.5	25.8	23.0	27.0	25.0	22.0	-	-	-
Agreed TAC[3]	-	20.0	17.5	27.0	25.0	25.0	25.0	22.0	-	-	-
Actual landings	17.9	24.0	22.0	21.5	20.6	18.5	12.0	-	24	12	18
Sp. stock biomass	31	39	37	33	31	24	19	21[1]	39	19	29
Recruitment (age 1)	21	6	15	9	15	6	15	13[1]	21	6	12
Mean F(2-5,u)	0.74	0.70	0.73	0.80	0.91	0.97	0.78	-	0.97	0.64	0.78

[1]Predicted or assumed. [2]Over period 1977-1986. [3]TAC is for the whole of Sub-area VI. Weights in '000 t, recruitment in millions.

Catches: Estimated landings in 1986 (Table 3.5.2) were much less than the TAC and much less than predicted. Landings have declined since 1981 and are now at levels observed in the mid-1970s. It is not expected that the TAC will be taken in 1987.

Data and assessment: Analytical assessment based on catch-at-age data. CPUE data available but not used because of inconsistencies. No independent recruit indices available; a CPUE index is used but does not give very reliable results.

Fishing mortality has increased in recent years and is now near the highest levels in the last 20 years. Current values may also be underestimated if the increasing trend is real.

Recruitment: The 1985 year class is estimated to be quite good, but this estimate may not be reliable. The estimate for 1984 was over-optimistic.

State of stock: The stock is at an historically low level (Figure 3.5.2.1), and fishing mortality is high and probably needs to be reduced towards F_{med} (about 0.6). The assessment is, however, uncertain, and a firm basis for remedial management action is lacking.

Forecast for 1988: Assuming F(87) = 0.78, Landings(87) = 15,000 t, SSB(88) = 21,000 t.

Option	Basis	F(88)	Predicted landings(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.15	5	45	Sharp reduction in catches, rapid recovery of SSB
B	0.8F(86)	0.63	14	30	
C	F(86)	0.78	16	27	Effort maintained, some recovery of SSB

Continued fishing at current levels of fishing mortality will lead to continuing low catches, but some recovery in SSB if the 1985 year class is indeed quite good (Figure 3.5.2.2).

Recommendation: Fishing mortality should not be allowed to increase, corresponding to a TAC not exceeding 16,000 t in 1988.

3.5.3 Cod in Division VIb (Rockall)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/ Assess:15).

Landings are small (Table 3.5.3) and accommodated by 500 t added to the TAC adopted for cod in Division VIa and applied to the whole of Sub-area VI.

3.5.4 Haddock in Division VIa (West of Scotland)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	13.0	<15.5	<15.5	<14.4	<27.0	<25.0	-	<23.0	-	-	-
Agreed TAC[3]	-	21.5	21.5	45.0	40.0	36.0	34.5	32.0	-	-	-
Actual landings	13	18	30	29	30	24	20	-	30	13	22
Sp. stock biomass	30	78	100	84	59	65	59	62[1]	100	25	59
Recruitment (age 0)	44.0	96.0	52.0	477.0	80.0	135.0	247.0	181.0[1]	536.0	44.0	196.0
Mean F(2-6)	0.61	0.39	0.46	0.53	0.83	0.89	0.67	-	0.89	0.39	0.65

[1]Predicted or assumed. [2]Over period 1977-1986. [3]TAC is set for Divisions VIa and VIb combined. Weights in '000 t, recruitment in millions.

Catches: Estimated landings have declined recently (Table 3.5.4), but are not far from mean levels. Landings fluctuate considerably because of variable recruitment.

Data and assessment: Analytical assessment of catch-at-age data including discards. CPUE data are used, and recruitment estimates are obtained from correlation with the North Sea. There are, however, considerable internal inconsistencies in this data set.

Fishing mortality is rather high, but has fluctuated without trend, and is estimated to be close to average levels.

Recruitment: Fluctuates strongly along with the year classes in the North Sea. The 1983 and 1986 year classes appear to be strong.

State of stock: The present stock size is near average (Figure 3.5.4.1). Exploitation of this stock is effectively uncontrolled because of the combined TAC for Divisions VIa and VIb.

Forecast for 1988: Assuming F(87) = 0.67, Landings(87) = 31,000 t, SSB(88) = 60,000 t.

Option	Basis	F(88)	Predicted landings(88) ('000 t)	Pred. discards ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.18	8	4	94	Sharp decrease in catches, rapid increase in SSB
B	0.8F(86)	0.53	21	10	71	
C	F(86)	0.67	25	12	64	Recovery of catches, SSB stable

Continued fishing at current levels of fishing mortality will lead to a recovery in catches in response to the good 1985 and 1986 year classes, with SSB stable near average levels (Figure 3.5.4.2).

Recommendation: Fishing mortality should not be allowed to increase, corresponding to a TAC not exceeding 25,000 t in 1988.

3.5.5 Haddock in Division VIb (Rockall)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	2.5	6.0	6.0	30.0	20.0	8.0	5.0	10.0	-	-	-
Agreed TAC	← Included in Sub-area VI combined TAC →										
Actual landings	7.3	9.1	3.9	0.4	2.6	9.2	3.6	-	43.0	0.4	8.6

[1]Over period 1977-1986. Weights in '000 t.

Catches in 1986 were considerably less than in 1985, but still moderate (Table 3.5.5). The catches of this stock fluctuate strongly, following occasional good recruitment.

Data and assessment: Catch-at-age data for 1985 and 1986 are available but insufficient for an analytical assessment. Results from research trawl surveys are also available for most recent years, but are not standardized.

Fishing mortality: Not assessed.

Recruitment is highly variable. The 1984 year class appears to be strong, and those of 1985 and 1986 may also be good.

State of stock: The size of the stock is likely to increase rapidly as a result of several good year classes. Firm advice will not be possible until the 1984 year class has recruited to the fishery.

Forecast for 1988: Not available.

The effects of continued fishing at current levels of fishing mortality cannot be assessed.

Recommendation: Separate TACs should be set for Divisions VIa and VIb to avoid the risk of overexploitation in Division VIa. A precautionary TAC of not more than 10,000 t should be set for Division VIb in 1988, in order to permit the steady development of a fishery on recent good year classes.

3.5.6 Whiting in Division VIa (West of Scotland)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	13.0	14.0	13.0	8.2	6.4	12.0	13.0	15.0	-	-	-
Agreed TAC[3]		16.4	13.0	16.0	16.4	16.4	16.4	16.4	-	-	-
Actual landings	13	12	14	16	16	13	8	-	17	8	14
Sp. stock biomass	31	51	45	36	29	25	25	31[1]	51	25	33
Recruitment (age 1)	191	40	35	48	73	74	84	143[1]	191	35	82
Mean F(2-4,u)	0.55	0.37	0.36	0.54	0.77	0.90	0.46	-	0.90	0.36	0.62

[1]Predicted or assumed. [2]Over period 1977-1986. [3]TAC is set for Divisions VIa and VIb combined. Weights in '000 t, recruitment in millions.

Catches: Landings have declined recently, and the 1986 landings are the lowest on record (Table 3.5.6) and much less than the TAC and the predicted level.

Data and assessment: Analytical assessment of catch-at-age data, excluding discards. CPUE data and recruit indices used, but data are not entirely reliable.

Fishing mortality fluctuates considerably. The current level is in the lower part of the historic range.

Recruitment is estimated by correlation with the North Sea. Recent year classes have been near average but that of 1986 is estimated to be strong.

State of stock: The stock size is near average and the present level of exploitation is not very high (Figure 3.5.6.1).

Forecast for 1988: Assuming F(87) = 0.46, Landings(87) = 11,000 t, SSB(88) = 47,000 t.

Option	Basis	F(88)	Predicted landings (88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.27	9	52	Sharp reduction in catches
B	0.8F(86)	0.37	12	49	
C	F(86)	0.46	15	46	Some recovery of catch and SSB

Continued fishing at current levels of fishing mortality will lead to some recovery of catches and biomass (Figure 3.5.6.2).

Recommendation: Fishing mortality should not be allowed to increase, corresponding to a TAC of not more than 15,000 t for 1988.

3.5.7 Whiting in Division VIb (Rockall)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Landings of whiting from Division VIb are negligible (Table 3.5.7).

3.5.8 Saithe in Sub-area VI (West of Scotland and Rockall)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	31	27	25	23	27	26	20	23	-	-	-
Agreed TAC	31.0	27.0	25.0	23.0	27.0	27.8	27.8	27.8	-	-	-
Actual landings	22	24	24	29	22	27	39	-	39	22	27
Sp. stock biomass	79	71	68	63	52	56	58	79[1]	110	52	75
Recruitment (age 1)	28	26	45	58	46	31	32	33[1]	58	20	33
Mean F(3-6,u)	0.29	0.31	0.33	0.36	0.28	0.31	0.48	-	0.48	0.28	0.34

[1]Predicted or assumed. [2]Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: The estimated landings in 1986 were considerably greater than the nominal landings (Table 3.5.8), the TAC, and the predicted catches. The increased landings are associated with increased effort by the major fleet and are close to the historic maximum.

Data and assessment: Analytical assessment of catch-at-age data using CPUE data. No independent estimates of year-class strength. Interpretation of data difficult.

Fishing mortality: Increased sharply in 1986 because of landings in excess of the TAC, and may not be well determined.

Recruitment: No independent estimates are available, but analysis of catch data suggests that the 1982, 1983, and 1985 year classes may be large.

State of stock: The stock has been at a low level but appears to be recovering with recent good year classes (Figure 3.5.8.1). The assessment assumes that the TAC will be exceeded again in 1987.

Forecast for 1988: Assuming F(87) = 0.48, Landings(87) = 46,000 t, SSB(88) = 77,000 t.

Option	Basis	F(88)	Predicted landings (88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.18	18	84	Sharp reduction in catches
B	0.8F(86)	0.38	35	68	F reduced towards previous levels
C	F(86)	0.48	42	62	Continued high catches, some decrease in SSB

Continued fishing at current levels of fishing mortality will lead to a continued high level of catches with some reduction in SSB if recent year classes are indeed strong (Figure 3.5.8.2).

Recommendation: Fishing mortality should be reduced towards the pre-1986 level, corresponding to a TAC for 1988 not exceeding 35,000 t.

3.5.9 Cod in Divisions VIId,e (English Channel)

3.5.9.1 Advice from the May 1987 ACFM meeting

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	←— Precautionary TAC for Sub-area VII excluding Division VIIa →										
Actual landings	5.2	5.3	4.2	4.4	3.7	4.0	10.6	-	11.3	3.7	6.4
Sp. stock biomass	2.1	1.6	1.9	2.0	1.1	0.7	1.5	-	3.1	0.7	1.8
Recruitment (age 1)	6	3	5	5	5	18	41	-	41	3	11
Mean F(2-4,u)	1.19	1.22	0.90	1.54	1.31	0.66	1.25	-	1.54	0.47	1.12

[1] Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: Estimated landings in 1986 were about double the recent average (Table 3.5.9).

Data and assessment: The catch-at-age data base has been revised. Sampling levels are very variable and not fully adequate. An analytic assessment was attempted but is not considered to be reliable. The reasons for the increase in landings are not clear, but could be due to increased fishing mortality, increased recruitment, and inaccuracies in the reported landings.

Fishing mortality: Appears to be high on ages older than 2, but very variable.

Recruitment: Given average F levels, the high catches in 1986 imply high recruitment of the 1984 and 1985 year classes, but this interpretation is not definite.

State of stock: Spawning stock size appears to be highly variable, but near average levels in 1986. The stock is mainly composed of immature fish.

Forecast for 1988: Not available.

The effect of continued fishing at current levels of fishing mortality cannot at present be assessed.

Recommendation: The quality of the data is not yet adequate for a useful prediction to be made. However, the available data indicate that there may be good recent recruitment, and ACFM suggests that a precautionary TAC could be set for Divisions VIId,e based on recent catch data.

3.5.9.2 Advice from the October/November 1987 ACFM meeting

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/Assess:15) and working paper submitted to ACFM.

ACFM gave advice on this stock in May 1987, but was asked to reconsider the matter in the light of any new data which might be available.

Preliminary catch data for 1987 indicate that catches are continuing at a high level (about 7,000 t for the first half of the year), comparable to that of 1986, and the agreed TAC for 1987 has recently been increased. (Note: the TAC applies to a larger area than Divisions VIId,e.)

ACFM has been informed that the processing of the age composition data for 1986 has been found to be deficient, and these data have been withdrawn.

ACFM, therefore, has no better basis for forecasting the situation in 1988 than hitherto. The reasons for the increase in reported catches cannot be deduced from the data available. Possible reasons include good recent recruitment, migration of fish from the North Sea, increased effort, and deficiencies in the catch data.

The appropriate management action would depend on the cause of the increase in catches. ACFM cannot resolve this question from the data available, and is unable to offer any additional advice for this stock.

3.5.10 Whiting in Divisions VIId,e (English Channel)

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/ Assess:15).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	←— Precautionary TAC for Sub-area VII excluding Division VIIa —→										
Actual landings	8.6	10.1	9.4	7.4	8.1	8.8	7.5	-	10.3	7.4	8.8
Sp. stock biomass	-	19.0	14.4	14.0	15.8	16.0	13.9	-	19.0	13.9	15.5
Recruitment (age 1)	-	39	52	62	57	46	18	-	62	18	46
Mean F(2-4,u)	-	1.12	0.96	0.79	1.00	0.75	0.97	-	1.12	0.75	0.93

[1]Over period 1977-1986. Weights in '000 t, recruitment in millions.

Catches: Estimated landings have been fairly stable, but were slightly reduced in 1986 (Table 3.5.10).

Data and assessment: The catch-at-age data have been revised. Sampling levels are very variable and not fully adequate. An analytic assessment was attempted, but is not considered to be sufficiently reliable to be used as the basis for a prediction.

Fishing mortality: Appears to be rather high and quite variable, with full exploitation on 3-year-old fish.

Recruitment: No independent recruit estimates are available. Catch data implies that recruitment has been fairly constant, but the 1985 year class may be weak.

State of stock: The stock size has fluctuated and is currently at a fairly low level.

Forecast for 1988: Not available.

The effects of continued fishing at current levels of fishing mortality cannot at present be assessed.

Recommendation: The quality of the data and the assessment are not yet adequate for a useful prediction to be made. ACFM recommends a precautionary TAC based on recent average catch levels.

3.5.11 Other stocks in Sub-area VII

Source of information: North Sea Roundfish Working Group report, March 1987 (C.M.1987/ Assess:15).

For roundfish in the following areas, sufficient data from biological sampling of the catches are not available for any useful assessment of the state of the stocks to be carried out at present. TACs can only be based on the nominal catch data given in the tables listed.

Species	Area	Table
Cod	VIIb,c,h-k	3.5.11.1
Haddock	VIId,e	3.5.11.2
Haddock	VIIb,c,g-k	3.5.11.3
Whiting	VIIb,c,h-k	3.5.11.4
Saithe	VII (all divisions)	3.5.11.5

ACFM draws the attention of managers to the fact that separate assessments and catch predictions are usually available for cod and whiting in Divisions VIIf,g, and that combining these with other parts of Sub-area VII subject to precautionary TACs may not be the best procedure.

3.6 Irish Sea/Bristol Channel and Celtic Sea Stocks

3.6.1 Irish Sea cod

3.6.1.1 Advice from the May 1987 ACFM meeting

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987, (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	13.0	12.5	10.0	10.4	8.8	10.7	10.3	-	-	-
Agreed TAC	5.0	13.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	5.0	13.3
Reported landings	10.7	14.9	13.3	10.3	8.7	11.1	8.4	-	-	-	-
Unallocated	+	+	+	-0.3	-0.3	-0.6	-0.3	-	-	-	-
Catch used by WG	10.8	14.9	13.4	10.0	8.4	10.5	9.7	-	14.9	6.3	10.1
Sp. stock biomass	7.7	10.9	11.4	10.0	7.8	7.5	7.6	8.2[1]	11.4	6.3	8.7
Recruitment (age 1)	11.8	6.6	2.9	4.4	6.8	6.8	3.2	6.1[1]	11.8	2.7	6.1
Mean F(1-6,u)	0.54	0.60	0.70	0.61	0.60	0.63	0.63	-	0.70	0.44	0.59

[1]Predicted or assumed. [2]Over period 1970-1986. Weights in '000 t, recruitment in millions. +Less than 100 t.

Catches: 1986 landings were 9% below the 1986 Working Group prediction. Ireland and Northern Ireland together account for 72% of the total (Table 3.6.1).

Data and assessment: Analytical assessment, using catch-at-age data with international effort index.

Fishing mortality: Little change since 1983; F currently just above the long-term mean (Figure 3.6.1.1).

Recruitment: Surveys indicate the 1985 year class to be poor, and the 1986 year class to be average. 1987 and 1988 year classes assumed to be average. No evidence that low recruitment occurs at low levels of SSB.

State of stock: Spawning stock biomass in 1987 corresponds to the long-term average.

Forecast for 1988: Assuming F(87) = 0.61, Catch(87) = 8,804 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.17	9.2	3.1	16.1	Large increases in SSB; catches reduced by 45%-65%
B	F_{max}	0.28	8.7	4.8	13.4	
C	0.8*F(86)	0.49	7.7	7.5	9.5	Catches and SSB approximate to recent levels
D	F(86)	0.61	7.2	8.9	7.8	

Continued fishing at current levels of fishing mortality will lead to no major change in spawning stock biomass in the near future assuming average recruitment.

Recommendation: The yield-per-recruit curve shows a maximum at about 50% of the estimated level of fishing mortality in 1986, and fishing mortality, therefore, should not be allowed to rise, but when considering the management strategy for cod, the interaction with Nephrops should be taken into account.

Special comments: The forecast may be updated by ACFM in November, when more information on recruitment should be available. Enforcement of the 45-cm minimum landing size regulation could result in an improved exploitation pattern and yield per recruit.

3.6.1.2 Advice from the October/November 1987 ACFM meeting

Surveys during 1987 provided data on three year classes: 1985-1987. Estimates of recruitment (in thousands at age 1) from the weighted average prediction using all surveys and including the new data are compared with the values assumed for the Working Group assessment as follows:

Year class	Working Group	New estimate
1985	3,161	3,040
1986	6,077	8,599
1987	6,077	5,781

It was decided to revise the forecast (Figure 3.6.1.2) by adopting the new estimate for the 1986 year class.

Forecast for 1988: Assuming F(87) = 0.61, Catch(87) = 9,128 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)
A	$F_{0.1}$	0.17	3.6	19.0
B	F_{max}	0.28	5.5	15.8
C	0.8F(86)	0.49	8.6	11.2
D	F(86)	0.61	10.1	9.1

The status quo catch prediction for 1988 is revised from 8,900 t to 10,100 t. ACFM recommends that the level of fishing mortality should not be allowed to rise, but the interaction with Nephrops should be taken into account.

3.6.2 Irish Sea whiting

3.6.2.1 Advice from the May 1987 ACFM meeting

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987, (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	10.0	12.0	10.0	12.0	10.0	13.4	16.0	16.0	16.0	10.0	11.9
Agreed TAC	-	-	18.2	18.2	18.2	18.2	18.2	18.2	-	-	-
Reported landings	12.7	17.0	17.0	10.8	12.5	16.8	10.3	-	17.0	10.3	13.9
Unallocated	-	-	0.2	-0.3	-1.0	-0.8	-0.5	-	-	-	-
Catch used by WG	12.7	17.0	17.2	10.5	11.6	16.0	9.7	-	17.2	9.7	13.5
Discards from *Nephrops* fishery	3.3	3.6	0.9	1.8	3.7	2.3	2.3	-	3.7	0.9	2.6
Sp. stock biomass	12.9	17.3	14.3	9.1	8.2	11.7	10.9	11.0[1]	17.3	8.2	12.1
Recruitment (age 0)	120	63	67	192	152	107	130	108[1]	192	63	108
Mean F(2-7,u)	0.86	0.97	1.19	1.07	1.17	1.15	0.97	-	1.17	0.86	1.05

[1]Predicted or assumed. [2]Over period 1980-1986. Weights in '000 t, recruitment in millions.

Catches: Ireland and Northern Ireland together take 80% of the catch. The 1986 landings were considerably below average (Table 3.6.2).

Data and assessment: Analytical assessment, using catch-at-age data with international effort index. The latter is derived from minor component in the fishery since no effort data are available for the two main fleets.

Fishing mortality: 16% lower in 1986 than in 1985; 9% below average. TAC well above catches in recent years. Discards treated as additional natural mortality.

Recruitment: Surveys show the 1985 year class to be average, the 1986 year class to be good; 1987, 1988 and 1989 year classes assumed to be average.

State of stock: Spawning stock biomass still slightly below average, although higher than the 1983-1984 levels (Figure 3.6.2).

Forecast for 1988: Assuming F(87) = 0.94 Catch(87) = 12,000 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.18	15	3	22	SSB rebuilt above high 1981 level
B	F_{max}	0.38	14	6	19	
C	0.8*F(86)	0.75	12	10	13	SSB rebuilt to slightly above average
D	F(86)	0.94	12	12	11	SSB maintained at 1986/1987 level

Continued fishing at current levels of fishing mortality will lead to maintenance of present spawning stock biomass, assuming average recruitment.

Recommendation: In view of the current high level of whiting discards, there is little purpose in reducing fishing mortality in order to increase long-term yields. Current F levels are slightly above the F_{med} value (0.9), however, and should, therefore, not be allowed to increase. Enforcement of the 70-mm minimum mesh size in the *Nephrops* fishery would be the most effective management strategy for whiting.

Special comments: Large quantities of juvenile whiting are taken as by-catch in the *Nephrops* fisheries and discarded. It is not known if the increase (on 1 July 1986) in the minimum legal mesh size for the *Nephrops* fishery from 60 mm to 70 mm has had a significant influence on the effective mesh size in use. An effective mesh size of 70 mm would virtually eliminate discarding of whiting. The absence of fishing effort data from the two main fleets considerably hinders the assessment of the Irish Sea whiting stock.

ACFM may be in a position to update the present assessment in November, when more information on whiting recruitment and on the effective mesh size in the *Nephrops* fishery may be available.

3.6.2.2 Advice from the October/November 1987 ACFM meeting

New indices are available from English surveys for the 1986 and 1987 year classes and new weighted average predictions including these together with the recruitment (in millions at age 0) as assumed by the Working Group are as follows:

Year class	Working Group	New estimate
1985	130	138
1987	108	239

Given that the estimate of the 1987 year class is based only on one survey and is uncertain, and that the 1986 year class is similar to the value used by the Working Group, no update was made to this assessment.

No new information has become available on the effective mesh size in the *Nephrops* fishery.

The ACFM recommendations given in the May report remain unchanged.

3.6.3 Irish Sea plaice

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987 (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	2.5	4.0	3.0	3.5	3.1	4.0	5.0	5.0	-	-	-
Agreed TAC	-	-	4.5	4.5	4.5	5.0	5.0	5.0	-	-	-
Reported landings	3.9	3.9	3.2	3.7	4.2	6.1	4.0	-	-	-	-
Unallocated	-	-	+	+	+	-1.0	0.5	-	-	-	-
Discards	-	-	-	-	-	-	0.3	-	-	-	-
Catch used by WG	3.9	3.9	3.2	3.6	4.2	5.1	4.8	-	5.1	2.9	4.0
Sp. stock biomass	4.9	5.7	5.6	4.9	5.7	6.7	7.3	7.3[1]	10.4	3.4	6.9
Recruitment (age 1)	16.3	8.7	21.1	21.5	19.8	15.2	20.5	16.2[1]	34.1	8.7	17.4
Mean F(1-12,u)	0.42	0.45	0.40	0.48	0.42	0.43	0.43	-	0.69	0.26	0.47

[1]Predicted or assumed. [2]Over period 1964-1986. Weights in '000 t, recruitment in millions. +Less than 100 t.

Catches: Have increased in recent years following good recruitment (Table 3.6.3). 1986 catches were 8% less than predicted by the 1986 Working Group. 10% by-catch restriction on UK beam trawlers estimated to have resulted in 250 t of discards of marketable plaice.

Data and assessment: Analytical assessment, using catch-at-age data and fishing effort indices.

Fishing mortality: Stable.

Recruitment: Surveys indicate the 1985 year class to be above average; 1986, 1987, and 1988 year classes assumed to be average.

State of stock: Spawning stock biomass is stable at just above the long-term average (Figure 3.6.3).

Forecast for 1988: Assuming F(87) = 0.41, Catch(87) = 4,700 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.11	7.9	1.5	10.8	
B	F_{max}	0.23	7.6	3.0	9.3	
C	0.8xF(86)	0.33	7.5	4.0	8.2	
D	F(86)	0.41	7.3	4.8	7.4	SSB stable

Continued fishing at current levels of fishing mortality will lead to no major change in catch and spawning stock biomass over the next few years, if recruitment remains near average.

Recommendation: F_{med} (0.39) is close to the current level of fishing mortality, and ACFM recommends that F in 1988 should not be allowed to rise.

3.6.4 Irish Sea sole

3.6.4.1 Advice from the May 1987 ACFM meeting

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987 (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	1.3	1.8	1.6	0.7	1.0	1.1	1.65	1.9	-	-	-
Agreed TAC	-	-	0.6	1.4	1.25	1.25	1.9	2.1	-	-	-
Reported landings	1.9	1.7	1.3	1.3	1.0	1.7	1.8	-	-	-	-
Unallocated	+	+	+	-0.1	+	-0.5	0.2	-	-	-	-
Catch used by WG	1.9	1.7	1.3	1.2	1.1	1.1	2.0	-	2.0	1.1	1.5
Sp. stock biomass	5.8	4.9	4.3	3.5	3.5	3.7	4.5	4.0[1]	9.4	3.5	5.6
Recruitment (age 2)	5.3	4.1	1.9	5.0	11.4	15.8	6.1	6.1[1]	16.3	1.9	7.8
Mean F(4-12,u)	0.49	0.37	0.30	0.35	0.29	0.35	0.57	-	0.57	0.28	0.36

[1]Predicted or assumed. [2]Over period 1970-1986. Weights in '000 t, recruitment in millions. +Less than 100 t.

Catches: Belgium and UK (England & Wales) accounted for 88% of the catch in 1986. Doubling of catch in 1986 because fishing effort increased (Table 3.6.4).

Data and assessment: Analytical assessment, using catch-at-age and Belgian fishing effort indices.

Fishing mortality: Fishing effort data suggest a dramatic increase in fishing mortality, but uncertainties concerning some of the effort information, and its interpretation, cast some doubt on this. The 1987 fishery should yield further evidence on this point.

Recruitment: Catch-per-unit-effort indices of 2- and 3-year-old sole give conflicting information. 1982 and 1983 year classes assumed good, 1984 and subsequent year classes assumed average.

State of stock: Appears to be heavily exploited (Figure 3.6.4.1), but see reservation in the statement on fishing mortality above.

Forecast for 1988: Assuming F(87) = 0.57 Catch(87) = 2,300 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.4F(86)	0.23	3.3	0.8	3.6	SSB 1989 slightly higher than 1988
B	F_{max}	0.34	3.2	1.2	3.2	SSB decline halted
C	0.8F(86)	0.45	3.2	1.5	2.9	
D	F(86)	0.57	3.1	1.7	2.6	

Continued fishing at current levels of fishing mortality will lead to continuing rapid decline of spawning stock, if fishing mortality estimates are correct.

Recommendation: ACFM will re-evaluate this assessment in November, when information from the 1987 fishery will be available.

3.6.4.2 Advice from the October/November 1987 ACFM meeting

In the report of the May meeting of ACFM, doubts were expressed about the very large increase in fishing mortality between 1985 and 1986 suggested by fishing effort data and its interpretation. Belgian beam trawl catch and effort data for the second quarter in 1987 are now available. The effort data support the view that fishing mortality showed a very large increase in 1986 and indicate that it has further increased somewhat in 1987.

New English recruitment indices have become available for the 1983, 1984, and 1985 year classes and weighted average predictions from these are compared to the values assumed by the Working Group (in thousands at age 2) as follows:

Year class	Working Group	New estimate
1983	15,815	14,235
1984	6,134	8,509
1985	6,134	5,638

In the light of the new data, it was decided to update the prediction (Figure 3.6.4.2) by revising the recruitment of the 1984 year class to the new estimate. All other input to the prediction was the same as in the original assessment. The revised forecast is as follows:

Forecast for 1988: Assuming F(87) = 0.57, Catch(87) = 2,294 t.

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)
A	0.4F(86)	0.23	3.54	0.90	3.82
B	F_{max}	0.34	3.50	1.26	3.43
C	0.8F(86)	0.45	3.46	1.59	3.10
D	F(86)	0.57	3.42	1.88	2.81

In its May report, ACFM stated that continued fishing at current levels of fishing mortality will lead to a continuing rapid decline in spawning stock if fishing mortality estimates are correct. While the new data suggest that the fishing mortality estimates are correct, there is still some uncertainty. In this situation, ACFM recommends that fishing mortality should be reduced towards the pre-1986 level corresponding to a TAC in 1988 of certainly not more than 1,900 t and preferably not more than 1,600 t. If the state of the stock is next year confirmed to be in as serious a state as currently indicated, TACs in future years may have to be much lower than recent levels.

3.6.5 Celtic Sea cod

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987 (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	3.5	3.5	-	-	5.6	-	-	-	-
Agreed TAC	TAC covers Sub-areas VII (except Division VIIa) and VIII →										
Actual landings	5.7	8.2	6.6	5.3	5.6	6.2	7.8	-	8.2	5.3	6.2
Sp. stock biomass	5.6	5.8	7.8	7.7	7.2	8.3	12.4	10.8[1]	8.3	5.6	7.1
Recruitment (age 1)	5.4	2.6	1.1	3.5	4.6	2.6	2.7	2.7[1]	5.4	1.1	3.3
Mean F(1-7,u)	0.54	0.63	0.54	0.54	0.41	0.41	0.46	-	0.63	0.41	0.51

[1]Predicted or assumed. [2]Over period 1980-1985. Weights in '000 t, recruitment in millions.

Catches: 1986 catch was 22% higher than predicted by the Working Group in 1986, mainly because the 1983 year class had been underestimated. France accounts for 90% of total catch. French fishing effort increased in the first half of the year (Table 3.6.5).

Data and assessment: Analytical assessment, using catch-at-age data and fishing effort index. Data based could be improved if sampling could be extended to include the French *Nephrops* fleet. Current assessment uncertain.

Fishing mortality: Not as high as in the early 1980s, but appears to have increased by 12% in 1986; it may be higher than the assessment suggests. The effect of the TAC is difficult to quantify; in addition to the assessment area, it covers the rest of Sub-area VII (except Division VIIa) and Sub-area VIII.

Recruitment: No recruitment indices available; average strength assumed for 1985 and subsequent year classes.

State of stock: Spawning stock biomass appears to be at the highest level seen in the data series, but this estimate may be optimistic (Figure 3.6.5).

Forecast for 1988: Assuming F(87) = 0.46 Catch(87) = 7,300 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F_{max}	0.26	10.9	4.5	13.9	
B	0.8F(86)	0.37	10.6	6.1	11.8	Average catch in 1988, SSB increases 1989
C	F(86)	0.46	10.4	7.2	10.3	

Recommendation: ACFM recommends that fishing mortality should not be allowed to rise; this corresponds to a TAC of 7,000 t in 1988, which should apply to Divisions VIIf,g. A precautionary TAC should be set for other parts of Sub-areas VII and VIII, except Divisions VIIa,d,e. This TAC should be based on recent catch levels.

3.6.6 Celtic Sea whiting

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987 (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	-	6.5	-	-	8.10	-	-	-	-
Agreed TAC	←—— Applies to Sub-areas VII and VIII, except Division VIIa ——→										
Actual landings	8.4	8.5	7.5	8.5	7.2	8.3	6.6	7.3[1]	8.5	6.0	7.2

[1]Predicted or assumed. [2]Over period 1976-1986. Weights in '000 t.

Catches: Reached a peak in 1983; close to average since then (Table 3.6.6). France accounts for 95% of the landings.

Data and assessment: Catch and fishing effort data available, but no information on age structure of catches. Difficulties in age reading addressed at a workshop held May 1987. Short-cut assessment carried out.

Fishing mortality: No information available, although international fishing effort index has been decreasing since 1983.

Recruitment: No information available.

State of stock: Currently unknown, but French catch rates have been rising steadily since 1974.

Forecast for 1988: Not available.

Recommendation: ACFM recommends a precautionary TAC for 1988 of around 7,000 t, which should apply only to Divisions VIIf,g. A precautionary TAC should be separately set for other parts of Sub-area VII, except Divisions VIIa,d,e, which should be based on recent catch levels.

3.6.7 Celtic Sea plaice

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987 (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	0.7	1.4	1.2	1.0	1.2	1.3	1.6	-	-	-	-
Agreed TAC	-	-	-	1.2	1.2	1.8	1.8	1.8	-	-	-
Reported landings	1.4	1.4	1.3	1.2	1.3	1.3	1.4	1.5	-	-	-
Unallocated	-	-	-	-	+	0.2	0.2	-	-	-	-
Catch used by WG	1.4	1.4	1.3	1.2	1.2	1.6	1.7	-	1.7	0.7	1.1

[1]Predicted or assumed. [2]Over period 1973-1986. Weights in '000 t. +Less than 100 t.

Catches: Catches in this assessment area are unavoidable by-catches in directed sole fisheries and mixed demersal fisheries (Table 3.6.7).

Data and assessment: Status quo assessment. Absence of reliable age composition data makes it impossible to carry out an analytical assessment.

Fishing mortality: No detailed information available, but fishing effort has increased substantially since 1978. Fishing mortality probably above F_{max}.

Recruitment: No reliable indices are available. Belgian catch-per-unit-effort data suggest that the 1982 and 1983 year classes are good.

State of stock: Catch-per-unit effort data suggest a general increase in stock size since the 1970s.

Forecast for 1988: Not available.

Recommendation: There is no advantage in managing Celtic Sea plaice by TAC. There is virtually no directed fishery, and fishing mortality is, therefore, determined mainly by the TAC on other species. If a TAC is to be set for Celtic Sea plaice, ACFM recommends that it should not be at a level that restricts fishing on other species in the Celtic Sea.

3.6.8 Celtic Sea sole

3.6.8.1 Advice from the May 1987 ACFM meeting

Source of information: Irish Sea and Bristol Channel Working Group report, March 1987 (C.M.1987/Assess:13).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	-	-	-	-	-	1.6	-	-	-
Agreed TAC	-	-	1.6	1.4	1.2	1.2	1.5	1.6	-	-	-
Actual landings	1.3	1.2	1.1	1.4	1.3	1.3	1.5	-	1.9	0.8	1.2
Sp. stock biomass	4.4	3.5	3.5	3.3	3.1	3.0	2.7	2.1[1]	5.6	2.7	3.9
Recruitment (age 2)	3.1	4.7	4.5	4.5	6.2	4.2	4.3	4.3[1]	8.4	3.0	4.3
Mean F(3-10,u)	0.27	0.35	0.30	0.36	0.32	0.40	0.53	-	0.53	0.17	0.30

[1]Predicted or assumed. [2]Over period 1971-1986. Weights in '000 t, recruitment in millions.

Catches: Increased to 1,500 t in 1986, following fishing effort increase (Table 3.6.8).

Data and assessment: Analytical assessment, using catch-at-age and fishing effort indices.

Fishing mortality: Fishing effort data suggests a 30% increase in fishing mortality in 1986, but this may be overestimated.

Recruitment: Catch-per-unit-effort indices are available but do not provide clear information. 1982 year class appears to be good. 1983 and subsequent year classes assumed to be average.

State of stock: Spawning stock biomass appears to be declining (Figure 3.6.8).

Forecast for 1988: Assuming F(87) = 0.52, Catch(87) = 1,300 t.

Option	Basis	F(88)	Predicted SSB (88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F_{max}	0.23	2.1	0.6	2.4	
B	0.8F(86)	0.41	2.0	0.9	2.0	
C	F(86)	0.52	1.9	1.1	1.8	

Continued fishing at current levels of fishing mortality will lead to continued rapid decline of spawning stock, if fishing mortality estimates are correct.

Recommendation: Fishing mortality should be reduced towards the pre-1986 level corresponding to a TAC of not more than 900 t. ACFM will re-evaluate this assessment in November, when information from the 1987 fishery will be available.

3.6.8.2 Advice from the October/November 1987 ACFM meeting

In May, ACFM stated in its report that the increase in fishing mortality between 1985 and 1986 of 30% indicated by fishing effort data may be an overestimate. New catch and effort data for Belgian beam trawlers in the second quarter of 1987 are now available. Trends in these effort indices do not appear to be closely related to estimated fishing mortality, so the new data for the second quarter do not provide much guidance on recent fishing mortality levels.

Belgian catch-per-unit-effort data indicate that recruitment of the 1984 year class has been average, and this is consistent with the assumption in the assessment.

Given the continued uncertainty concerning current fishing mortality, ACFM recommends that fishing mortality should be reduced towards the pre-1986 level corresponding to a TAC in 1988 of certainly not more than 1,100 t and preferably not more than 900 t.

3.7 Sole and Plaice in the North Sea and English Channel

In 1986, landing and effort statistics especially for the North Sea sole and plaice showed a further deterioration. The reliability of ACFM assessments and management advice depends both on the composition of catches from biological sampling and on total catches. This information was not available for North Sea sole and plaice in 1986 as the amount of unreported catches could not be estimated with a reasonable degree of reliability. For North Sea sole, the 1986 unreported landings could range up to 10,000 t (reported landings 13,029 t), and for North Sea plaice (reported landings 125,591 t), the 1986 unreported landings may have approached 60,000 t, although these are maximum estimates.

For sole in Division VIId, French CPUE or effort data were not available for 1986. Such information is definitely required as the French catches amount to almost 65% of the total international catches in that area.

The sole stock in the Bay of Biscay was assessed for the first time. The data base was, however, too short and some information on catch statistics was believed to be unreliable. Improvement of the data base may, however, be expected in the near future.

ACFM is very concerned about the deterioration of the data base especially for North Sea plaice and sole and expressed the urgent need to obtain accurate landing statistics and associated effort data for 1985 onwards. Additional measures such as enforcement of legal mesh sizes, increase in mesh size, protection of spawning population, and protection of juvenile fish by closed areas were also discussed.

3.7.1 North Sea sole

Source of information: North Sea Flatfish Working Group report, October 1987 (C.M.1988/ Assess:9).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	15.0	15.0	15.0	15.0	14.0	15.0	12.0	11.0	-	-	-
Agreed TAC	-	15.0	21.0	20.0	20.0	22.0[3]	20.0[1]	14.0	-	-	-
Actual landings	15.8	15.4	21.6	24.9	26.6	24.2[3]	20.0[1]	-	26.6	15.4	20.7
Sp.stock biomass	35.7	24.4	33.7	40.0	41.4	37.3[1]	33.6[1]	<30.0[1]	45.9	24.4	37.6
Recruitment (age 1)	150	143	144	138	99	76[1]	114[1]	85[1]	150	11	106
Mean F(3-10,u)	0.45	0.47	0.52	0.47	0.61	0.61	0.61[1]	-	0.61	0.38	0.49

[1]Predicted or assumed. [2]Over period 1976-1985. [3]Minimum estimate. Weights in '000 t, recruitment in millions.

Catches: No reliable catch figure available for 1986; therefore, no analytical assessment could be run. Catches have been high between 1982 and 1985 (Table 3.7.1).

Data and assessment: Present trends in stock number are monitored by independent trawl surveys as VPA is no longer available. Short-term management advice based on SHOT forecast.

Fishing mortality: F gradually increased during last 20 years to a record high level. F in 1986 could not be estimated but is assumed to be at about the F(85).

Recruitment: Recruitment has been near average levels, but cannot yet be estimated reliably. 1987 year class may be well above average. A more precise estimate of the size of that year class will be available from 1988 surveys. The 1987 year class had no influence on the 1988 catches but may help to rebuild the SSB in the near future.

State of stock: SSB has declined continously from a maximum level of 145,000 t in 1962 to a record low level below 30,000 t at present.

Forecast for 1988: Assuming F(87) = F(85), Catch(87) = 19,000 t[1], SSB(88) = <30,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(85)	0.61	20[1]	?	Continuation of too low SSB
B	<F(85)	<0.61	11	?	SSB will have chance to rebuild

[1]SHOT forecast.

Continued fishing at current levels of fishing mortality will lead to the continuation of the danger of recruitment failure due to low SSB.

Recommendation: The present level of the spawning stock biomass, although not precisely known, is well below the objective of 50,000 t. This new objective includes an allowance for two successive poor year classes, resulting in a buffer of 10,000 t. Therefore, ACFM recommends that the first priority should be given to rebuild the spawning stock biomass as quickly as possible to the suggested minimum level by reducing the fishing mortality. The estimate of unreported landings used (5,000 t) should be deducted from the estimated catch at a constant F before calculating a TAC. Elimination of unreported landings would already correspond to a substantial reduction (about 30%) in fishing mortality without constraining the activities of fleets operating within the regulations. Adoption of a TAC at a lower level than this would assist in rebulding the SSB, and ACFM recommends a TAC not exceeding 11,000 t for 1988.

Special comments: A SHOT forecast of catch in 1988 was prepared, based on the historic record of landings, including estimates of unreported landings, and estimates of recruitment from the historic VPA and recruit index data. The estimated catches, therefore, also include an element (about 5,000 t) of unreported landings. The results of the calculations are very close to those subsequently obtained by a Working Group member and reported to ACFM during the meeting.

Consideration has been given to additional technical measures which could also contribute to the required rebuilding of the stock.

The possible measures are:

- increase in mesh size to 90 mm,
- increase in minimum landing size,
- closure of the fishing during the spawning season,
- closure of the fishing prior to the spawning season (i.e., first quarter),
- closed seasons for coastal beam trawl fishing which is concentrated on recruits,
- increase in mesh size for vessels with engine power ≤221 KW.

Most of these measures would benefit recruitment but at present these benefits cannot be quantified. In respect to the widespread effective mesh size of 60 mm in the sole fleet, ACFM strongly recommends the proper and overall enforcement of the legal 80-mm mesh size which applies to vessels with engine power exceeding 221 KW.

3.7.2 Measures to improve the exploitation pattern of North Sea plaice

Source of information: Report of ad hoc Meeting of North Sea Flatfish Working Group, February 1987 (C.M.1987/Assess:14).

The present exploitation of North Sea plaice is characterized by a level which is well beyond F_{max} and with an exploitation pattern that is concentrated too much on the younger age groups, implying a significant discarding of undersized plaice. The ad hoc meeting of the North Sea Flatfish Working Group discussed possible management measures that could improve the exploitation pattern.

Two main approaches were considered:

1) increase in mesh size,
2) protected areas.

The first option was considered to be unrealistic because a mesh size increase to 120 or 130 mm would be necessary to stop the discarding of undersized plaice. Such an increase in mesh size would virtually eliminate the sole fishery. Therefore, the Working Group focused on the option of protected areas.

However, ACFM is of the opinion that the use of mesh size regulations should be given further consideration and would prefer that this matter be reconsidered during the October 1987 meeting of the North Sea Flatfish Working Group, taking into account the problems in mixed fisheries and other North Sea fisheries.

From data on the distribution of the youngest age groups and on the discarding rate by age group, it was concluded that high concentrations of young plaice occur in the sea area along the continental coast in the southeastern North Sea which coincide with a high rate of discarding (Figure 3.7.2).

Although for the present situation no concise information on the seasonal distribution of fishing effort is available, it is evident that fishing effort concentrates in the area of high abundance of young plaice in the second and third quarters when the fleets direct their effort on sole. A plaice box in these quarters, therefore, would result in the biggest improvement in the annual yield of North Sea plaice.

A change in the distribution of fishing effort influences the yield per recruit and the level of recruitment. In order to quantify the expected gain from a plaice box, a simulation model was used to calculate the exploitation pattern, yield per recruit, and stock numbers or level of recruitment from the distribution of fishing effort and the distribution of plaice age groups.

The following input data were used:

1) quarterly distribution of plaice by age group based on a large number of fish surveys and commercial beam trawl CPUE, extrapolated for rectangles not covered;

2) quarterly distribution of proportions of undersized plaice by age group based on a large number of fish surveys and extrapolated for rectangles not covered;

3) quarterly distribution of total international fishing effort based on Netherlands and UK data for the period 1974-1977;

4) discard rates in beam trawl fisheries during the periods 1969-1970 and 1976-1983.

The basic unit of distribution was the statistical rectangle.

The results of the simulations are given in Tables 3.7.2.1 and 3.7.2.2 for a quarterly closure of the plaice box in the period 1974-1977. The change in exploitation pattern (Table 3.7.2.1) results in a modest change in the average weight of the fish in the landings and in the spawning stock. The biggest gain is caused by the increase in apparent recruitment due to reduced discard mortality (Table 3.7.2.2). The gain in relative recruitment is highest if the plaice box is closed in the second or third quarter. The first and fourth quarters are intermediate. The gain in relative recruitment amounts to 25% if the box is closed in the second or third quarters.

The results of the simulation refer to the time period 1974-1977. For the present situation with a higher fishing mortality, especially on the younger age groups, the expected gain will be higher. Under the assumption of an increase in total international effort by 20% compared to the period 1974-1977, the gain in relative recruitment will be 30% (second and third quarter closure).

Although the simulation model was verified by comparing the simulated exploitation pattern for the period 1974-1977 with the pattern from the VPA of the observed landings (Table 3.7.2.3), the results of the simulations are sensitive to the input parameters used. Because the information available to derive the input parameters is not fully satisfactory, the results of the simulations should be used with caution and should only be taken as an indication of the order of magnitude of the gain to be obtained.

The Working Group concluded that the youngest age groups of North Sea plaice are densely concentrated in the coastal areas in the southeastern North Sea, leading to significant discarding of undersized plaice. The Working Group felt that a considerable gain can be obtained by closing this area, especially in the second and/or third quarters. A plaice box in these quarters will result in an increase in relative recruitment of more than 25%. Since important catches of North Sea sole are made in the plaice box in these quarters, such a protected area in the coastal areas of the eastern North Sea will also enhance the recovery of the sole stock. However, for such management advice to be considered for the total flatfish fishery, the problems with the sole stock must be examined further in relation to the above-mentioned results on plaice.

ACFM, having considered the Working Group report, is of the opinion that this first scientific evaluation of possible management measures to improve the exploitation pattern of North Sea plaice is sufficient for initial consideration by the management bodies.

3.7.3 North Sea plaice

Source of information: North Sea Flatfish Working Group report, October 1987 (C.M.1988/ Assess:9).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	112	105	140	164	150	130	90	120	-	-	-
Agreed TAC	112	105	140	164	182	200	180	150	-	-	-
Actual landings	140	140	155	144	158	160[3]	165[1]	-	160	149	139
Sp.stock biomass	289	298	284	302	280	295	263	-	326	248	301
Recruitment (age 1)	652	373	977	437	636	437	900[1]	450[1]	977	319	516
Mean F(2-10,u)	0.41	0.42	0.46	0.46	0.51	0.51	0.51[1]	-	0.51	0.32	0.42

[1]Predicted or assumed. [2]Over period 1976-1985. [3]Minimum estimate. Weights in '000 t, recruitment in millions.

Catches: Reliable catch figure for 1986 is not available. The catch level for 1986 is the highest on record. Catches increased from about 70,000 t in the late 1950s to about 160,000 t in 1985 (Table 3.7.3).

Data and assessment: Present trends in stock number and fishing mortalities monitored by independent trawl surveys now that VPA is no longer available. Short-term management advice based on SHOT forecast.

Fishing mortality: F increased steadily over the past 20 years to a record high level in 1985.

Recruitment: Recruitment has been well above average for a number of recent years (1976, 1981, 1983, 1985). The 1985 year class, having a strength of twice the mean size, will especially contribute very much to the 1988 catch and SSB.

State of stock: SSB decreased steadily to a level below 300,000 t, which is considered the minimum desirable level.

Forecast for 1988: Assuming F(87) = F(85), Catch(87) = 168,000 t[1] (including about 40,000 t unreported landings), SSB(88) = ?.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(85)	0.51	193[1]	-	SSB close to 300,000 t
B	0.7F(85)	0.36	150[1]	-	Increase SSB to above 300,000 t

[1]SHOT forecast.

Recommendation: The catch forecasts in the table above are based on the historic record of landings including estimates of unreported landings. It should, therefore, be stressed that they are forecasts of the total landings from the stock whether reported or unreported.

To rebuild and maintain the spawning stock at a level above 300,000 t, fishing mortality should be reduced in 1988 and ACFM recommends that this can be achieved by reducing the total landings (whether officially reported or unreported) to not more than 150,000 t. Since unreported landings have formed a considerable proportion of the total catch in the most recent years, their expected level should be taken into account when setting a TAC for 1988.

<u>Special comments</u>: A SHOT forecast of catch in 1988 was prepared, based on the historic record of landings, including estimates of unreported landings, and estimates of recruitment from the historic VPA and recruit index data. The estimated catches, therefore, also include an element (about 40,000 t in 1986) of unreported landings. The estimated catch in 1986 (165,000 t) exceeds the previous estimate for a constant level of exploitation (144,000 t), and a corresponding increase in the yield/biomass ratio was also assumed for consistency. The results of the calculations are very close to those subsequently obtained by a Working Group member and reported to ACFM during the meeting.

Additional management measures for the plaice fishery were again considered.

The introduction of a PLAICE BOX (Figure 3.7.3) in the second and third quarters (see May 1987 ACFM report), protecting juvenile plaice, is estimated to increase the long-term equilibrium yield and SSB of plaice about 25% due to enhanced recruitment. The gain would be only substantial after three years (about 10%) and would gradually increase to about 25% after six years. This PLAICE BOX will also strongly reduce the catches and fishing mortality of sole, particularly of 1- to 3-group fish which predominate in these coastal areas at that time, and thus enhance recruitment of sole, although no quantification has been made. The exact boundaries of this PLAICE BOX have been slightly modified to take account of detailed information on the distribution of undersized plaice.

An identical gain of about 25% in recruitment may also be expected when enforcing an effective mesh size of 120 mm during the second and third quarters in this PLAICE BOX. This measure would, moreover, allow fisheries for cod, legal sized plaice, and large sole to continue there.

3.7.4 Sole in Division VIId

Source of information: North Sea Flatfish Working Group report, October 1987 (C.M.1988/ Assess:9).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	1.7	1.4	-	2.4	1.4	2.4	2.6	-	-	-	-
Agreed TAC	-	-	2.6	2.1	2.5	2.7	3.2	3.85	-	-	-
Actual landings	1.7	2.2	2.8	3.2	3.3	3.8	3.9	-	3.9	1.7	3.0

[1]Over period 1980-1986. Weights in '000 t.

Catches: Catches have increased since 1974 by a factor of 4. In 1986, 20% of the catch was unreported (Table 3.7.4).

Data and assessment: Poor data base, mainly lacking French effort data.

Fishing mortality: Unknown.

Recruitment: 1986 year class appears to be average; 1987 year class, on the basis of only one survey, may be well above average.

State of stock: Unknown.

Forecast for 1988: For continued fishing at the current level of exploitation, a catch of 3,400 t was calculated for 1988 using a SHOT forecast assuming average recruitment and a catch of 3,500 t in 1987.

Recommendation: ACFM recommends a TAC for 1988 of 3,400 t based on a SHOT forecast.

3.7.5 Sole in Division VIIe

Source of information: North Sea Flatfish Working Group report, October 1987 (C.M.1988/Assess:9).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	0.8	1.0	1.7	0.4	0.9	1.3	1.3	1.37	-	-	-
Agreed TAC	-	-	1.7	1.1	1.35	1.4	1.3	1.15	-	-	-
Actual landings	1.3	1.2	1.4	1.5	1.4	1.4	1.4	-	1.4	0.6	1.2
Sp.stock biomass	5.6	5.3	5.6	4.8	4.5	4.4[1]	4.8[1]	-	5.6	3.8	4.9
Recruitment (age 1)	8.4	4.6	4.3	6.6	9.2	4.2[1]	5.9[1]	-	9.2	4.2	5.9
Mean F(2-10,u)	0.19	0.22	0.28	0.34	0.30	0.32	0.31	-	0.34	0.12	0.24

[1]Predicted or assumed. [2]Over period 1976-1986. Weights in '000 t, recruitment in millions.

Catches: Catches have been stable since 1980 (Table 3.7.5).

Data and assessment: VPA was tuned with UK effort data.

Fishing mortality: F increased from 0.10 in 1970 to 0.34 in 1983 and has been stable since.

Recruitment: Recruitment shows an increasing trend with strong year classes in 1975, 1979, and 1983 (Figure 3.7.5).

State of stock: Healthy. Exploited at about F_{max}. SSB is at a relatively high level.

Forecast for 1988: Assuming F(87) = 0.25, Catch(87) = 1,200 t, SSB(88) = 4,400 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	$F_{0.1}$	0.12	0.6	4.9	
B	F(86) = F_{max}	0.31	1.3	4.1	

Continued fishing at current levels of fishing mortality will lead to stable SSB and yield.

Recommendation: Fishing mortality should not increase above the 1986 level corresponding to a TAC of 1,300 t.

Special comments: It is important to note that in this stock the historic trend in SSB is strongly influenced by the level of F chosen for the oldest age groups. These Fs this year were based on correlations between CPUE and SSB.

3.7.6 Plaice in Divisions VIId,e

Source of information: North Sea Flatfish Working Group report, October 1987 (C.M.1988/ Assess:9).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	-	-	-	3.5	3.5	5.4	6.2	6.8	-	-	-
Agreed TAC	-	-	5.5	6.5	6.0	6.5	6.9	8.3	-	-	-
Actual landings	4.4	6.5	6.4	6.3	7.3	7.3	7.4	-	7.4	2.6	5.3

[1]Over period 1976-1987. Weights in '000 t.

Catches: Landings increased steadily up to 1981 and remained stable thereafter (Table 3.7.6).

Data and assessment: No analytical assessment due to poor data base.

Fishing mortality: Unknown.

Recruitment: Unknown.

State of stock: Unknown.

Forecast for 1988: Not available.

Recommendation: ACFM can only advise a precautionary TAC of 6,900 t based on catch levels during 1982-1986.

3.7.7 Sole in Divisions VIIIa,b (Bay of Biscay)

Source of information: North Sea Flatfish Working Group report, October 1987 (C.M.1988/Assess:9).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	3.1[2]	3.1[2]	3.1[2]	3.305[2]	3.305[2]	4.44	-	-	-
Actual landings	2.8	2.7	3.5	3.3	3.7	3.9	3.9	-	3.9	2.3	3.1

[1]Over period 1977-1986. [2]VIII (EC zone). Weights in '000 t.

Catches: Catches have increased steadily (Table 3.7.7). Unreported catches showed great variability in time. No estimates of unreported catches available before 1986. French CPUE show a slight decrease between 1978 and 1986.

Data and assessment: Data base contains only total catches (including discards), and was used for preliminary VPA. Results should be used with caution. Yield/recruit analysis.

Fishing mortality: F appears stable over recent 5 years (Figure 3.7.7).

Recruitment: Recruitment was below average in 1984, 1985, and 1986.

State of stock: SSB has increased slightly.

Forecast for 1988: Not available.

Recommendation: A precautionary TAC of 3,700 t is recommended based on catch levels for the period 1982-1986.

Special comments: More than 40% of the catch consists of immature fish. There seems to be a declining trend in the recruitment, but this needs to be confirmed.

4. STOCKS IN NEAFC REGIONS 2 AND 3

4.1 Hake in Sub-areas IV and VI-IX

General Overview

Disagreement on the interpretation of otoliths of hake individuals has again made it impossible to try assessments based on catch-at-age data. As a consequence, length-based assessments have been conducted. This type of evaluation does not make it possible to obtain short-term forecasts, since starting stock numbers are those obtained under equilibrium conditions instead of current population numbers.

Results of the assessments show a negative feature common to both northern and southern stocks: the very inadequate exploitation pattern, due to the non-enforcement of current legal rules about minimum landing sizes and mesh sizes, and to heavy discards when hake is caught as a by-catch in fisheries directed to other species (especially in the northern stock).

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

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

Source of information: Hake Assessment Working Group report, June-July 1987 (C.M.1988/ Assess:2).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	30	30	30	30	30	Based on	recent	landings	-	-	-
Agreed TAC[2]	-	-	-	-	-	-	47.36	62.36	-	-	-
Actual landings	57.3	53.9	55.0	57.7	63.2	65.9	56.6	-	65.9	50.6	56.8

[1]Over period 1978-1986. [2]Sum of area TACs corresponding to Northern stock. Weights in '000 t.

Catches: Landings relatively constant (Table 4.1.1), but discards in the last two years averaged 4,250 t compared with 2,600 t in the preceeding seven years.

Data and assessment: Length composition data by fleet for landings and discards 1978-1986. Assessment by length cohort analysis.

Fishing mortality: Cannot yet be assessed reliably, but appears to exceed F_{max} and to be highest on small (immature) fish.

Recruitment: No quantitative data, but indications that the 1984 and 1985 year classes are above average.

State of stock: Very undesirable exploitation pattern, leading to depressed yields (see Special comments). In 1986, 74% of the total number of fish caught were less than 30 cm long, 66% of which were discarded.

Forecast for 1988: Not available.

Recommendation: ACFM reiterates its recommendation that the current landing size and mesh size regulations be strictly enforced, i.e., 80-mm mesh size in Sub-areas VI and VII (70-mm in Division VIIa) and 65-mm in Sub-area VIII. The most important regulations to be enforced are those of mesh size and by-catch limits in the *Nephrops* fishery. ACFM also recommends a precautionary TAC of 54,000 t, based on the average landings for the period 1978-1983.

Special comments: The text table below shows the relative effects (%) in the equilibrium catch of changes in the level of fishing effort and/or exploitation pattern:

	Exploitation pattern	
Effort factor	Current[1]	No fishing on fish less than 25 cm
0.8	+7%	+40%
1.0	0	+40%
1.2	-7%	+38%

[1]Including discards.

4.1.2 Hake - Southern stock (Divisions VIIIc and IXa)

Source of information: Hake Assessment Working Group report, June-July 1987 (C.M.1988/ Assess:2).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	10.0	8.5	8.5	8.5	8.5	8.5	15.0	15.0	-	-	-
Agreed TAC	-	-	-	-	-	-	-	25.0	-	-	-
Actual landings[2]	19.4	16.5	18.9	24.7	21.0	18.1	19.9	-	34.8	13.4	21.6

[1]Over period 1972-1986. [2]Working Group data. Weights in '000 t.

Catches: Landings relatively constant since 1979 (average 19,000 t)(Table 4.1.2). Some discarding, but no quantitative data. Portuguese official landings increased by 50% in 1986 compared with 1985.

Data and assessment: Length composition data by fleet for landings 1978-1986. Assessment by length cohort analysis.

Fishing mortality: Resulting estimates depending on growth parameters used; could not be reliably estimated.

Recruitment: No quantitative data.

State of stock: Interpretation of current levels of fishing mortality dependent on growth parameters. Exploitation pattern unsatisfactory resulting in depressed yields. In 1986, 60% of the total number of fish landed were less than 30 cm long.

Forecast for 1988: Not available.

Recommendation: ACFM recommends a TAC for 1988 of 15,000 t on the basis of recent landings, discounting those of undersized individuals in order to discourage their being fished. ACFM also reiterates its previous advice of:

- establishing a minimum mesh size of 80 mm in all trawl fisheries for hake in the area, and a corresponding minimum landing size of 27 cm;

- enforcing the existing closures of the main hake nursery grounds off the Spanish coast to the trawl fishery from October to March, and introducing it on the nursery grounds off the Portuguese coast (see ICES Coop. Res. Rept. 102, 1980) (Figure 4.1.2). These areas are in depths of less than 200 m and are delineated as follows:

$37^0 10'$N to $37^0 51'$N
$39^0 50'$N to $40^0 20'$N
$41^0 30'$N to $41^0 50'$N

Special comments: Due to the lack of indices of recruitment, abundance, and fishing mortality and validated growth parameter estimates, the only fact really clear about the exploitation of this stock is that 47% of the individuals landed in the last two years were less than 25 cm long (the legal minimum landing size is currently 24 cm), which reflects a very undesirable exploitation of juvenile individuals.

4.2 Fisheries Units in Sub-areas VII and VIII

Source of information: Fisheries Units in Sub-areas VII and VIII Working Group report, September 1987 (C.M.1988/Assess:3).

4.2.1 Description of the fishery units

Most countries participating in the fisheries in Sub-areas VII and VIII provided new detailed information and it was thus possible to update the description of the fishery units and have a better idea of their respective importance in terms of the number of vessels involved and species concerned (Table 4.2.1). However, improvements are still needed in order to better understand the structure and behaviour of the fleets.

4.2.2 Updating of the data base

The data base used in 1986 has been updated by the addition of the length composition of catches in 1986 for cod, hake, megrim, monk, *Nephrops*, sole, and whiting. In most cases the number and quality of landing data have improved, but data on discards have become more scarce. A thorough review of deficiencies has been made and is presented in the Working Group report.

The data bases from single-species assessment working groups could not be used as was initially foreseen, as they are at present age- and possibly country-structured instead of length- and fleet-structured. As at some stage these working groups prepare length composition of catches, ACFM recommends that the Irish Sea and Bristol Channel, North Sea Roundfish, and North Sea Flatfish Working Groups present the relevant part of their data in a form which will satisfy the requirements of this Working Group.

Biological and selectivity parameters used in the VPA and in the simulations were kept unchanged from last year in the absence of any new data except for sole in Sub-area VII.

4.2.3 State of the stock

This Working Group has not had as its prime objective the requirement to carry out single-species assessments or to advise on stocks already covered by species assessment working groups. Detailed accounts of the state of the stocks and fisheries might better be referred to in the sections on the northern stock of hake (Section 4.1.1), Celtic Sea sole, cod, and whiting (Section 3.6), and sole in the Bay of Biscay (Section 3.7.7), and in the report of the STCF special meeting on *Nephrops*.

For information, Table 4.2.2 has been set up to show the average fishing mortalities over the length groups which contribute most to the total catches and compare them to the values assumed for M and M/K.

Current assessments and available information on the fisheries indicate that none of the stocks considered are in critical condition at present. The main problem emphasized in all reports relates to the unsatisfactory exploitation patterns for most species, which might be improved for some of them if the regulations were more effectively enforced. Concern has been expressed, however, on the declining abundance of monkfish, *L. piscatorius*, in recent years as evidenced by time series of CPUE. Due to their morphology, both monkfish species are not amenable to efficient protection at young ages by adopting mesh sizes which were acceptable to maintain fishing activity on other species.

The trade-off aspects implied in this case, and also in the case of the by-catches in the *Nephrops* fisheries emphasized in the reports of the Hake and the Irish Sea and Bristol Channel Working Groups, would be better evaluated using a mixed-fisheries approach such as initiated by this Working Group.

4.2.4 Assessment of the effects of management measures

The length-based multispecies (biological interactions excluded), multifleet VPA and simulation software has been improved and now includes an option to simulate changes in minimum landing sizes in addition to changes in minimum mesh sizes and variations in fishing effort.

Management regimes were simulated in accordance with the current and envisaged regulations adopted by the Council of EC (Council Reg. 3094/86):

- mesh size of 50 mm and then 55 mm in the Nephrops fishery in the Bay of Biscay;

- minimum landing size of 30 cm for hake in Region 2 and 24 cm in Region 3, 25 mm for Nephrops in Region 2 and 20 mm in Region 3, 25 cm for megrim, 30 cm for cod, 27 cm for whiting, and 24 cm for sole;

- an increase in the minimum landing size of hake in Region 3 to 27 cm at 1 January 1991;

- an increase in the minimum landing size of cod to 35 cm at 1 January 1989.

- combinations of changes in minimum mesh sizes and minimum landing sizes.

In all cases, the minimum landing size was changed only in the fishery units which did not already comply with the regulation.

The results are produced in a format illustrated in Table 4.2.3. For each regime, a table is output for each stock component, and then for the sum over all species.

All simulations indicate an immediate reduction in the total landings, but the long-term effects vary according to the management regimes, species, and fishery units. These results reflect the status quo with regard to fishing effort; if the fishing effort is allowed to increase in those fishery units to which the mesh size regulation applies, long-term gains may be underestimated.

When landing size regulations are enforced alone, they systematically result in losses, in the short term and the long term as well, in the landings of the units concerned. When applied in addition to mesh regulations, they either amplify the losses or reduce the gains in landings. This is a logical consequence of the structure of the model, which does not allow for redistribution of effort in response to minimum landing sizes. In reality, such redistribution may occur, and the effects are, therefore, more complicated (and not so negative) as suggested by these results.

The changes implied by the selected regimes show that the fisheries in the Bay of Biscay would be those which are most concerned.

No assessment was conducted on the effects of different management regimes expressed as changes in values; neither were the effects assessed of these regimes on the condition of the stocks.

The model used has been conceived to evaluate the effects of changing mesh sizes and minimum landing sizes, but it does not provide results which can be used to make short-term forecasts and advice on TACs. It is very dependent on equilibrium conditions which may not prevail if recruitment varies or if changes occur in the composition and fishing patterns of the fleets. Effort should, therefore, be devoted to the development of compound age- and length-based methods which do not have this limitation, provided that the required data do not seriously reduce the set of species which would be dealt with. ACFM notes that some revision of the membership, scope, and relationship of relevant working groups may be required in due course, since the development of methodology and practical application for assessment may need to be carried out in distinct groups.

Improvements in the use of the present tool can be envisaged in the following ways:

- consideration of monetary values, for which provision is already made in the model to give a more realistic evaluation in the multispecies context. As a first step, a relative unit, such as cod-equivalent, might be used, although it would not be sufficient to account for changes in landing values with size which may be highly relevant when mesh changes are considered.

- assessment of the effects of changes in effort by fishery unit, if such changes can be documented or anticipated in quantitative terms.

- Due to the large volume of output from the model, it is difficult in practice to present the managers with the full results in a concise form. For this reason, in the future, it would be preferable to investigate more fully and report on only those species and units for which the consequences of the regime considered are most marked. In this case, results could be reported in more detail, which point out the effects on, and constraints due to, each fishery and each stock component.

- In all these options, more accurate estimates of the biological parameters should be input in the model, as these are critical with respect to the robustness of the results.

4.3 Horse Mackerel in Sub-areas IV and VI-IX

4.3.1 General comments

ACFM noted the increasing importance of the horse mackerel fisheries and also the difficulties encountered by the Working Group in performing the assessments. ACFM identified two main issues of concern: one is that the species is highly migratory and hence allocating catches or landings to stocks is difficult. The other problem concerns differences in ageing criteria between different countries. Both of these difficulties will not be easily solved in the short term. However, in view of the importance of these stocks, more effort must be made on their assessment. In particular, methods other than the traditional ones based on catch at age should be used (e.g., estimation of stock biomasses from egg and acoustic surveys). The participation of more countries in the Working Group meetings would also be desirable.

During the mackerel egg surveys in 1977, 1980, 1983, and 1986, the egg production of horse mackerel was also estimated and showed that the time and extent of those surveys adequately covered the general spawning area of horse mackerel (Figure 4.3.1). The boundaries of this main spawning area are in the English Channel and the southern part of the surveyed area in the Bay of Biscay.

The Working Group considered that the horse mackerel in Divisions VIa, VIIa-c,e-k, and VIIIa,b,d,e should be regarded as one unit stock referred to as the "Western horse mackerel".

Horse mackerel in the North Sea spawn mainly in the southern North Sea. They are assumed to be a unit stock and will be referred to as the "North Sea horse mackerel". During winter, these fish are probably overwintering in the English Channel and will mix to some extent with the Western horse mackerel. The areas for the North Sea horse mackerel are Divisions IIa, IIIa, IVa-c, and VIId. Division VIIe is not included because it is assumed to contain mainly Western horse mackerel and should, therefore, be considered as a mixing area.

The horse mackerel in Divisions VIIIc and IXa will also be considered for the time being to be a unit stock; however, this is not based on biological information on spawning areas. These horse mackerel will be referred to as the "Southern horse mackerel".

This separation of stocks made by the Working Group was considered to be provisional, but useful for practical purposes for the immediate future.

4.3.2 North Sea horse mackerel (Divisions IIa, IIIa, IVa-c, VIId)

Source of information: Report of the Working Group on Pelagic Stocks in Divisions VIIIc and IXa and Horse Mackerel, April 1987 (C.M.1987/Assess:23).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	250[2]	125[2]	181[2]	18.5[3]	30[3]	30[3]	-	-	-
Actual landings	2	7	5	4	26	24	18	-	26	18	23

[1]Over period 1984-1986. [2]Division IIa and Sub-areas IV, VI-VII (EC waters only). [3]Division IIa and Sub-area IV (EC waters only). Weights in '000 t.

Catches: Catches increased in 1984-1986 due to Danish industrial catches (Table 4.3.2).

Data and assessment: Length distributions were available from the Dutch groundfish surveys in 1980-1986. Danish acoustic surveys in 1985 and 1986 in the eastern North Sea and Skagerrak provided stock biomass estimated for this area of 500,000 t and 523,000 t, respectively. No estimates are available for the remainder of the distributional area of the stock.

Fishing mortality: No data.

Recruitment: The 1979 and 1982 year classes seem to be strong.

State of stock: Not known.

Forecast for 1988: Not available.

4.3.3 Western horse mackerel (Divisions VIa, VIIa-c,e-k, VIIIa,b,d,e)

Source of information: Report of the Working Group on Pelagic Stocks in Divisions VIIIc and IXa and Horse Mackerel, April 1987 (C.M.1987/Assess:23).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	250[2]	125[2]	181[2]	162.5[3]	54	158[4]	-	-	-
Actual landings	-	-	42	68	75	90.0	102	-	102	42	75

[1]Over period 1982-1986. [2]Division IIa and Sub-areas IV, VI-VIII (EC waters only). [3]Division Vb and Sub-areas VI-VIII (EC waters only). [4]Division Vb, Sub-areas VI and VII, and Divisions VIIIa,b (EC waters only). Weights in '000 t.

Catches: Increased considerably in the period 1982-1986 (Tables 4.3.3.1-4.3.3.3).

Data and assessment: Egg surveys in 1977, 1980, 1983, and 1986 indicated a spawning stock biomass of above 1 million t. The validity of these estimates is uncertain; in particular, the fecundity of horse mackerel needs to be determined accurately. Length composition data are available; age determination is difficult.

Fishing mortality: No data.

Recruitment: Inspection of the catch-at-age data suggests that the 1982 year class is large; subsequent year classes are probably small.

State of stock: The spawning stock biomass appears to be decreasing, probably as a result of the low levels of recruitment.

Forecast for 1988: Precise catch predictions not possible.

Recommendation: Until sufficient scientific data are available to provide more precise advice, catches should not be increased.

4.3.4 Southern horse mackerel (Divisions VIIIc and IXa)

Source of information: Report of the Working Group on Pelagic Stocks in Divisions VIIIc and IXa and Horse Mackerel, April 1987 (C.M.1987/Assess:23).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	75.2[2]	72.5[2]	72.5[2]	-	-	-
Actual landings	71	72	59	74	46	44	71	-	74	44	62

[1] Over period 1980-1986. [2] Division VIIIc, Sub-areas IX and X, and CECAF Division 34.1.1 (EC waters only). Weights in '000 t.

Catches: Reported catches decreased to the lowest level in 1985. In 1986, landings increased by 61% compared to 1985 (Table 4.3.3.3).

Data and assessment: Catch-at-age data for the period 1981-1986 are available but insufficient for an analytical assessment. Results from research trawl surveys are also available from 1979 to 1986. There are some uncertainties in age readings. No assessment possible.

Fishing mortality: Not assessed.

Recruitment: Length composition of the catches seems to indicate that the 1982 and 1986 year classes could be very strong; 1981, 1984, and 1985 year classes seem to be very weak.

State of stock: Immature fish constituted a very large proportion of the catch. The heavy exploitation of this component seriously reduces recruitment to the spawning stock.

Forecast for 1988: Not available.

Recommendation: Further information is needed about the seasonal and spatial distribution of young fish in order to establish a basis for closed seasons and areas. As large amounts of juvenile horse mackerel are caught, measures should be taken to improve the exploitation pattern. The Southern horse mackerel stock (Divisions VIIIc and IXa) is fished with different mesh sizes in the trawls. The present regulation allows the stock to be fished in Division VIIIc with a minimum mesh size of 40 mm, while in Division IXa, a minimum mesh size of 65 mm is in force. In view of the unsatisfactory exploitation pattern of this stock, a uniform mesh size of 65 mm should be applied on the total area of distribution. ACFM, therefore, recommends that the mesh size in Division VIIIc for the directed trawl fishery for horse mackerel should be increased to 65 mm.

5. STOCKS IN NEAFC REGION 3

5.1 Sardine in Divisions VIIIc and IXa

Source of advice: Report of the Working Group on Assessment of Pelagic Stocks in Divisions VIIIc and IXa and Horse Mackerel, April 1987 (C.M.1987/Assess:23).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	-	-	-	200	120	-	90	140	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	192	214	205	181	203	204	181	-	214	126	176
Sp.stock biomass	429	515	514	469	555	541	446[1]	375[1]	555	190	409
Recruitment (age 0)	24	17	13	33	12	9	14[1]	14[1]	33	8	17
Mean F(1-5,u)	0.40	0.41	0.43	0.38	0.35	0.37	0.42	-	0.91	0.35	0.45

[1]Predicted or assumed. [2]Over period 1980-1986. Weights in '000 t, recruitment in billions.

Catches: Total catches in 1986 decreased by about 12% compared to 1985 (Table 5.1). No TAC regulations have yet been implemented for this stock.

Data and assessment: Analytical assessmend based on acoustic survey results. Data from acoustic surveys were revised as recommended by the Acoustic Planning Group in 1986.

Fishing mortality: Remained stable in the period 1977-1986 (Figure 5.1). The exploitation pattern has not changed.

Recruitment: After the very strong 1983 year class, the 1984 and 1985 year classes are weak. The acoustic surveys indicated that the 1986 year class is about average.

State of stock: Spawning stock biomass peaked in 1984, but has now declined because of the poor recruitment in 1984 and 1985. The fishery has been supported mainly by the 1983 year class, which accounted for 30% of the 1986 catch.

Forecast for 1988: Assuming F(87) = 0.42, Catch (87) = 153,000 t, SSB(88) = 354,000 t.

	1988					1989		
Option	Basis	Stock biom.	SSB	F(1-5)	Catch	Stock biom.	SSB	Consequences/implications
A	F(86)	507	354	0.42	147	495	347	SSB reduced by more than 20% from 1986 level
B	$F_{0.1}$	507	348	0.50	171	474	325	SSB reduced by more than 25% from 1986 level

Weights in '000 t.

Recommendation: Taking into account the recent decline in recruitment and SSB since 1984, the fishing mortality should not be allowed to increase above the 1986 level and, therefore, ACFM recommends a TAC for 1988 of not more than 150,000 t.

5.2 Mackerel in Divisions VIIIc and IXa

Source of information: Report of the Working Group on Pelagic Stocks in Divisions VIIIc and IXa and Horse Mackerel, April 1987 (C.M.1987/Assess:23).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	-	-	-	-	-	-	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	24.7[2]	36.57[2]	-	-	-
Actual landings	16	18	21	15	20	18	24	-	24	15	19

[1]Over period 1980-1986. [2]Division VIIIc, Sub-areas IX and X, and CECAF Division 34.1.1 (EC waters only). Weights in '000 t.

Catches: Total landings have been fluctuating around the mean level of 19,000 t (Tables 5.2.1 and 5.2.2).

Data and assessment: Landings in number by age for 1981-1986 are available for Division IXa. Data were insufficient to carry out an assessment.

Fishing mortality: No data.

Recruitment: No data, but age composition of the landings shows good year classes in 1981, 1984, and 1985.

State of stock: Immature fish constituted a very large proportion of the landings (ages 0-1).

Forecast for 1988: Not available.

Recommendation: As large amounts of juvenile mackerel are landed, measures should be taken to improve the exploitation pattern. Further information is needed about the seasonal and spatial distribution of young fish in order to establish a basis for closed areas and seasons.

6. STOCKS IN NEAFC REGIONS 1, 2, AND 3

6.1 Mackerel

6.1.1 Introduction

Nominal catches in the North Sea area (Sub-area IV and Division IIIa), the Norwegian Sea (Divisions IIa and Vb), and the western areas (Sub-areas VI and VII and Divisions VIII a,b) are given in Tables 6.1.1 - 6.1.3.

In 1986, as in previous years, considerable mixing of the North Sea and Western mackerel stocks took place, particularly in the period August-December when large quantities of the Western stock were present in the northern North Sea. Methods of dividing the catches into their stock components based on returns from tagging experiments no longer give reliable results when the stocks are so disparate in size. Since errors in allocation will have major effects on the reliability of the assessment of the North Sea stock, an analytical assessment was not possible for this stock. The effect of these errors in the Western stock assessment will be insignificant, however.

In spite of the difficulty of providing a separate assessment for the North Sea stock, ACFM wishes to stress that this stock is still considered to be a separate unit stock.

Advice for 1987

At the November 1986 meeting of ACFM, a preliminary TAC of 380,000 t was recommended for the western areas together with Divisions IIa and Vb for 1987. ACFM also advised that the assessment for the Western mackerel stock would be updated in May 1987 after full evaluation of the 1986 mackerel egg survey results. On the basis of a further evaluation carried out by the Mackerel Working Group, ACFM found no reason to alter its earlier assessment and, therefore, reiterates its recommendation that the TAC in the western areas (VI, VII, VIIIa,b, IIa, Vb) should be 380,000 t in 1987.

6.1.2 North Sea mackerel

Source of information: Mackerel Working Group report, February 1987 (C.M.1987/Assess:11).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC[6]	50	40	-	-	-	-	-	-	-	-	-
Agreed TAC[2]	-	-	25	30	32	37	55	55	-	-	-
Actual landings[3]	75	66	47	47	72	63	32	-	75	32	51
Sp. stock biomass[4]	258	189	162	168	133[5]	76	45[5]	-	826	45	326
Recruitment (age 1)[4]	143	233	282	27	20	?	?	-	515	20	176
Mean F(3-8,u)[4]	0.33	0.31	0.28	0.29	0.69	?	?	-	0.69	0.19	0.32

[1]Over period 1975-1986. [2]TACs for Sub-area IV, Division IIIa and Division IIa (EC zone). [3]Landings of North Sea stock. [4]From VPA in 1985. [5]Egg survey estimates. [6]TACs for Sub-area IV and Division IIIa. Weights in '000 t, recruitment in millions.

Catches: gradually declining catch from North Sea stock. Estimated catch in Sub-area IV and Division IIIa in 1986 was 238,000 t, of which 32,000 t was estimated to be North Sea stock.

Data and assessment: Extensive immigration of Western stock into North Sea from August-December and lack of reliable method of separating catch into stocks rules out analytical assessment. Trend in spawning stock indicated by egg surveys.

Fishing mortality: No recent estimates, but likely to be at a high level.

Recruitment: Continuing at very low level. Reports of 1984 and 1985 year classes in North Sea in considerable quantities indicate possible improvement, but no evidence that 1984 year class spawned in North Sea in 1986.

State of stock: Continuing decline to lowest recorded level in 1986.

Forecast for 1988: Not available.

Continued fishing at current levels of fishing mortality will lead to continued decline in SSB unless halted by major recruitment.

Recommendation: ACFM recommends that:

a) there should be no fishing for mackerel in Divisions IVb,c at any time of year;

b) the entire North Sea area (Sub-area IV and Division IIIa) should be closed to mackerel fishing during the period 1 January - 31 July;

c) catches in Divisions IIIa and IVa should be reduced to the lowest practical level, which from a biological point of view should be zero;

d) any catches taken in Division IVa should in so far as possible be taken in the northern and western parts of this division;

e) the 30-cm minimum landing size at present in force in the North Sea should be maintained and the present by-catch regulations should be continued.

Special comments: In view of the extremely small size of the North Sea stock, ACFM considers that the stock continues to need the maximum possible protection. This can only be achieved by closing mackerel fisheries in all areas where North Sea mackerel form more than a negligible part of the catch. From the information available, it is not possible to define these areas by firm boundaries, but in general terms, the proportion of North Sea stock mackerel in the catches in the North Sea will be lower the further north and west the catches are taken.

6.1.3 Western mackerel

Source of information: Mackerel Working Group report, February 1987 (C.M.1987/Assess:11).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC[3]	330	353	272	330	500	340	290	380	-	-	-
Agreed TAC[4]	350	-	401	407	438	410	362	400	-	-	-
Actual landings[5]	605	644	648	625	555	533	537	550[1]	662	171	482
Sp. stock biomass	2301	2428	2238	2421	2236	2112	1636	1835[1]	3652	1636	2765
Recruitment (age 0)	5562	7011	872	348	4995	2810[1]	2810[1]	2810[1]	7011	348	3739
Mean F(3-8,w)	0.26	0.21	0.22	0.21	0.22	0.20	0.22	0.24[1]	0.26	0.05	0.18

[1]Predicted or assumed. [2]Over period 1972-1986. [3]Recom. TACs for Western area (IV, VII, VIIIa,b, Vb, IIa). [4]Agreed TACs for VI,VII,XII,XIV, Vb(EC zone), VIII (except VIIIc), II (international waters only). [5]Landings of Western stock. Weights in '000 t, recruitment in millions.

Catches: Stable at lower level than early 1980s. Catches have exceeded recommended TACs in all recent years.

Data and assessment: Large catches taken in Division IVa from September-December 1986 misreported from Division VIa. Assessment based on egg survey estimates of spawning stock and on estimated catches of Western stock. There were some uncertainties in the evaluation of the egg survey results.

Fishing mortality: Stable over period 1981-1986 at a level slightly in excess of $F_{0.1}$.

Recruitment: Variable by a factor of 20:1. Poor 1982 and 1983 year classes followed by good 1984 year class. 1985 and 1986 year classes not yet quantified and assumed to be equal to geometric mean over period 1972-1984.

State of stock: Decline that started in late 1970s temporarily halted by 1984 year class. 1986 SSB the lowest recorded in period since 1972 (Figure 6.1).

Forecast for 1988: Assuming F(87) = 0.24, Catch(87) = 550,000 t, SSB = 1,790,000 t

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F_{med}	0.14	325	1,897	Small increase in SSB, significantly
B	$F_{0.1}$	0.19	428	1,790	No immediate change in SSB, followed by gradual recovery
C	$F_{(86)}$	0.22	491	1,726	Continued decline in SSB

Continued fishing at current levels of fishing mortality will lead to a slow decline in the spawning stock.

Recommendation: 1. ACFM recommends that F should be reduced below the 1986 level in order to permit some recovery of the spawning stock over the next few years. Fishing at the $F_{0.1}$ level would achieve this under assumptions of average recruitment. The corresponding TAC in 1988 is around 430,000 t. Any TAC set should apply to all areas in which Western mackerel are caught, i.e., including Sub-area IV and Divisions IIa and Vb in addition to the western areas covered under existing TAC regulations.
2. ACFM reiterates its recommendation that the eastern boundary of the closed area in Divisions VIIe,f should be at 2°W (see Figure 6.2).
3. ACFM reiterates its recommendation that a 30-cm minimum landing size should be implemented in all areas.

Special comments:

1. Catches of mackerel in 1986 were distributed as follows (Working Group estimate):

Area	North Sea stock	Western stock	Total
Division IIa	3,929	90,638	94,567
Division IIIa	2,335	4,218	6,553
Division IVa-c	17,502	213,594	231,096
Division Vb	6,444	1,223	7,667
Division VIa	2,038	99,416	101,454
Sub-area VII	-	128,204	128,204
Divisions VIIIa,b	-	74	74
Total	32,248	537,367	569,615

2. In 1986, major catches of the Western stock were made in the North Sea during the period August-December. The proportion of catches made in the North Sea in each month indicates that a high proportion of this stock spent almost four months of the year in the North Sea, i.e., an area in which catches are supposed to be severely restricted.

3. The poor representation of the 1984 year class in the spawning stock in 1986 is thought to have been due to a low growth rate and thus to deferred maturation. It also, however, gave rise to some doubts about the strength of this year class and ACFM wishes to stress the provisional nature of the estimate used in its projection for 1988.

4. Indications of the strength of the 1985 and 1986 year classes from young mackerel surveys were treated with considerable caution by ACFM, because the reliability of these surveys is not yet established. Geometric mean recruitment levels were used in the projections.

5. There are discrepancies between the levels of spawning stock biomass for the years since 1980, as calculated by annual assessments during recent years. ACFM appreciates that these can only be seen and reviewed by hindsight, but it should be clearly understood that the assessment of this stock has always been difficult and, at the time each assessment was carried out, the available data could not have led to any interpretations other than those presented in the ACFM reports.

In 1987, however, the results of a fourth egg survey have become available and the latest assessment is thus based on a more extensive series of observations than earlier Working Groups had to draw on (the assessment is not based on the 1986 survey alone). The calculated levels of spawning stock biomass are now in close agreement with those indicated by the survey series as a whole:

Year	Egg survey estimate	Assessment calculation
1977	3.0	3.0
1980	2.9	2.3
1983	2.4	2.4
1986	1.5	1.6

Weights are in million t.

The surveys are thus providing essential information for the assessment of the stock. The remaining uncertainties expressed by ACFM about the validity of the spawning stock biomasses obtained from the egg survey results concern the estimation of egg mortality and fecundity and the completeness of the survey coverage.

Previous discrepancies between assessments are now thought to be the results of recruitment having been underestimated by these earlier assessments.

Protection of juvenile Western mackerel

ACFM reevaluated management measures that might provide protection to juvenile Western mackerel. Since the introduction of the closed area in Divisions VIIe,f, there has been some improvement in the exploitation pattern (i.e., a reduction in the fishing mortality on juveniles), although the cause of this change is not certain. There have also been further changes in the distribution of juvenile mackerel. While the 1984 year class occurred in large numbers in Division VIa catches as juveniles, surveys for juvenile mackerel show that the pattern of distribution of the 1985 year class has been more similar to that of juveniles in the early 1980s. This year class was also caught in appreciable quantities by commercial vessels fishing east of the closed area in the Channel in January-February 1987.

The distribution of the 1985 year class re-emphasizes the need for maintenance of the present closed area in Divisions VIIe,f. Moreover, since November 1985, samples from both research vessel and commercial vessel catches over a wider area of Divisions VIIe-h, both within and outside the limits of the "box", have contained a high percentage of juvenile mackerel. A further extension of the closed area to the south, east, and west would, therefore, almost certainly afford more protection for juvenile mackerel. The data are from isolated locations, however, and it is not easy to determine precisely how far the boundaries of the "box" should be extended. The catches of the 1985 year class made in areas to the east of the "box" early in 1987 nevertheless support the earlier recommendation about the eastern boundary of the "box" made by ACFM that it should be 2^{0}W.

In the past, mesh selection experiments using conventional diamond-mesh codends have demonstrated the absence of selection when commercial catch rates are obtained. Recent experiments using square-mesh codends, however, show a more effective selection. In view of their promise in solving the problem of how to reduce exploitation on juvenile mackerel, ACFM supports the continuation of these experiments.

6.2 Blue Whiting

6.2.1 Blue whiting in the northern area (Sub-areas I-VI and XIV and Divisions VIIb,c)

Source of information: Blue Whiting Assessment Working Group report, September 1987 (C.M. 1988/Assess:6).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Max. recom. TAC	-	-	1000	570-780	-	783	1000	950	-	-	-
Actual landings	1093	871	590	539	605	645	757	-	1093	15	440
Sp.stock biomass	4586	3909	3477	3125	3049	3560	4257	4449[1]	6503	2690	4602
Recruitment (age 0)	5.7	7.4	36.8	25.6	27.0[1]	13.9[1]	11.4[1]	10.8[1]	36.8[3]	5.7[3]	17.1[3]
Mean F(4-8,u)	0.24	0.26	0.16	0.19	0.18	0.17	0.20	-	0.26	<0.01	0.11

[1]Predicted or assumed. [2]Over period 1970 - 1986. [3]Over period 1970-1983.
Weights in '000 t, recruitment in billions.

Catches: After the minimum in 1983, catches have increased about half-way towards the maximum in 1980 (Tables 6.2.1.1 - 6.2.1.5). TACs preferred by ACFM have not been reached in any year.

Data and assessment: Analytical assessment using catch-in-number data and results of acoustic surveys during the spawning season.

Fishing mortality: The average F on age groups 4-8 reached a maximum in 1981 since when it has stabilized slightly below the $F_{0.1}$ level.

Recruitment: The strong year classes of 1982 and 1983 followed a series of weak year classes. The size of subsequent year classes is not yet known.

State of stock: The spawning stock biomass reached a minimum in 1984 (Figure 6.2.1). Since then the strong 1982 and 1983 year classes have started to recruit to the spawning stock and an increase has been observed.

Forecast for 1988: Assuming F(87) = $\bar{F}$(86), Catch(87) = 792,000 t.

Option	Basis	F(88)	Predicted SSB(88) ('000 t)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.19	4,262	747	4,027	
B	$F_{0.1}$	0.21	4,262	832	3,946	

Continued fishing at current levels of fishing mortality will lead to a slight decrease in the spawning stock in 1988 and 1989 compared to 1987.

Recommendation: Although high levels of recruitment may not continue, there is no reason to prevent full utilization of the good 1982 and 1983 year classes. ACFM, therefore, recommends setting a TAC in 1988 of 832,000 t, corresponding to exploitation at the $F_{0.1}$ level.

Special comments: Assumptions about the size of the 1984-1986 year classes have a major influence on the catch and stock projections for 1987 and 1988, these year classes together accounting for 34% and 43% of the predicted catch in the two years, respectively. Since the size of these year classes is not yet known, it should be noted that the projections on which the TAC advice is based are subject to considerable uncertainty.

6.2.2 Blue whiting in the southern area (Divisions VIId,e,g-k and Sub-areas VIII and and IX

Source of information: Blue Whiting Assessment Working Group report, September 1987 (C.M. 1988/Assess:6).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Max. recom. TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	29.9	38.7	31.6	30.8	31.2[2]	42.8[2]	33.1[2]	-	42.8	21.4	31.0

[1] Over period 1970-1986. [2] Excluding catches in Sub-area VII allocated to northern stock.
Weights in '000 t.

Catches: Except for 1981 and 1985, the catches have been at a stable level (Table 6.2.2.1).

Data and assessment: A preliminary analytical assessment was performed using catch-in-number data for the years 1982-1986.

Fishing mortality: No information available on the absolute level of fishing mortality, but catches are composed mainly of young age groups.

Recruitment: No information.

State of stock: No information.

Forecast for 1988: None.

Recommendation: Because of uncertainty in the interpretation of the provisional assessment made in 1987, ACFM is not yet able to give advice on catch levels for this stock, but would draw attention to the fact that the catches are composed mainly of small blue whiting in marked contrast to the directed fishery in the northern area.

Special comments: The provisional assessment carried out in 1987 indicated much higher apparent levels of total mortality in this stock than in the northern blue whiting stock. In the absence of surveys covering the more offshore parts of the range of the southern stock, it is not clear whether these mortality rates are real or an artifact caused by emigration out of the area of the fishery.

6.2.3 Distribution in time and space of different life history stages of blue whiting

As pointed out in the 1986 ACFM report, a full description of available knowledge on the migration and distribution of each life history stage of blue whiting was given in the 1985 ACFM report. At the 1987 meeting, the only new information available is on the distribution of catches made in 1986. The updated table is presented as Table 6.2.3.1. It should be noted that the information contained in this table was supplied by members of the Blue Whiting Assessment Working Group and involved making some assumptions about the division of catches between zones. The total for each year, furthermore, does not correspond exactly with officially-reported landings. It should also be noted that the proportion of the catches taken in the fishery zone at Jan Mayen is not known for years prior to 1981 when this zone was declared.

With the curtailment of the ICES-coordinated acoustic surveys after 1986, no further information is available on the distribution of biomass during the blue whiting feeding period in summer. For reference, the information given in the 1986 report on the percentages of the total biomass estimates from these surveys in each area of national fisheries jurisdiction and in international waters is given in Table 6.2.3.2. The area covered by these surveys has varied from year to year but includes major parts of Divisions IIa and Vb, together with adjacent parts of Divisions IVa, Va, VIa, and XIVa, and in one year, part of Division IIIa. While the area covered is thought to contain a high proportion of the northern stock at the time of the survey, it does not include the entire distributional range of the stock.

6.3 Squid

Source of information: Squid Assessment Study Group report, May 1987 (C.M. 1988/Assess:1).

The Study Group on Squid Assessment was set up following a request from NEAFC, with the objective of describing the distribution of the squid species/stocks and, if possible, assessing the stocks.

At the last Statutory Meeting, this Group was transformed into the Study Group on Squid Biology under the Shellfish Committee and will work by correspondence in the coming year.

The Group dealt with squid species *sensu stricto* which fall into two main categories: the Ommastrephid short-finned squids (*Todarodes*, *Illex*, and *Todaropsis*) and the Loliginid long-finned squids (*Loligo*) which have a more demersal mode of life than the former. Other cephalopods such as the cuttlefish (*Sepia*) species were not considered, although they are the object of active fisheries in European waters.

6.3.1 Trends in landings

From 1971-1980, landings of squid from the ICES area averaged about 10,000 t, but in 1981, landings increased to about 20,000 t and have subsequently remained at about this level (Table 6.3.1.1). Data for 1986 are incomplete, but landings are expected to be significantly reduced owing to the failure of the fishery off northern Norway.

In the following paragraphs, which summarize catches by area (Table 6.3.1.2), the main species from each area are presented in parentheses.

In the fishery off northern Norway (Sub-areas I and II) (*Todarodes sagittatus*), the fishery recovered in the late 1970s after a period when squid were unavailable. The higher catches in recent years have been in response to the development of markets for human consumption. However, as mentioned above, there was a complete failure of the fishery in 1986.

At Iceland (Division Va) (*Todarodes sagitattus*), there is only a sporadic fishery in years when squid became available.

Catches at Faroes (Division Vb) (Todarodes sagittatus and Loligo forbesi) have been relatively steady, but with occasional years of substantially increased landings which are also believed to result from increased availability of squid in the area.

At Rockall (Division VIb) (Loligo forbesi, Todarodes sagittatus, Todaropsis eblanae, and Alloteutis subulata), catches have also fluctuated in relation to availability, but are also dependent on the variations in the amount of directed fishing for squid. Landings in 1986 are expected to be in excess of 1,000 t.

At the Azores (Sub-area X) (Loligo forbesi), there is a trend in the last few years of increasing landings from the small artisanal fishery.

In the remaining area (Loligo vulgaris, Loligo forbesi, and Illex coindetii), catches have fluctuated without any clear trend.

Investigations of the causes of fluctuations in landings are made particularly difficult by the absence of adequate catch statistics which, in most cases, consist of a mixture of the various species of squid, and of other cephalopods in some instances.

6.3.2 General considerations on biology and exploitation

There are serious deficiencies in our knowledge on the distribution and biology of the main exploited species of squid in the northeast Atlantic. It appears that the three main species at least (Todarodes sagittatus, Loligo forbesi, and Loligo vulgaris) have a very short life cycle, possibly as short as one year, although longevity has not been precisely established. The extent to which this feature is a major cause of natural fluctuations in the abundance of the stocks should be investigated.

It appears probable that squid spawn only once and die after spawning, but there are no estimates of natural mortality rates up to the time of spawning. Fecundity is relatively low compared with fish.

The only information on the distribution of squids is based mainly on information from fisheries, and little is known about the distribution in areas where there is no fishing. e.g., off the continental shelf.

In general, fisheries, especially directed jigging fisheries, exploit only more or less fully-grown squid. Therefore, growth overfishing should not be a problem.

Very little is known about factors determining recruitment in the species under consideration, and there are no available data to evaluate the extent to which changes in biomass are influenced by fishing.

6.3.3 Prospects and requirements for assessment

At present, the available data are inadequate for any assessment to be attempted. Correcting this situation would require that improvements be made in the comprehension of the biology of the stocks, in the accuracy and relevance of catch data, and in the development of adequate assessment methods.

In addition to more extensive market sampling, biological studies might benefit from the collection of data during research surveys conducted each year, provided these cover sufficiently extended areas and are carried out in seasons which are compatible with the migration pattern of the species. Under these conditions, survey data might be considered for fishery-independent estimations of standing biomass. Specific surveys aimed at squid might obviously be planned in the future, especially in offshore areas, if the cost involved is judged acceptable.

Regarding the choice of methods to be used with these species, advantage might be taken of experience obtained in other parts of the world. However, the inherent feature of a short life-span and the presence of a single or very few cohorts in any year makes it difficult to predict, in advance of the fishing season for management purposes, the abundance eventually available to the fisheries.

Whatever the methods used for assessing the effects of fishing on the dynamics of the stock, the very first priority is that catch statistics be made available with the required details (by species, area, and gear).

Table 2.1.1 North-East Arctic COD.
Total nominal catch (t) by fishing areas (Norwegian coastal cod not included). (As officially reported to ICES.)

Year	Sub-area I	Division IIa	Division IIb	Total catch
1960	357,327	115,116	91,599	622,042
1961	409,694	153,019	220,508	783,221
1962	548,621	139,848	220,797	909,266
1963	547,469	117,100	111,768	776,337
1964	206,883	104,698	126,114	437,695
1965	241,489	100,011	103,430	444,983
1966	292,253	134,805	56,653	483,711
1967	322,798	128,747	121,060	572,605
1968	642,452	162,472	269,254	1,074,084
1969	679,373	255,599	262,254	1,197,226
1970	603,855	243,835	85,556	933,246
1971	312,505	319,623	56,920	689,048
1972	197,015	335,257	32,982	565,254
1973	492,716	211,762	88,207	792,685
1974	723,489	124,214	254,730	1,102,433
1975	561,701	120,276	147,400	829,377
1976	526,685	237,245	103,533	867,463
1977	538,231	257,073	109,997	905,301
1978	418,265	263,157	17,293	698,715
1979	195,166	235,449	9,923	440,538
1980	168,671	199,313	12,450	380,434
1981	137,033	245,167	16,837	399,037
1982	96,576	236,125	31,029	363,730
1983	64,803	200,279	24,910	289,992
1984	54,317	197,573	25,761	277,651
1985	112,605	173,559	21,756	307,920
1986[1]	156,516	201,398	68,562	426,476

[1] Provisional figures.

Table 2.1.2 North-East Arctic COD.
Nominal catch (t) by countries (Norwegian coastal cod not included) (Sub-area I and Divisions IIa and IIb combined). (As officially reported to ICES.)

Year	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Norway	Poland	United Kingdom	USSR	Others	Total all countries
1960	3,306	22,321	-	9,472	231,997	20	141,175	213,400	351	622,042
1961	3,934	13,755	3,921	8,129	268,377	-	158,113	325,780	1,212	783,221
1962	3,109	20,482	1,532	6,503	225,615	-	175,020	476,760	245	909,266
1963	-	18,318	129	4,223	205,056	108	129,779	417,964	-	775,577
1964	-	8,634	297	3,202	149,878	-	94,549	180,550	585	437,695
1965	-	526	91	3,670	197,085	-	89,962	152,780	816	444,930
1966	-	2,967	228	4,284	203,792	-	103,012	169,300	121	483,704
1967	-	664	45	3,632	218,910	-	87,008	262,340	6	572,605
1968	-	-	225	1,073	255,611	-	140,387	676,758	-	1,074,084
1969	29,374	-	5,907	5,543	305,241	7,856	231,066	612,215	133	1,197,226
1970	26,265	44,245	12,413	9,451	377,606	5,153	181,481	276,632	-	933,246
1971	5,877	34,772	4,998	9,726	407,044	1,512	80,102	144,802	215	689,048
1972	1,393	8,915	1,300	3,405	394,181	892	58,382	96,653	166	565,287
1973	1,916	17,028	4,684	16,751	285,184	843	78,808	387,196	276	792,686
1974	5,717	46,028	4,860	78,507	287,276	9,898	90,894	540,801	38,453	1,102,434
1975	11,309	28,734	9,981	30,037	277,099	7,435	101,843	343,580	19,368	829,377
1976	11,511	20,941	8,946	24,369	344,502	6,986	89,061	343,057	18,090	867,463
1977	9,167	15,414	3,463	12,763	388,982	1,084	86,781	369,876	17,771	905,301
1978	9,092	9,394	3,029	5,434	363,088	566	35,449	267,138	5,525	698,715
1979	6,320	3,046	547	2,513	294,821	15	17,991	105,846	9,439	440,538
1980	9,981	1,705	233	1,921	232,242	3	10,366	115,194	8,789	380,434
						Spain				
1981	12,825	3,106	298	2,228	277,818	14,500	5,262	83,000	-	399,037
1982	11,998	761	302	1,717	287,525	14,515	6,601	40,311	-	363,730
1983	11,106	126	473	1,243	234,000	14,229	5,840	22,975	-	289,992
1984	10,674	11	686	1,010	230,743	8,608	3,663	22,256	-	277,651
1985[1]	13,418	23	1,019	4,395	211,065	7,846	3,335	62,489	4,330	307,920
1986[1]	18,159	770	1,543	10,093	228,787	5,497	7,581	150,541	3,505	426,476
1987	EXPECTED LANDINGS									545,000

[1] Provisional figures.

Table 2.2.1 North-East Arctic HADDOCK.
Total nominal catch (t) by fishing areas (Norwegian coastal haddock not included). (As officially reported to ICES.)

Year	Sub-area I	Division IIa	Division IIb	Total
1960	125,657	27,925	1,854	155,434
1961	165,165	25,642	2,427	193,234
1962	160,972	25,189	1,727	187,888
1963	124,774	21,031	939	146,744
1964	79,056	18,735	1,109	98,900
1965	98,505	18,640	939	118,079
1966	124,115	34,892	1,614	160,621
1967	108,066	27,980	440	136,486
1968	140,970	40,031	725	181,726
1969	88,960	40,208	1,341	130,509
1970	59,493	26,611	497	86,601
1971	56,300	21,567	435	78,302
1972	221,183	41,979	2,155	265,317
1973	283,728	23,348	2,989	320,065
1974	159,037	47,033	5,068	221,138
1975	121,686	44,330	9,726	175,742
1976	94,065	37,566	5,649	137,279
1977	72,159	28,452	9,547	110,158
1978	63,965	30,478	979	95,422
1979	63,841	39,167	615	103,623
1980	54,205	33,616	68	87,889
1981	36,834	39,864	455	77,153
1982	17,948	29,005	2	46,955
1983	7,550	13,872	185	21,607
1984	4,000	13,247	71	17,318
1985[1]	30,385	10,774	111	41,270
1986[1]	69,479	26,251	728	96,458

[1] Provisional figures.

Table 2.2.2 North-East Arctic HADDOCK.
Nominal catch (t) by countries (Norwegian coastal haddock not included) (Sub-area I and Divisions IIa and IIb combined). (As officially reported to ICES.)

Year	Faroe Islands	France	German Dem.Rep.	Germany, Fed.Rep.	Norway	Poland	United Kingdom	USSR	Others	Total
1960	172	-	-	5,597	46,263	-	45,469	57,025	125	155,651
1961	285	220	-	6,304	60,862	-	39,650	85,345	558	193,234
1962	83	409	-	2,895	54,567	-	37,486	91,910	58	187,438
1963	17	363	-	2,554	59,955	-	19,809	63,526	-	146,224
1964	-	208	-	1,482	38,695	-	14,653	43,870	250	99,158
1965	-	226	-	1,568	60,447	-	14,345	41,750	242	118,578
1966	-	1,072	11	2,098	82,090	-	27,723	48,710	74	161,778
1967	-	1,208	3	1,705	51,954	-	24,158	57,346	23	136,397
1968	-	-	-	1,867	64,076	-	40,129	75,654	-	101,726
1969	2	-	309	1,490	67,549	-	37,234	24,211	25	130,820
1970	541	-	656	2,119	37,716	-	20,423	26,802	-	87,257
1971	81	-	16	896	45,715	43	16,373	15,778	3	78,905
1972	137	-	829	1,433	46,700	1,433	17,166	196,224	2,231	266,153
1973	1,212	3,214	22	9,534	86,767	34	32,408	186,534	2,501	322,626
1974	925	3,601	454	23,409	66,164	3,045	37,663	78,548	7,348	221,157
1975	299	5,191	437	15,930	55,966	1,080	28,677	65,015	3,163	175,758
1976	536	4,459	348	16,660	49,492	986	16,940	42,485	5,358	137,265
1977	213	1,510	144	4,798	40,118	-	10,878	52,210	287	110,158
1978	466	1,411	369	1,521	39,955	1	5,766	45,895	38	95,422
1979	343	1,198	10	1,948	66,849	2	6,454	26,365	454	103,623
1980	497	226	15	1,365	61,886	-	2,948	20,706	246	87,889
1981	381	414	22	2,398	58,856	Spain	1,682	13,400	-	77,153
1982	496	53	-	1,258	41,421	-	827	2,900	-	46,955
1983	428	-	1	729	19,371	139	259	680	-	21,607
1984	297	15	4	400	15,186	37	276	1,103	-	17,318
1985	424	21	20	395	17,490	77	153	22,690	-	41,270
1986[1]	881	54	75	1,079	48,178	22	431	45,738	-	96,458
1987	Expected Landings									210,000

[1] Provisional figures.

Table 2.3 North-East Arctic SAITHE.
Nominal catch (tonnes) by countries in Sub-area I and Divisions IIa and IIb combined. (As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Faroe Islands	270	809	1,117	532	236
France	5,658	4,345	2,601	1,016	194
German Dem.Rep.	7,164	6,484	2,435	-	-
Germany, Fed.Rep.	19,985	18,190	14,823	12,511	8,413
Norway	139,705	121,069	141,346	128,878	166,139
Poland	1	35	-	-	-
Portugal	783	203	-	-	-
Spain	1,327	121	685	780	-
UK (Engl.& Wales)	6,853	2,790	1,170	794	395
UK (Scotland)	82	37	-	-	-
USSR	989	381	3	43	121
	182,817	154,464	164,180	144,554	175,498

Country	1982	1983	1984	1985	1986[1]
Faroe Islands	339	539	503	490	426
France	82	418	431	657	256
German Dem.Rep.	-	-	6	11	-
Germany, Fed.Rep.	7,224	4,933	4,532	1,837	3,470
Norway	159,643	149,556	152,818	103,899	66,152
Poland	-	-	-	-	-
Portugal	-	-	-	-	-
Spain	-	33	-	-	-
UK (Engl.& Wales)	731	1,251	335	202	28
UK (Scotland)	1	-	-	+	21
USSR	14	206	161	51	27
Total	168,034	156,936	158,786	107,147	70,380

[1] Provisional figures.

Table 2.4.1 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries (Sub-area I, Divisions IIa and IIb combined). (As officialy reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	1	-	-	-	-
Faroe Islands	8	1	-	-	206
France	660	3,608	1,142	1,297	537
German Dem.Rep.	17,614	16,165	16,162	8,448	4,614
Germany, Fed.Rep.	7,231	11,483	11,913	7,992	4,688
Norway	7,381	7,802	9,025	8,472	9,249
Poland	175	2,957	261	87	26
Portugal	1,480	378	1,100	271	-
Spain	-	-	1,375	1,965	930
UK (England & Wales)	6,330	3,390	1,756	1,307	470
UK (Scotland)	-	-	-	-	-
USSR	144,993	78,092	70,451	72,802	81,652
Total	185,873	124,172[2]	113,620[2]	102,765[2]	102,372

Country	1982	1983	1984	1985	1986[1]
Belgium	-	-	-	-	-
Faroe Islands	-	-	-	-	-
France	841	798	2,970	3,326	2,471
German Dem.Rep.	4,463	3,394	4,168	3,260	1,323
Germany, Fed.Rep.	3,182	3,395	3,289	3,306	3,561
Norway	10,045	11,083	18,650	20,456	23,215
Poland	-	-	-	-	-
Portugal	-	-	1,806	2,056	1,591
Spain	72	222	25	38	-
UK (England & Wales)	336	182	716	167	110
UK (Scotland)	-	-	-	-	14
USSR	112,810	105,459	69,689	59,943	20,694
Total	131,749	124,533	101,313	92,552	52,979

[1] Provisional figures.

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

Table 2.4.2 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries in Sub-area I.
(As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	1	-	-	-	-
France	149	27	7	1	16
Germany, Fed.Rep.	786	+	-	-	7
Norway	1,181	1,333	1,374	736	543
Portugal	55	8	-	170	-
UK (England & Wales)	1,686	959	462	295	61
UK (Scotland)	-	-	-	-	-
USSR	13,154	2,575	639	33	1,220
Total	17,012	4,902	2,482	1,235	1,847

Country	1982	1983	1984	1985	1986[1]
Belgium	-	-	-	-	-
France	-	-	-	-	-
Germany, Fed.Rep.	10	-	1	143	50
Norway	732	580	1,472	2,378	4,319
Portugal	-	-	-	-	-
UK (England & Wales)	77	48	22	43	32
UK (Scotland)	-	-	-	-	3
USSR	1,750	4,023	532	368	1,066
Total	2,569	4,651	2,027	2,932	5,470

[1] Provisional figures.

Table 2.4.3 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries in Division IIa.
(As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Faroe Islands	8	1	-	-	206
France	478	3,575	1,134	1,296	521
German Dem.Rep.	12,688	12,933	12,439	7,460	2,205
Germany, Fed.Rep.	4,764	11,482	11,913	7,992	4,681
Norway	6,050	6,369	7,637	7,734	8,704
Poland	47	2,477	261	78	26
Portugal	1,249	352	1,100	89	-
Spain	-	-	1,125	1,500	620
UK (England & Wales)	4,064	2,067	1,195	967	409
UK (Scotland)	-	-	-	-	-
USSR	94,639	31,783	29,519	46,762	56,130
Total	123,987	71,039	66,323	73,878	73,502

Country	1982	1983	1984	1985	1986[1]
Faroe Islands	-	-	-	-	-
France	841	798	2,970	3,326	2,471
German Dem.Rep.	2,760	2,500	2,570	2,800	1,252
Germany, Fed.Rep.	3,172	3,395	3,288	2,972	3,319
Norway	9,140	10,500	17,111	18,062	18,860
Poland	-	-	-	-	-
Portugal	-	-	1,134	1,327	1,273
Spain	-	-	-	-	-
UK (England & Wales)	259	134	672	120	75
UK (Scotland)	-	-	-	-	11
USSR	63,125	82,836	63,342	59,047	19,099
Total	79,297	100,163	91,087	87,654	46,360

[1] Provisional figures.

Table 2.4.4 REDFISH in Sub-areas I and II.
Nominal catch (t) by countries in Division IIb.
(As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Faroe Islands	-	+	-	-	-
France	33	6	1	-	-
German Dem.Rep.	4,926	3,232	3,723	988	2,409
Germany, Fed.Rep.	1,681	1	-	-	-
Norway	150	100	14	2	2
Poland	128	480	-	9	-
Portugal	176	18	-	12	-
Spain	-	-	250	465	310
UK (England & Wales)	580	364	99	45	+
UK (Scotland)	-	-	-	-	-
USSR	37,200	43,734	40,293	26,007	24,302
Non-members	-	296[2]	435[2]	124[2]	-
Total	44,874	48,231	44,815	27,652	27,023

Country	1982	1983	1984	1985	1986[1]
Faroe Islands	-	-	-	-	-
France	-	-	-	-	-
German Dem.Rep.	1,703	894	1,598	460	71
Germany, Fed.Rep.	-	-	-	191	192
Norway	173	3	67	16	36
Poland	-	-	-	-	-
Portugal	-	-	672	729	318
Spain	72	222	25	38	-
UK (England & Wales)	+	-	22	4	3
UK (Scotland)	-	-	-	-	+
USSR	47,935	18,600	5,815	528	529
Total	49,883	19,719	8,199	1,966	1,149

[1] Provisional figures.

[2] As reported to Norwegian authorities.

Table 2.4.5 REDFISH in Sub-areas I and II.
Nominal catch (t) of *Sebastes marinus* and *Sebastes mentella* in Sub-area I and Divisions IIa and IIb combined.

Species	1977	1978	1979	1980	1981
S. marinus	39,508	31,695	26,475	23,411	20,826
S. mentella	146,365	92,477	87,145	79,354	81,546
Total	185,873	124,172	113,620	102,765	102,372

Species	1982	1983	1984	1985	1986[1]
S. marinus	16,366	19,260	28,379	29,484	30,127
S. mentella	115,383	105,273	72,934	63,068	22,852
Total	131,749	124,533	101,313	92,552	52,979

[1] Provisional figures.

Table 2.5.1 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries (Sub-area I, Divisions IIa and IIb combined). (As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Faroe Islands	21	-	3	-	8
France	-	-	-	-	-
German Dem.Rep.	8,176	4,611	3,488	2,080	1,358
Germany, Fed.Rep.	148	321	481	303	128
Norway	4,217	4,082	2,843	3,157	4,201
Poland	224	544	106	-	-
UK (Engl.& Wales)	1,059	407	59	26	9
UK (Scotland)	-	-	-	-	-
USSR	15,045	14,651	10,311	7,670	9,276
Others	-	1	21	48	38
Total	28,890	24,617	17,312	13,284	15,018

Country	1982	1983	1984	1985	1986[1]
Faroe Islands	-	-	-	-	-
France	8	67	138	239	13
German Dem.Rep.	1,153	1,913	2,089	3,807	2,659
Germany, Fed.Rep.	18	130	76	193	59
Norway	3,206	4,883	4,376	5,464	7,812
Poland	-	-	-	-	-
UK (Engl.& Wales)	10	2	23	5	10
UK (Scotland)	-	-	-	-	2
USSR	12,394	15,152	15,181	10,237	12,200
Others	-	-	-	-	-
Total	16,789	22,147	21,883	19,945	22,755

[1] Provisional figures.

Table 2.5.2 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Sub-area I. (As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Germany, Fed.Rep.	1	-	-	-	19
Norway	1,371	1,148	727	490	641
UK (Engl.& Wales)	541	232	36	12	5
UK (Scotland)	-	-	-	-	-
USSR	360	211	182	100	564
Others	-	-	-	-	1
Total	2,273	1,591	945	602	1,230

Country	1982	1983	1984	1985	1986[1]
Germany, Fed.Rep.	-	-	-	-	1
Norway	505	490	593	602	936
UK (Engl.& Wales)	8	1	17	1	5
UK (Scotland)	-	-	-	-	1
USSR	200	196	81	122	615
Others	-	-	-	-	-
Total	713	687	691	725	1,558

[1] Provisional figures.

Table 2.5.3 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Division IIa. (As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Faroe Islands	21	-	3	-	8
France	-	-	-	-	-
German Dem.Rep.	1,641	1,398	787	570	18
Germany, Fed.Rep.	22	321	481	303	109
Norway	1,446	2,084	2,051	2,529	3,077
Poland	95	197	4	-	-
UK (Engl.& Wales)	211	82	11	9	4
UK (Scotland)	-	-	-	-	-
USSR	6,960	8,809	6,929	2,014	2,031
Others	-	1	21	48	37
Total	10,396	12,892	10,287	5,473	5,284

Country	1982	1983	1984	1985	1986[1]
Faroe Islands	-	-	-	-	-
France	8	67	138	239	13
German Dem.Rep.	73	14	189	82	55
Germany, Fed.Rep.	18	130	76	172	42
Norway	2,487	4,257	3,703	4,791	6,733
Poland	-	-	-	-	-
UK (Engl.& Wales)	2	1	1	2	5
UK (Scotland)	-	-	-	-	1
USSR	2,459	5,031	5,459	6,894	5,553
Others	-	-	-	-	-
Total	5,047	9,500	9,566	12,180	12,402

[1] Provisional figures.

Table 2.5.4 GREENLAND HALIBUT in Sub-areas I and II. Nominal catch (t) by countries in Division IIb. (As officially reported to ICES.)

Country	1977	1978	1979	1980	1981
German Dem.Rep.	6,535	3,213	2,701	1,510	1,340
Germany, Fed.Rep.	125	-	-	-	-
Norway	1,400	850	65	138	483
Poland	129	347	102	-	-
UK (Engl.& Wales)	307	93	12	5	-
USSR	7,725	5,631	3,200	5,556	6,681
Total	16,221	10,134	6,080	7,209	8,504

Country	1982	1983	1984	1985	1986[1]
German Dem.Rep.	1,080	1,899	1,900	3,725	2,604
Germany, Fed.Rep.	-	-	-	21	16
Norway	214	136	80	71	143
Poland	-	-	-	-	-
UK (Engl.& Wales)	+	+	5	2	+
USSR	9,735	9,925	9,641	3,221	6,032
Total	11,029	11,960	11,626	7,040	8,795

[1]Provisional figures.

Table 2.6.1 Nominal catches (in tonnes) of cod in Sub-area XIV, 1978-1987. (Data for 1978-1981 broken down by countries are from Bulletin Statistique.)

Country	1978	1979	1980	1981	1982
Faroe Islands	6	-	-	292	-
Germany, Fed. Rep.	3,936	1,062	3,193	7,367	8,940
Greenland	1,347	2,755	1,778	890	893
Iceland	13	3	19	1	-
Norway	17	-	-	-	-
UK	41	-	-	-	-
Total	5,362	3,820	4,990	8,550	9,833
Working Group total	26,000[3,4]	34,000[3,4]	12,000[2,3]	16,000[2,3]	27,000[2,3]

Country	1983	1984	1985	1986[1]	1987[1]
Faroe Islands	368	-	-	2	-
Germany, Fed. Rep.	8,237	6,987	2,006	4,065	5,489[6]
Greenland	438	1,047	106	601[5]	1,200
Iceland	-	-	-	-	-
Norway	-	-	-	-	-
UK	-	-	-	-	-
Total	9,043	8,034	2,112	4,668	6,689
Working Group total	13,377[3]	8,068[3]	2,112	4,668	6,689

[1] Preliminary.

[2] Including estimates of discards.

[3] Including catches reported from ICES Sub-area XII and Division Vb.

[4] Including estimates of unreported catches.

[5] Including 97 t by chartered trawlers.

[6] 5,289 t reported up to Sep + 200 t assumed for Oct-Dec.

Table 2.11.2 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	1985	1986
1	1.470	0.421	0.111	0.100
2	22.422	18.011	12.800	8.161
3	151.198	32.237	24.521	33.893
4	30.181	141.324	21.535	23.421
5	21.525	17.039	84.733	20.654
6	8.637	7.111	11.836	77.526
7	14.017	3.915	5.708	18.228
8	13.666	4.112	2.323	10.971
9	3.715	4.516	4.339	8.583
10	2.373	1.828	4.030	9.662
11	3.424	0.202	2.758	7.174
12	0.552	0.255	0.970	3.677
13	0.100	0.260	0.477	2.914
14	0.003	0.003	0.578	1.786
JUVENILE	78.323	24.055	15.363	11.744
ADULT	194.960	207.179	161.356	215.006
TOTAL CATCH	58.665	50.293	49.092	65.413

Table 2.11.3 Catches north of 62^0 N of Norwegian spring-spawning herring (tonnes) since 1972.

Year	A	B[1]	C	D	Total	Total included unreported catches
1972	0	9,895	3,266[2]	-	13,161	13,161
1973	139	6,602	276	-	7,017	7,017
1934	906	6,093	620	-	7,619	7,619
1975	53	3,372	288	-	3,713	13,713
1976	0	247	189	-	436	10,436
1977	374	11,834	498	-	12,706	22,706
1978	484	9,151	189	-	9,824	19,824
1979	691	1,866	307	-	2,864	12,864
1980	878	7,634	65	-	8,577	18,577
1981	844	7,814	78	-	8,736	13,736
1982	983	10,447	225	-	11,655	16,655
1983	3,857	13,290	907	-	18,054	23,054
1984	18,730	29,463	339	-	48,532	53,532
1985	29,363	37,187	197	4,300	71,047	81,047
1986[3]	71,122	55,507	156	-	126,785	136,785
1987[4]	71,919	-	-	-	-	-

A = catches of adult herring in winter.

B = mixed herring fishery in autumn.

C = by-catches of 0- and 1-group herring in the sprat fishery.

D = USSR-Norway by-catch in the capelin fishery (2-group).

[1] Includes also by-catches of adult herring in other fisheries.

[2] In 1972, there was also a directed herring 0-group fishery.

[3] Preliminary.

[4] Preliminary up to 1 September 1987.

Table 2.12.1 International catch of Barents Sea capelin ('000 t) in the years 1965-1987.

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	811	624	42	1,477
1985	453	398	17	851
1986	72[1]	51	-	123[1]
1987	-	-	-	-

[1]Preliminary figure.

Table 2.12.2 The total annual and seasonal catch of capelin in the Iceland-Greenland-Jan Mayen area since 1964 (in '000 t).

	Winter season		Summer and Autumn season				
Year	Iceland	Far/Nor	Iceland	Norway	Faroes	EEC	Total
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	-	-	-	-	-	13.0
1983	-	-	133.3	-	-	-	133.3
1984	439.6	-	425.2	104.6	10.2	8.5	988.1
1985	348.5	-	644.8	188.7	81.4		1,263.4
1986	342.0	49.9	552.3	149.7	64.4	5.3	1,163.6
1987	500.6	59.9	16.0[1]	82.0[1]	66.3[1]	-	724.8[1]

[1] Until 15 October.

Table 3.1.2 HERRING. Catch in tonnes 1977-1986 North Sea, Sub-area IV, and Division VIId by country. These figures do not in all cases correspond to the official statistics and cannot be used for management purposes.

Country	1977	1978	1979	1980	1981
Belgium	57	-	-	-	-
Denmark	12,769	4,359	10,546	4,431	21,146
Faroe Islands	8,078	40	10	-	-
France	1,613	2,119	2,560	5,527	15,099
German Dem.Rep.	2	-	-	-	-
Germany,Fed.Rep.	221	24	10	147	2,300
Netherlands	4,134	18	-	509	7,700
Norway	4,065	1,189	3,617	2,165	70
Poland	2	-	-	-	-
Sweden	3,616	-	-	-	-
UK (England)	3,224	2,843	2,253	77	303
UK(Scotland)[2]	8,159	437	-	610	45
USSR	78	4	162	-	-
Total North Sea	46,010	11,033	19,158	13,466	46,663
Total including unallocated catches	-	-	-	60,994	140,972

Country	1982	1983	1984	1985	1986[1]
Belgium	9,700	5,080	5,080	3,482	414
Denmark	67,851	10,468	38,777	129,305[1]	121,631
Faroe Islands	-	-	-	-	1,580
France	15,310	16,353	20,320	14,400	9,730
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep.	349	1,837	11,609	8,930	4,026
Netherlands	22,300	40,045	44,308	79,335[1]	85,998
Norway	680	32,512	98,714	161,279[1]	219,598
Poland	-	-	-	-	-
Sweden	-	284	886	2,442	1,872
UK (England)	3,703	111	1,689	5,564	1,404
UK (Scotland)[2]	1,780	17,260	31,393	55,795	77,459
USSR	-	-	-	-	-
Total North Sea	122,056	133,794	252,776	460,532	523,710
Total including unallocated catches	235,925	317,124	317,263	534,173	544,801

[1] Preliminary.

[2] Catches of juveniles from Moray Firth not included.

Table 3.1.4.1 HERRING catches in the Baltic Sea by countries and sub-divisions, 1984 and 1985 (tonnes). By-catch of sprat in directed herring fisheries excluded and by-catch of herring in sprat fisheries included.

Year and country	Total catch	Sub-divisions											
		22	23	24	25	26	27	28	29S	29N	30	31	32
1985													
Denmark	30,341	10,322	6,849	5,620	7,550	-	-	-	-	-	-	-	-
Finland	98,999	-	-	-	-	-	-	-	8	39,740	25,857	9,154	24,240
German Dem.Rep.	51,607	1,940	-	48,006	1,566	-	95	-	-	-	-	-	-
Germany, Fed.Rep.	7,925	7,353	-	535	37	-	-	-	-	-	-	-	-
Poland	89,531	-	-	16,721	49,840	22,970	-	-	-	-	-	-	-
Sweden	57,554	-	1,113	11,373	21,093	22	17,990	2,317	34	1,010	1,885	717	-
USSR	110,783	-	-	-	14,175[1]	18,465	-	28,209	25,035	-	-	-	24,899
Total	446,740	19,615	7,962	82,255	94,261	41,457	18,085	30,526	25,077	40,750	27,742	9,871	49,139
1986													
Denmark	19,441	9,035	1,490	5,011	3,905	-	-	-	-	-	-	-	-
Finland[2]	98,244	-	-	-	-	-	154	116	513	39,762	26,409	9,090	22,200
German Dem.Rep.[2]	53,061	1,907	-	49,273	1,881	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	8,550	7,845	-	705	-	-	-	-	-	-	-	-	-
Poland	80,442	-	-	12,344	47,336	20,762	-	-	-	-	-	-	-
Sweden	39,842	-	1,365	5,946	19,315	-	7,870	1,964	51	494	2,501	336	-
USSR	115,665	-	-	-	20,090	17,430	-	28,695	23,930	-	-	-	25,520
Total	415,245	18,787	2,855	73,279	92,527	38,192	8,024	30,775	24,494	40,256	28,910	9,426	47,720

[1] Catches in Sub-divisions 25 and 27.
[2] Preliminary data.

Table 3.1.4.2 HERRING in Division IIIa. Landings in tonnes 1977-1986.(Data mainly provided by Working Group Members.)

Country	1977	1978	1979	1980	1981
Skagerrak					
Denmark	14,152	7,753	8,729	22,811	45,525
Faroe Islands	10,064	1,041	817	526	900
Germany, Fed.Rep.	32	28	181	-	199
Norway (Open sea)	-	1,860	2,460	1,350	6,330
Norway (Fjords)	1,837	2,271	2,259	2,795	900
Sweden	8,109	11,551	8,140	10,701	30,274
Total	34,194	24,504	22,586	38,183	83,768
Kattegat					
Denmark	38,205	29,241	21,337	25,380	48,922
Sweden	37,160	35,193	25,272	18,260	38,871
Total	75,365	64,434	46,609	43,640	87,833
Division IIIa total	109,559	88,938	69,195	81,823	171,601

Country	1982	1983	1984	1985	1986[1]
Skagerrak					
Denmark	43,328	54,102	64,621	88,192	94,022
Faroe Islands	715	1,980	891	455	520
Germany, Fed.Rep.	43	40	-	-	11
Norway (Open sea)	10,140	500	-	2,752	677
Norway (Fjords)	1,560	2,834	1,494	1,673	860
Sweden	24,859	35,176	59,195	40,349	42,996
Total	80,645	94,632	126,201	133,421	139,086
Kattegat					
Denmark	38,609	62,901	71,359	69,235	41,669
Sweden	38,892	40,463	35,027	39,829	35,852
Total	77,501	103,364	106,386	109,064	77,521
Division IIIa total	158,146	197,996	232,587	242,485	216,607

[1] Preliminary.

Table 3.1.5.1 Celtic Sea and Division VIIj HERRING landings (t), 1977-1986. (Data provided by Working Group members.)

Year	France	Germany Fed.Rep.	Ireland	Nether-lands	Un-allocated	Total
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
1985	622	-	11,000	-	4,601	16,223
1986[1]	-	-	13,338	+	-	13,338

[1] Provisional.

Table 3.1.5.2 Celtic Sea and Division VIIj HERRING landings (tonnes) by season (1 April to 31 March). (Data provided by Working Group members.)

Year	France	Germany Fed.Rep.	Ireland	Nether-lands	Un-allocated	Total
1977/1978	95	96	6,264	1,378	-	7,833
1978/1979	8	220	8,239	1,002	-	7,559
1979/1980	584	20	7,932	850	935	10,321
1980/1981	9	2	9,024	292	3,803	13,130
1981/1982	123	-	15,830	1,150	-	17,103
1982/1983	+	-	13,042	-	-	13,042
1983/1984	495	-	10,000	1,500	9,186	21,181
1984/1985	680	-	7,000	890	14,009	22,579
1985/1986	622	-	11,995	-	4,509	17,126
1986/1987[1]	-	-	14,725	1	-	14,726

[1] Provisional.

Table 3.1.6 Catch in weight, Division VIa (North) HERRING 1977-1986.

Country	1977	1978	1979	1980	1981
Denmark	626	128	-	-	1,580
Faroes	3,564	-	-	-	-
France	1,548	1,435	3	-	1,243
German Dem. Rep.	-	-	-	2	-
Germany, Fed. Rep.	-	26	-	-	3,029
Iceland	-	-	-	256	-
Ireland	-	-	-	-	-
Netherlands	8,705	5,874	-	-	5,602
Norway	1,098	4,462	-	-	3,850
Sweden	261	-	-	-	-
UK (England)	301	134	54	-	1,094
UK (Scotland)	25,238	10,097	3	33	30,389
USSR	-	-	-	15	-
Unallocated	-	-	-	-	4,633
Total	41,341	22,176	60	306	51,420

Country	1982	1983	1984	1985	1986[1]
Denmark	-	-	96	-	-
Faroes	74	834	954	104	400
France	2,069	1,313	-	20	18
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	8,453	6,283	5,564	5,937	2,769
Iceland	-	-	-	-	-
Ireland	-	-	-	-	6,000[2]
Netherlands	11,317	20,200	7,729	5,500	5,160[2]
Norway	13,018	7,336	6,669	4,690	4,799
Sweden	-	-	-	-	-
UK (England)	90	-	-	-	-
UK (Scotland)	38,381	31,616	37,554	28,065	25,294
USSR	-	-	-	-	-
Unallocated	18,958	-4,059	16,588	502	37,840[2]
Total	92,360	63,523	75,154	43,814	82,280

[1] Preliminary.
[2] Including discards.

Table 3.1.7 Monthly landings (tonnes) of HERRING from the Firth of Clyde (all fishing methods combined). (Data provided by Working Group).

Month	1975	1976	1977	1978	1979	1980
January	–[1]	–[1]	–[1]	4[1]	4[1]	6[1]
February	68[1]	7[1]	–[1]	6[1]	8[1]	3[1]
March	85	69[1]	–[1]	7[1]	13[1]	8[1]
April	369	521	530	246	12[1]	4[1]
May	283	436	44	245	4[1]	2[1]
June	203	281	640	238	336	114
July	354	332	494	376	466	656
August	240	473	601	587	450	645
September	515	541	559	581	374	559
October	811	598	556	653	263	79
November	571	595	560	647	1[1]	3[1]
December	120	236	328	272	–[1]	2[1]
Not known	44	50	35	–	–	–
Total	3,663	4,139	4,847	3,862	1,951	2,081

Month	1981	1982	1983	1984	1985	1986
January	15[1]	2[1]	+[1]	–[1]	–[1]	–[1]
February	15[1]	16[1]	1[1]	–[1]	–[1]	–[1]
March	14[1]	1[1]	1[1]	–[1]	–[1]	–[1]
April	32[1]	2[1]	–[1]	–[1]	–[1]	–[1]
May	25[1]	615	1[1]	554	527	272[1]
June	429	850	265	847	831	724
July	982	757	519	944	815	763
August	511	262	681	276	661	786
September	106	–[1]	604	246	187	555
October	–[1]	–[1]	457	124	1[1]	218[1]
November	2[1]	–[1]	1[1]	–[1]	–[1]	77[1]
December	4[1]	1[1]	–[1]	–[1]	–[1]	–[1]
Not known	–	–	273[2]	247[2]	–	–
Total	2,135	2,506	2,803	3,238	3,022	3,395

[1] Subject to closure of directed fishery for whole or part of the month.

[2] Landed in Northern Ireland and Isle of Man.

Table 3.1.8 Estimated HERRING catches in tonnes in Divisions VIa (south) and VIIb,c, 1977-1986.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
France	-	-	-	-	-	353	19	-	-	-
Germany Fed.Rep.	221	100	5	-	2,687	265	-	-	-	-
Ireland	15,916	19,128	18,910	27,499	19,443	16,856	15,000	10,000	13,900	15,450
Netherlands	4,423	481	1,939	1,514	2,790	1,735	5,000	6,400	1,270	1,550
Poland	6	-	-	-	-	-	-	-	-	-
UK (N.Ireland)	1	6	2	1	2	-	-	-	-	-
USSR	1	-	-	-	-	-	-	-	-	-
Unallocated	-	-	1,752	1,110	-	-	13,000	11,000	8,204	11,785
Total	20,567	19,715	22,608	30,124	24,922	19,209	33,019	27,400	23,374	28,785

[1]Provisional.

Table 3.1.9 HERRING. Total catches (t) in North Irish Sea (Division VIIa), 1977-1986.

Country	1977	1978	1979	1980	1981
France	85	174	455[2]	1	-
Ireland	3,331	2,371	1,805	1,340	283
Netherlands	500	98	-	-	-
UK	11,498	8,432[1]	10,078[3]	9,272	4,094
Others	-	-	-	-	-
Total	15,414	11,075	12,338	10,613	4,377

Country	1982	1983	1984	1985	1986[5]
France	-	48[2]	-	-	-
Ireland	300	860	1,084	1,000	1,640
Netherlands	-	-	-	-	-
UK	3,375	3,025	2,982	4,077	4,376
Others	1,180[4]	-	-	4,110[4]	1,424[4]
Total	4,855	3,933	4,066	9,187	7,440

[1] Includes 68.5 t of spring-spawned herring.

[2] No data basis for allocation to stock.

[3] Additional unrecorded catch of 106 t estimated.

[4] Unallocated.

[5] Preliminary.

Table 3.2.2 Industrial landings from the fisheries for SANDEEL, SPRAT, and NORWAY POUT in the North Sea ('000 t), 1974-1986.

Year	Major fisheries					By-catch Annex V species[2]	Total
		Clupeoids		Gadoid species			
	Sandeel	Sprat	Herring	Norway pout	Blue whiting[1]		
1974	525	314	-	736	62	220	1,857
1975	428	641	-	560	42	128	1,799
1976	488	622	12	435	36	198	1,791
1977	786	304	10	390	38	147	1,675
1978	787	378	8	270	100	68	1,611
1979	578	380	15	320	64	77	1,434
1980	729	323	7	471	76	69	1,675
1981	569	209	84	236	62	85	1,245
1982	620	153	153	360	118	57	1,461
1983	537	91	155	423	118	38	1,362
1984	669	80	35	355	79	34	1,252
1985	621	50	63	197	73	29	1,033
1986[3]	851	16	40	174	37	23	1,141
1 Quarter[4]	13.0	7.8	5.5	37.9	5.6	10.1	79.8
2 Quarter[4]	603.6	5.5	1.4	5.3	17.3	3.2	636.3
3 Quarter[4]	222.4	0.4	9.6	45.2	10.8	4.1	292.5
4 Quarter[4]	11.7	2.7	23.6	86.1	3.1	5.3	132.5
Mean 1974-1985	611	295	54	396	72	96	1,516

[1] Anon. (1985).
[2] Anon (1984a, 1984b).
[3] Preliminary.
[4] For 1986; does not include Faroese data.

Table 3.2.3 Industrial landings from the fisheries for SANDEEL, SPRAT, and NORWAY POUT in Division IIIa ('000 t), 1974-1986[1].

Year	Major fisheries					Total
		Clupeoids		Gadoid species		
	Sandeel	Sprat[2]	Herring	Norway pout	Blue whiting	
1974	8	74	76	13	-	171
1975	17	101	57	19	-	197
1976	22	59	38	42	-	161
1977	7	73	32	21	-	132
1978	23	83	16	25	-	147
1979	34	101	13	25	6	179
1980	39	87	25	26	14	191
1981	59	79	63	30	+	231
1982	18	51	54	44	5	172
1983	28	29	89	30	16	192
1984	19	40	112	46	15	224
1985	6	29	116	9	19	179
1986	67	18	103	6	9	185
Mean 1974-1985	23	67	58	27	-	175[3]

[1]Data 1974-1984 from Anon. (1986b), 1985-1986 provided by Working Group members.
[2]Landings for human consumption included.
[3]Blue whiting excluded.

Table 3.2.4 NORWAY POUT. Annual landings (tonnes) in Division IIIa. (Data officially reported to ICES.)

Country	1971	1972	1973	1974	1975	1976	1977
Denmark	25,800	17,259	23,152	10,669	15,666	40,144	20,694
Faroes	-	-	643	-	-	-	-
Norway	296	-	-	62[2]	925[2]	50[2]	104
Sweden	-	-[4]	-[4]	-[4]	3,272	2,255	318
Total	26,096	17,259	23,795	10,731	19,863	42,449	21,116

Country	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Denmark	23,922	23,951	26,235	29,273	51,317	36,124	67,007	9,349	6,004[5]
Faroes	-	-	-	-	-	-	-	-	-
Norway	362	1,182	141	752	1,265	990	947	831	-
Sweden	591[3]	32	39	60	103	52	+	-	-
Total	24,875	25,165	26,415	30,085	52,685	37,166	67,954	10,180	6,004

[1] Preliminary (provided by WG members).

[2] Including by-catch.

[3] Includes North Sea.

[4] Included in the North Sea.

[5] Preliminary (provided by WG members).

Table 3.2.5 NORWAY POUT annual landings ('000 tonnes) in Sub-area IV by countries, North Sea, 1957-1986.

Year	Denmark	Faroes	Norway	Sweden	UK (Scotland)	Others	Total
1957	-	-	0.2	-	-	-	0.2
1958	-	-	-	-	-	-	-
1959	61.5	-	7.8	-	-	-	69.3
1960	17.2	-	13.5	-	-	-	30.7
1961	20.5	-	8.1	-	-	-	28.6
1962	121.8	-	27.9	-	-	-	14.7
1963	67.4	-	70.4	-	-	-	137.8
1964	10.4	-	51.0	-	-	-	61.4
1965	8.2	-	35.0	-	-	-	43.2
1966	35.2	-	17.8	-	-	+	53.0
1967	169.6	-	12.9	-	-	+	182.6
1968	410.8	-	40.9	-	-	+	451.8
1969	52.5	19.6	41.4	-	-	+	113.5
1970	142.1	32.0	63.5	-	0.2	0.2	238.0
1971	178.5	47.2	79.3	-	0.1	0.2	305.3
1972	259.6	56.8	120.5	6.8	0.9	0.2	444.8
1973	215.2	51.2	63.0	2.9	13.0	0.6	345.9
1974	464.5	85.0	154.2	2.1	26.7	3.3	735.8
1975	251.2	63.6	218.9	2.3	22.7	1.0	559.7
1976	244.9	64.6	108.9	+	17.3	1.7	435.4
1977	232.2	50.9	98.3	2.9	4.6	1.0	389.9
1978	163.4	19.7	80.8	0.7	5.5	-	270.1
1979	219.9	21.9	75.4	-	3.0	-	320.2
1980	366.2	34.1	70.2	-	0.6	-	471.1
1981	167.5	16.6	51.6	-	+	-	235.7
1982	256.3	15.4	88.0	-	-	-	359.7
1983	301.1	24.5[1]	97.3	-	+	-	422.9
1984	251.9	19.1[1]	83.8	-	0.1	-	354.9
1985	163.7	9.9	22.8	-	0.1	-	196.5
1986	146.3	6.6	21.5	-	-	-	174.4

[1] Including by-catch.

Table 3.2.6 NORWAY POUT. Annual landings (tonnes) in Division VIa. (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[3]	-	82[3]	-
Poland	-	-	-	75	-	-	-
UK (Scotland)[2]	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	1985	1986[1]
Belgium	-	-	-	-	-	-	-	-	-
Denmark	4,443	15,609	13,070	2,877	751	530	4,301	8,574[1]	...
Faroes	18,484	4,772	3,530	3,540	3,026	6,261	3,400	998	...
Germany, Fed. Rep.	-	-	-	-	-	-	70	-	-
Netherlands	21	98	68	182	548	1,534	-	139[1]	...
Norway	-	-	-	-	-	-	-	-	-
Poland	-	-	-	-	-	-	-	-	-
UK (Scotland)[2]	302	23	1,202	1,158	586	-	23	13	-
USSR	-	-	-	-	-	-	-	-	-
Total	23,250	20,502	17,870	7,757	4,911	8,325	7,794	9,697	...

[1] Preliminary.
[2] Amended using national data.
[3] Including by-catch.

Table 3.2.7 SANDEEL, Division IIIa. Landings in tonnes as officially reported to ICES except where indicated.

Country	1977	1978	1979	1980	1981
Denmark	6,082	21,731	33,305	39,357	59,408
Faroes	–	2	–	–	–
Sweden	432	1,121[2]	3	9	44

Country	1982	1983	1984	1985	1986
Denmark	21,540	34,286[1]	27,679[1]	6,271[1]	67,304
Faroes	–	–	–	–	–
Sweden	5	31	–	–	–

[1] Estimate provided by Working Group members.
[2] Includes North Sea.

Table 3.2.8.1 Sandeel catches ('000 t) from the North Sea divided into assessment areas.

Year	Shetland	Northern North Sea	Southern North Sea
1975	12.9	235.7	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
1985	17.2	79.7	513.5
1986	14.0	375.1	457.5

Table 3.2.8.2 Landings of SANDEEL from the North Sea, 1952-1986, in '000 t.

Year	Denmark	Germany, Fed.Rep.	Faroes	Nether-lands	Norway	Sweden	UK	Total
1952	1.6	-	-	-	-	-	-	1.6
1953	4.5	+	-	-	-	-	-	4.5
1954	10.8	+	-	-	-	-	-	10.8
1955	37.6	+	-	-	-	-	-	37.6
1956	81.9	5.3	-	+	1.5	-	-	88.7
1957	73.3	25.5	-	3.7	3.2	-	-	105.7
1958	74.4	20.2	-	1.5	4.8	-	-	100.9
1959	77.1	17.4	-	5.1	8.0	-	-	107.6
1960	100.8	7.7	-	+	12.1	-	-	120.6
1961	73.6	4.5	-	+	5.1	-	-	83.2
1962	97.4	1.4	-	-	10.5	-	-	109.3
1963	134.4	16.4	-	-	11.5	-	-	162.3
1964	104.7	12.9	-	-	10.4	-	-	128.0
1965	123.6	2.1	-	-	4.9	-	-	130.6
1966	138.5	4.4	-	-	0.2	-	-	143.1
1967	187.4	0.3	-	-	1.0	-	-	188.7
1968	193.6	+	-	-	0.1	-	-	193.7
1969	112.8	+	-	-	-	-	0.5	113.3
1970	187.8	+	-	-	+	-	3.6	191.4
1971	371.6	0.1	-	-	2.1	-	8.3	382.1
1972	329.0	+	-	-	18.6	8.8	2.1	358.5
1973	273.0	-	1.4	-	17.2	1.1	4.2	296.9
1974	424.1	-	6.4	-	78.6	0.2	15.5	524.8
1975	355.6	-	4.9	-	54.0	0.1	13.6	428.2
1976	424.7	-	-	-	44.2	-	18.7	487.6
1977	664.3	-	11.4	-	78.7	5.7	25.5	785.6
1978	647.5	-	12.1	-	93.5	1.2	32.5	786.8
1979	449.8	-	13.2	-	101.4	-	13.4	577.8
1980	542.2	-	7.2	-	144.8	-	34.3	728.5
1981	464.4	-	4.9	-	52.6	-	46.7	568.6
1982	506.9	-	4.9	-	46.5	0.4	52.2	610.9
1983	485.1	-	2.0	-	12.2	0.2	37.0	536.5
1984	596.3	-	11.3	-	28.3	-	32.6	668.5
1985	587.6	-	3.5	-	13.1	-	17.2	621.4
1986	752.5	-	4.2	-	82.1	-	12.0	850.6

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

Table 3.2.11 SANDEEL, Division VIa. Landings in tonnes, 1977-1986, as officially reported to ICES.

Country	1977	1978	1979	1980	1981
Denmark	-	-	-	109	-
Norway	54	-	-	-	-
UK (Scotland)	13	+	-	211	5,972

Country	1982	1983	1984	1985	1986
Denmark	-	-	-	-	-
Norway	-	-	-	-	-
UK (Scotland)	10,873	13,051	14,166	18,586	24,469

Table 3.2.12

Landings of SPRAT in Division IIIa and in the Norwegian fjords in Division IVa ('000 tonnes). (Data provided by Working Group members.)

Year	Skagerrak				Kattegat			Div. IIIa total	Fjords of western Norway (Div.IVa East)	Grand total
	Denmark	Sweden	Norway	Total	Denmark	Sweden	Total			
1974	17.9	2.0	1.2	21.1	31.6	18.6	50.2	71.3	3.3	74.6
1975	15.0	2.1	1.9	19.0	60.7	20.9	81.6	100.6	2.9	103.5
1976	12.8	2.6	2.0	17.4	27.9	13.5	41.4	58.8	0.6	59.4
1977	7.1	2.2	1.2	10.5	47.1	9.8	56.9	67.4	5.4	72.8
1978	26.6	2.2	2.7	31.5	37.0	9.4	46.4	77.9	5.2	83.1
1979	33.5	8.1	1.8	43.4	45.8	6.4	52.2	95.6	5.0	100.6
1980	31.7	4.0	3.4	39.1	35.8	9.0	44.8	83.9	2.9	86.8
1981	26.4	6.3	4.6	37.3	23.0	16.0	39.0	76.3	3.1	79.4
1982	10.5	6.7	1.8	19.0	21.4	4.8	26.2	45.2	6.0	51.2
1983	3.4	6.4	1.9	11.7	9.1	5.7	14.8	26.5	3.0	29.5
1984	13.2	5.4[2]	1.8	20.4	10.9	5.2	16.1	36.5	3.6	40.1
1985[1]	1.3	8.1[2]	2.5	11.9	4.6	5.4	10.0	21.9	7.1	29.0
1986[1]	0.4	6.6	1.1	8.1	0.9	9.0	9.9	18.0	1.8	19.8

[1] Preliminary figures.
[2] 14,000 t reported as clupeoid by-catch in the Skagerrak were not sampled, but 4,000 t of this are estimated to be sprat.

Table 3.2.13 SPRAT catches in the North Sea ('000 tonnes), 1977-1986. (Data provided by Working Group members.)

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
					Division IVa West					
Denmark	0.1	-	-	-	2.8	-	-	-	0.9	0.6
Faroe Islands	0.4	-	-	-	-	-	-	-	-	-
France	+	-	-	-	-	-	-	-	-	-
German Dem.Rep.	+	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	0.6	-	-	0.1	-	-	-	-	-	-
Netherlands	+	-	-	-	-	-	-	-	6.7	-
Norway	16.0	1.3	-	-	-	-	-	-	-	-
UK (Scotland)	26.9	16.9	6.8	3.8	1.0	+	-	+	-	+
USSR	+	-	-	-	-	-	-	-	-	-
Total	44.0	18.2	6.8	3.9	3.8	+	-	+	7.6	0.6
					Division IVa East (North Sea) stock					
Denmark	0.11	-	-	-	-	+	-	-	+	0.2
Norway	0.7	0.1	+	0.4	-	-	3.0	-	-	-
Total	0.8	0.1	+	0.4	-	+	3.0	-	+	0.2
					Division IVb West					
Denmark	57.5	44.1	75.3[2]	76.7[2]	53.6	23.1	32.6	5.6	1.8	0.4
Faroe Islands	1.8	-	2.8[2]	2.8[2]	-	-	-	-	-	-
France	+	-	-	-	-	-	-	-	-	-
German Dem. Rep.	0.7	-	-	-	-	-	-	-	-	-
Norway	5.5	56.2	47.8	18.3	0.2	8.6	-	-	-	-
UK (England)	51.9	53.9	12.9	2.4	-	-	-	+	-	-
UK (Scotland)	10.9	14.8	5.0	2.5	0.7	0.2	+	+	-	-
USSR	1.6	-	-	-	-	-	-	-	-	-
Total	123.9	169.0	143.8	102.7	54.5	31.9	32.6	5.6	1.8	0.4

[1] Preliminary figures as reported. (cont'd)

[2] Includes Division IVb East.

[3] Includes Division IVb West.

+ = less than 0.1.

- = magnitude known to be nil.

Table 3.2.13 (cont'd).

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
					Division IVb East					
Denmark	126.8	161.0	191.5	149.0	127.5	91.2	39.2	62.1	36.6	10.3
German Dem.Rep.	0.7	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	4.3	-	1.8	6.1	4.8	1.5	-	0.6	0.6	0.6[3]
Norway	-	29.8	27.4	33.7	0.2	7.2	12.0	3.9	-	-
Sweden	1.5	-	-	0.6	-	-	-	-	-	-
Total	133.3	190.8	222.7	189.4	132.5	99.9	51.2	66.6	37.2	10.9
					Division IVc					
Belgium	-	-	-	-	-	-	-	-	+	+
Denmark	1.4	-	1.5	6.5	4.3	2.4	1.0	0.5	+	0.1
France	+	-	-	-	-	-	-	-	-	+
German Dem.Rep.	+	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	0.4	-	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	0.1	-	-
Norway	-	0.2	3.1	16.2	-	3.7	-	3.5	-	-
UK (England)	0.2	-	1.4	4.3	14.0	14.9	3.6	0.9	3.4	4.1
Total	2.0	0.2	6.0	27.0	18.3	21.0	4.6	5.0	3.4	4.3
					Total North Sea					
Belgium	+	+	+	-	-	-	-	-	+	+
Denmark	179.9	205.1	268.3	232.2	188.2	116.6	72.6	68.1	39.5	11.7
Faroe Islands	2.2	-	2.8	2.8	-	-	-	-	-	-
France	+	-	-	-	-	-	-	-	-	+
German Dem.Rep.	1.4	-	-	-	-	-	-	-	-	-
Germany, Fed.Rep.	5.3	-	3.8	6.2	4.8	1.5	-	0.6	-	0.6
Netherlands	+	-	-	-	-	-	-	0.1	0.6	-
Norway	22.2	87.6	78.6	68.6	0.4	19.5	12.0	7.4	6.7	-
Poland	+	-	-	-	-	-	-	-	-	-
Sweden	1.5	-	-	0.6	-	-	-	-	-	-
UK (England)	52.1	53.9	14.3	6.7	14.0	14.9	3.6	0.9	3.4	4.1
UK (Scotland)	37.8	31.7	11.8	6.3	1.7	0.2	+	+	-	+
USSR	1.6	-	-	-	-	-	-	-	-	-
Total	304.0	378.3	379.6	323.4	209.1	152.7	88.2	77.2	50.2	16.4

[1]Preliminary figures as reported.

+ = less than 0.1.

- = magnitude known to be nil.

Table 3.2.14

SPRAT in Division VIa. Landings in t.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Denmark	-	259	-	-	242	-	-	-	-	-
Germany, Fed.Rep.	+	-	97	-	2	-	-	-	-	-
Ireland	282	533	12	1,787	790	287	-	192	-	-
Netherlands	49	46	125	428	892	2,156	1,447	-	-	-
Norway	267	-	-	-	-	24	-	-	-	-
UK (Scotland)[2]	4 246	11,563	1,087	2,987	1,488	1,057	1,971	2,438	2,933	509
Total	4,844	12,401	1,321	5,202	3,414	3,524	3,418	2,630	2,933	509

Source: ICES Statistician.
[1] Preliminary figures.
[2] Amended from national data.

Table 3.2.15

Nominal catch of SPRAT in Divisions VIId,e, 1977-1986.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985[1]	1986[1]
Belgium	-	-	-	-	-	-	3	-	-	-
Denmark	74	1,796	9,981	7,483	-	286	638	1,417	-	-
France	120	225	2,373	1,867	146	44	60	47	14	-
Germany, Fed.Rep.	-	34	6	52	1	-	-	-	-	-
Netherlands	115	826	441	1,401	1,015	1,533	2,350	589	-	-
Norway	-	-	-	65	-	-	-	-	-	-
UK (England + Wales)	2,928	2,118	2,032	6,864	10,183	4,749	4,756	2,402	3,771	1,084
Total	3,237	4,999	14,833	17,732	13,890	6,612	7,827	4,455	3,785	1,084

[1] Preliminary.

Table 3.3.1 Cod landings from the Kattegat, 1971-1986 (t).

Year	Denmark	Sweden	Fed.Rep. of Germany[1]	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	7,590	4,091	205	11,886
1985	9,052	3,640	14	12,706
1986[2]	6,930	2,054	94	9,078

[1] Landing statistics incompletely split on the Kattegat and the Skagerrak. The figures are estimated by the Working Group.

[2] Preliminary.

Table 3.3.2 Cod landings from the Skagerrak, 1971-1986 (t).

Year	Open Skagerrak					Norwegian Fjords
	Denmark	Sweden	Norway	Others	Total	Norway
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	-	675	19,853	-
1978	23,614	592	-	260	24,466	1,305
1979	14,007	1,279	-	213	15,499	1,752
1980	21,551	1,712	402	341	24,006	1,580
1981	25,498	2,835	286	294	28,913	1,792
1982	23,377	2,378	314	41	26,110	1,466
1983	18,467	2,803	346	163	21,784	1,520
1984	17,443	1,981	311	156	19,891	1,187
1985	14,521	1,914	193	-	16,628	990
1986[1]	18,424	1,505	174	-	20,103	917

[1] Preliminary.

Table 3.3.3 Nominal landings (tonnes) 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[2]	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	8,670	756	608	221	10,255
1984	7,837	321	499	30	8,687
1985[1]	7,652	279	351	15	9,314
1986[1]	4,092	226	148	5	4,471

[1] Preliminary.

[2] Includes Divisions IVa and IVb.

Table 3.3.4 Nominal landings (tonnes) 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	48	1,061	8	12,636
1984	12,694	51	1,168	60	13,973
1985[1]	12,671	45	654	2	13,372
1986[1]	15,865	64	460	1	16,390

[1] Preliminary.

Table 3.3.5 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	-	4,035
1982	2,717	201	-	2,918
1983	3,280	291	-	3,571
1984	3,252	323	32	3,607
1985	2,979	403	4	3,386
1986[1]	2,488	170	+	2,658

[1] Preliminary.

Table 3.3.6 Plaice landings from the Skagerrak (tonnes).

Year	Denmark	Sweden	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	594	133	14	7,739
1984	7,560	356	1,580	27	22	9,545
1985	9,646	296	2,225	136	18	12,321
1986[1]	10,653	215	2,170	55	24	13,117

[1] Preliminary.

Table 3.3.7 Catches (t) of SOLE from Division IIIa.

Year	Denmark	Sweden	Fed.Rep.of Germany	Netherlands	Belgium	Others	Total
1952	156	51	59	-	-	-	266
1953	159	48	42	-	-	-	249
1954	177	43	34	-	-	-	254
1955	152	36	35	-	-	-	223
1956	168	30	57	-	-	-	255
1957	265	29	53	-	-	-	347
1958	226	35	56	-	-	-	317
1959	222	30	44	-	-	-	296
1960	294	24	83	-	-	-	401
1961	339	30	61	-	-	-	430
1962	356	-	58	-	-	-	414
1963	338	-	27	-	-	-	365
1964	376	-	45	-	-	-	421
1965	324	-	50	-	-	-	374
1966	312	-	20	-	-	-	332
1967	429	-	26	-	-	-	455
1968	290	-	16	-	-	11	317
1969	261	-	7	-	-	-	268
1970	183	-	-	-	-	-	183
1971	288	-	9	-	-	-	297
1972	376	-	12	-	-	-	388
1973	327	-	13	-	-	-	340
1974	449	-	9	-	-	-	458
1975	458	16	16	9	-	-	498
1976	422	11	21	155	2	-	611
1977	517	13	8	276	1	-	815
1978	502	9	9	141	-	-	661
1979	376	8	6	84	1	-	475
1980	316	9	12	5	2	-	344
1981	271	7	16	-	1	-	295
1982	210	4	8	1	1	-	224
1983	262	11	15	31	-	-	319
1984	326	13	13	54	-	-	406
1985	396	19	1	132[1]	+	-	548
1986	623	25[1]	-	150[2]	-	-	798[1]

[1] Preliminary.

[2] Assumed.

Data from Bull. Stat.

Table 3.3.8.1 Pandalus borealis landings from Divisions IIIa and IVa eastern part ('000 tonnes).

Year	Skagerrak, Kattegat				Division IVa Norwegian Deep			
	Denmark[1]	Norway	Sweden	Total	Denmark[1]	Norway	Sweden	Total
1970	757	982	1,827	3,566	345	747	915	2,007
1971	834	1,392	1,548	3,774	356	1,094	1,358	2,808
1972	773	1,123	1,374	3,270	244	1,354	1,150	2,748
1973	716	1,415	1,194	3,325	39	918	936	1,893
1974	475	1,186	1,483	3,144	55	623	520	1,198
1975	733	1,576	1,751	4,060	84	763	252	1,099
1976	865	2,541	2,352	5,758	339	807	177	1,323
1977	763	2,257	1,906	4,926	357	747	113	1,217
1978	757	1,925	1,529	4,211	702	515	80	1,297
1979	973	2,612	1,752	5,337	89	428	35	552
1980	1,678	3,666	2,121	7,465	-	896	38	934
1981	2,593	3,943	2,210	8,746	-	1,240	31	1,271
1982	2,623	3,693	1,359	7,675	1,083	1,349	91	2,523
1983	1,325	3,723	1,037	6,085	242	1,638	99	1,979
1984	1,641	3,509	933	6,083	159	1,245	120	1,524
1985	3,677	4,772	1,474	9,923	340	1,841	130	2,311
1986[2]	4,102	4,524	1,306	9,932	764	1,649	157	2,570

[1] 1982-1986 total Danish catch distributed on areas according to log-book data.

[2] Preliminary.

Table 3.3.8.2 Pandalus Division IIIa. CPUE and estimates of effort indices, 1982-1986.

Year	Denmark				Sweden				Norway			Total relative effort index[1]
	C/f (kg/day)	C (tonnes)	f (days)	Relative effort	C/f (kg/hr)	C (tonnes)	f (hrs)	Relative effort	C (tonnes)	f (hrs)	Relative effort	
1982	561	2,623	4,677	1.00	28.8	1,359	47,187	1.00	3,693	128,229	1.00	1.00
1983	535	1,325	2,476	0.53	23.9	1,037	43,389	0.92	3,723	155,774	1.21	1.01
1984	474	1,641	3,462	0.74	25.3	933	36,877	0.78	3,509	138,696	1.08	0.94
1985	726	3,677	5,068	1.08	32.1	1,474	45,919	0.97	4,772	148,660	1.16	1.10
1986	571	4,102	7,185	1.54	29.3	1,306	44,588	0.94	4,524	154,403	1.20	1.31

[1] Weighted by landings.

Table 3.3.8.3 Catch per unit effort of the Danish (kg/day) and Swedish (kg/hr) fisheries and calculated effort indices for the Norwegian Deeps within Division IVa.

Year	Denmark				Sweden				Norway			Total relative effort
	CPUE (kg/day)	Catch (tonnes)	Effort (days)	Relative effort	CPUE (kg/hr)	Catch (tonnes)	Effort (hrs)	Relative effort	Catch (tonnes)	Effort (hrs)	Relative effort	
1982	471	1,083	2,299	1.00	42.2	91	2,156	1.00	1,349	31,967	1.00	1.00
1983	470	242	515	0.22	34.5	99	2,870	1.33	1,638	47,478	1.88	1.32
1984	279	159	570	0.25	24.7	120	4,858	2.25	1,245	50,405	1.58	1.49
1985	465	340	731	0.32	30.1	130	4,319	2.00	1,841	61,163	1.91	1.68
1986[1]	486	764	1,572	0.68	34.0[2]	157	4,618	2.14	1,649	48,500	1.52	1.31

[1] Preliminary.

[2] No fishing in the third quarter.

Table 3.3.8.4 Landings (tonnes) of *Pandalus borealis* from Division IVa, the Fladen Ground.

Year	Denmark	Federal Republic of Germany	Norway	UK (Scotland)	Total
1970	3,115	-	-	103	3,218
1971	3,216	33	-	439	3,688
1972	2,204	-	-	187	2,391
1973	157	-	-	163	320
1974	282	-	-	434	716
1975	1,308	-	-	525	1,833
1976	1,522	-	-	1,937	3,459
1977	425	-	112	1,692	2,229
1978	890	-	81	2,027	2,998
1979	565	-	44	268	877
1980	1,122	-	76	377	1,575
1981	685	-	1	347	1,033
1982	283	-	-	352	635
1983	5,729	-	8	1,827	7,564
1984	4,553	-	13	25	4,591
1985	3,649	-	-	1,341	4,990
1986	3,416	-	-	301	3,717

Table 3.4.1 The North Sea demersal fisheries. Projection of catches in 1988 under varying options of F in the human consumption (HC) fishery relative to 1986.

HC F(88)/F(86)	Cod	Haddock	Whiting	Saithe
0.4	96 96	107 113	48 81	111 112
0.5	115 115	128 135	59 91	134 136
0.6	132 132	148 154	69 100	155 156[1]
0.7	148 148[1]	166 172	78 109	175 177
0.8	162 162	182 188[1]	87 117	194 196
0.9	175 175	197 203	95 125	212 214
1.0	186 186	211 217	104 134[1]	228 230
1.1	197 197	224 229	111 140	244 246
1.2	207 207	236 241	118 147	258 260

Upper figure: HC landings.
Lower figure: Total landings.
[1] Recommended.

Table 3.4.2 Nominal catch (in tonnes) of COD in Sub-area IV, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	10,346	17,473	12,576	9,630	8,744
Denmark	42,582	41,858	48,509	56,404	64,968
Faroe Islands	260	56	113	150	38
France	7,511	11,944	12,559	10,910	11,369
German Dem.Rep.	21	75	84	63	-
Germany, Fed.Rep.	22,663	37,040	20,411	26,343	29,741
Ireland	136	174	1	-	-
Netherlands	29,903	48,817	34,752	45,400	51,281
Norway[2]	1,449	2,747	3,575	4,506	6,766
Poland	381	115	142	28	7
Sweden	36	...[3]	298	293	321
UK (England & Wales)	35,424	59,127	54,923	49,951	59,856
UK (Scotland)	34,406	41,984	42,811	45,044	53,921
USSR	-	17	17	-	-
Total IV	185,118	261,427	230,771	248,722	287,012
WG total	181,121	260,890	248,051	260,278	300,599

Country	1982	1983	1984	1985	1986[1]
Belgium	6,604	6,704	5,804	4,815	6,707
Denmark	61,454	48,828	46,751	41,737	28,646
Faroe Islands	65	361	-	71	58
France	8,399	7,159	8,129	4,834	7,024[4]
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep.	18,525	20,333	13,453	7,679	5,468
Ireland	-	-	-	-	-
Netherlands	36,490	34,111	25,460	30,844	24,500
Norway[2]	12,163	6,625	7,005	5,022	5,850
Poland	62	75	7	-	10
Sweden	453	422	575	748	511[5]
UK (England & Wales)	54,277	53,860	35,605	60,931	24,287
UK (Scotland)	57,308	58,581	54,359	60,554	45,654
USSR	-	-	-	-	-
Total IV	255,800	237,059	197,148	186,004	148,715
WG total	255,934	229,499	206,014	192,253	157,000

[1] Provisional.
[2] Figures from Norway do not include cod caught in Rec. 2 fisheries.
[3] Included in Division IIIa.
[4] Includes Division IIa.
[5] Jan-Nov.

Table 3.4.3 Nominal catch (in tonnes) of HADDOCK in Sub-area IV, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	2,293	1,295	732	1,414	1,217
Denmark	20,069	8,093	8,248	12,928	13,198
Faroe Islands	385	12	7	27	46
France	6,914	5,122	7,208	7,407	11,966
German Dem. Rep.	8	37	12	36	-
Germany, Fed. Rep.	3,744	2,589	2,549	2,354	3,387
Ireland	53	101	-	-	-
Netherlands	1,598	857	955	1,557	2,279
Norway[2]	374	609	968	1,191	2,283
Poland	485	62	106	59	31
Sweden	113	-[3]	907	1,165	1,301
UK (England and Wales)	17,167	12,200	10,774	12,195	14,570
UK (Scotland)	89,465	58,406	54,119	64,058	82,798
USSR	8,010	54	18	-	-
Total IV	150,678	89,437	86,603	104,391	133,076
WG total incl.discards	207,788	163,890	141,858	217,107	206,930

Country	1982	1983	1984	1985	1986[1]
Belgium	966	985	494	719	329
Denmark	22,704	25,653	16,368	23,619	17,650
Faroe Islands	6	51	-	5	20
France	15,988	11,250	8,103	5,389	7,060[4]
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	4,510	3,654	2,571	2,796	1,945
Ireland	-	-	-	-	-
Netherlands	1,021	1,722	1,052	3,875	1,614
Norway[2]	2,888	3,862	3,959	3,256	4,300
Poland	317	150	17	-	-
Sweden	1,874	1,360	1,518	1,942	1,703[5]
UK (England and Wales)	16,403	15,476	12,340	13,274[6]	7,745
UK (Scotland)	107,773	100,390	87,479	112,549	126,475
USSR	-	-	-	-	-
Total	174,450	164,553	133,901	167,424	168,841
WG total incl.discards	225,789	232,203	213,252	250,000	220,000

[1] Provisional.
[2] Figures from Norway do not include haddock caught in Rec. 2 fisheries.
[3] Included in Division IIIa.
[4] Includes Division IIa.
[5] Jan-Nov.
[6] Foreign landings not included.

Table 3.4.4 Nominal catch (in tonnes) of WHITING in Sub-area IV, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	3,275	3,304	3,941	3,153	2,623
Denmark	46,479	15,741	41,965	17,916	16,430
Faroe Islands	472	42	581	21	12
France	17,592	22,525	27,590	23,626	24,744
German Dem. Rep.	-	22	5	-	-
Germany, Fed. Rep.	461	348	1,280	1,267	601
Ireland	9	38	-	-	-
Netherlands	9,406	11,030	13,417	14,389	14,600
Norway	33	64	49	27	27
Poland	445	8	3	1	-
Sweden	341	...[2]	31	16	9
UK (England and Wales)	6,185	7,542	7,581	6,778	5,964
UK (Scotland)	33,017	42,779	44,841	42,218	31,399
USSR	2,413	-	-	-	-
Total Sub-area IV	120,128	103,443	141,284	109,412	96,409
WG total incl.discards	345,539	179,192	236,712	215,979	182,272

Country	1982	1983	1984	1985	1986[1]
Belgium	2,272	2,864	2,798	2,177	2,282
Denmark	27,043	18,054	19,771	16,142[1]	17,762
Faroe Islands	57	18	-	6	-[2]
France	23,780	21,263	19,209	10,853	11,840[4]
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	223	317	286	226	283
Ireland	-	-	-	-	-
Netherlands	12,218	10,935	8,767	6,973	13,670
Norway	17	39	88	90[1]	81
Poland	-	1	2	-	-
Sweden	11	44	53	22	29[3]
UK (England and Wales)	4,743	4,366	5,017	4,967[5]	3,598
UK (Scotland)	29,640	41,248	42,967	30,398	29,092
USSR	-	-	-	-	-
Total Sub-area IV	100,004	99,149	98,958	71,854	78,639
WG total incl.discards	131,881	154,236	139,000	97,000	151,000

[1] Provisional.
[2] Included in Division IIIa.
[3] Jan-Nov.
[4] Includes Division IIa.
[5] Foreign landings not included.

Table 3.4.5 Nominal catch (tonnes) of SAITHE in Sub-area IV and Division IIIa, 1977-1986. (Data for 1977-1985 from Bulletin Statistique).

Country	1977	1978	1979	1980	1981
Belgium	107	44	14	13	12
Denmark	17,334	10,372	10,461	10,370	6,454
Faroe Islands	318	213	407	1,020	614
France	41,022	38,122	40,983	37,306	42,649
German Dem. Rep.	2,430	2,404	1,504	925	-
Germany, Fed. Rep.	26,860	25,982	18,780	11,095	8,246
Ireland	126	88	-	-	-
Netherlands	7,270	5,135	1,466	245	123
Norway	14,949	17,627	17,575	47,959	55,882
Poland	12,378	5,661	6,104	2,404	698
Sweden	1,275	990	211	342	156
UK (England and Wales)	6,822	8,382	6,256	4,879	4,309
UK (Scotland)	11,366	14,330	6,257	6,525	6,529
USSR	46,385	10,161	2,015	-	-
Sub-total	288,642	139,511	114,033	123,083	125,672
By catch from industrial fisheries:					
Denmark[2]	1,805	72	493	-	-
Norway[2]	4,392	2,494	1,142	363	1,280
Total	394,839	142,077	115,668	123,446	126,952

Country	1982	1983	1984	1985	1986[1]
Belgium	4	7	32	31	17
Denmark	10,114	10,530	8,526	8,431	10,262
Faroe Islands	746	806	-	895	435
France	47,064	38,782	43,592	42,200	56,826[4]
German Dem. Rep.	-	-	-	-	-
Germany, Fed. Rep.	13,517	13,649	25,262	22,551	20,872
Ireland	-	-	-	-	-
Netherlands	36	89	181	233	134
Norway	70,464	78,135	90,497	93,406	62,000
Poland	793	415	413	-	495
Sweden	372	548	522	1,764	1,737[5]
UK (England and Wales)	5,627	6,845	8,183	981[3]	821
UK (Scotland)	8,136	6,321	6,970	9,932	14,936
USSR	-	-	-	-	-
Sub-total	156,873	156,127	184,178	180,424[1]	168,535
By catch from industrial fisheries:					
Denmark[2]	-	-	-	-	-
Norway[2]	5,003	1,445	5,616	7,895	1,126
Total	161,876	157,572	189,794	188,319[1]	169,661

[1] Preliminary.
[2] Data from national labs.
[3] Foreign landings not included.
[4] Includes Division IIa.
[5] Jan-Nov.

Table 3.5.2 Nominal catch (in tonnes) of COD in Division VIa, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	-	-	4	57	30
Denmark	-	-	-	27[2]	-
Faroe Islands	43	-	40	3	-
France	3,583	4,499	4,590	5,495	7,601
Germany, Fed. Rep.	3	31	40	1	21
Ireland	984	1,214	2,237	2,331	2,725
Netherlands	5	3	20	1	-
Norway	29	40	32	48	40
Spain	20[2]	108[2]	-	-	-
Sweden	-	-	-	-	-
UK (England and Wales)	2,434	2,082	2,348	2,302	3,187[3]
UK (Scotland)	5,513	5,539	6,929	7,603	10,339
UK (Northern Ireland)	5	5	2	2	7
Total	12,619	13,521	16,242	17,870	23,950

Country	1982	1983	1984	1985	1986[1]
Belgium	35	21	22	48	94
Denmark	3	-	-[1]	-	-
Faroe Islands	2	-	-[1]	-	-
France	7,160	8,140	7,637	7,411	8,386[4]
Germany, Fed. Rep.	8	205	75	66	76[5]
Ireland	3,527	2,695	2,316	2,564	970
Netherlands	-	-	-	1	-
Norway	238	267[1]	231	204	171
Spain	41	52	64	28	-
Sweden	1	-	-	-	-
UK (England and Wales)	2,948	1,141	692	170[6]	61
UK (Scotland)	7,969	8,933	9,483	8,032	4,246
UK (Northern Ireland)	33	37	32	17	63
Total	21,965	21,491	20,552	18,541	14,067

[1] Provisional.

[2] Includes Division VIb.

[3] Including 37 tonnes caught in Sub-area VI and landed abroad.

[4] Includes Divisions VIb and Vb.

[5] Includes Division VIb.

[6] Foreign landings not included.

Table 3.5.3 Nominal catch (in tonnes) of COD in Division VIb, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Denmark	–	–	–	–[2]	2
Faroe Islands	40	10	92	75	4
France	3	1	2	1	443
Germany, Fed. Rep.	–	–	111	136	–
Ireland	–	3	–	–	134
Norway	3	69	138	80	70
UK (England and Wales)	89	285	129	1	67
UK (Scotland)	33	384	198	370	143
Total	168	752	670	696	863
Country	**1982**	**1983**	**1984**	**1985**	**1986[1]**
Denmark	–	–	–	–	–
Faroe Islands	77	112	18	–	–
France	27	97	9	17	–
Germany, Fed. Rep.	+	195	–	3	...[2]
Ireland	–	–	–	–	...[2]
Norway	51	462[1]	373[1]	204	–
Spain	58	42	241	1,200	98
UK (England and Wales)	3	163	161	111[3]	65
UK (Scotland)	157	35	221	437	169
Total	373	1,106	1,023	1,972	332

[1] Provisional.

[2] Included in Division VIa.

[3] Foreign landings not included.

Table 3.5.4 Nominal catch (in tonnes) of HADDOCK in Division VIa, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	-	-	2	3	1
Denmark	-	-	37	-	-
Faroe Islands	-	-	2	-	-
France	3,401	4,255	4,786	2,808	3,403
Germany, Fed. Rep.	+	20	2	3	7
Ireland	616	441	877	726	1,891
Netherlands	28	13	2	2	3
Norway	7	13	9	16	29
Spain	-	-	-	-	-
UK (England & Wales)	3,827	2,805	1,654	1,279	1,052
UK (Scotland)	11,422	9,629	7,459	8,198	12,051
UK (Northern Ireland)	-	-	-	+	-
Total	19,301	17,176	14,830	13,935	18,437
WG total incl.discards	23,657	19,510	28,847	17,478	33,306

Country	1982	1983	1984	1985	1986[1]
Belgium	2	1	6	7	-
Denmark	+	-	-[1]	-	-
Faroe Islands	-	-	-	-	-
France	3,760	4,520	4,240	5,930	3,553[2]
Germany, Fed. Rep.	71	65	83	38	27
Ireland	4,402	3,450	3,932	3,512	1,427
Netherlands	391	25	-[1]	-	-
Norway	37	68	32[1]	75	55
Spain	97	201	-	166	-
UK (England & Wales)	2,035	1,376	1,042	303	188
UK (Scotland)	19,249	21,593	18,472	15,036	12,953
UK (Northern Ireland)	1	4	5	1	40
Total	30,045	31,303	27,942	25,068	18,243
WG total incl.discards	39,681	37,630	46,364	41,737	27,000

[1] Provisional.

[2] Includes Divisions VIb and Vb.

Table 3.5.5 Nominal catch (in tonnes) of HADDOCK in Division VIb, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Faroe Islands	3	11	20	5	1
France	4	3	4	1	10
Germany, Fed. Rep.	-	-	-	17	-
Ireland	-	61	-	-	-
Norway	+	4	16	2	10
Spain	-	-	-	6	88
UK (England & Wales)	2,694	2,365	1,654	6,261	9,005
UK (Scotland)	297	2,060	548	1,051	27
Total	42,998	4,504	2,242	7,343	9,141

Country	1982	1983	1984	1985	1986[1]
Faroe Islands	21	3	3	1	-
France	32	48	12	116	...[2]
Germany, Fed. Rep.	4	1	-	4	...[2]
Ireland	-	-	-	-	-
Norway	3	20	45	29	90
Spain	121	79	128	892	-
UK (England & Wales)	3,736	113	788	1,738	604
UK (Scotland)	5	136	1,654	6,397	2,869
UK (Northern Ireland)	-	-	-	-	84
Total	3,922	400	2,630	9,177	3,647

[1] Provisional.

[2] Included in Division VIa.

Table 3.5.6 Nominal catch (in tonnes) of WHITING in Division VIa, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	-	-	-	+	-
Denmark	-	119	92	32	-
Faroe Islands	-	-	770	-	-
France	3,395	3,610	2,779	2,609	1,637
Germany, Fed.Rep.	1	2	4	1	49
Ireland	2,752	2,080	2,791	4,407	8,148
Netherlands	78	23	17	2	6
Spain	763[2]	-	-	-	-
UK (England & Wales)	520	669	320	227	145
UK (Scotland)	9,873	8,174	10,613	7,386	8,519
UK (N. Ireland)	-	-	-	-	-
Total	17,382	14,677	17,386	14,664	18,504
WG total	17,411	14,677	17,081	12,816	12,203
Country	1982	1983	1984	1985	1986[1]
Belgium	2	-	-	3	-
Denmark	+	-	-	-	-
Faroe Islands	-	-	-	-	-
France	1,798	2,029	1,887	1,502	1,998[3]
Germany, Fed.Rep.	53	43	6	9	3[2]
Ireland	3,406	3,578	3,454	1,917	1,569
Netherlands	285	811	-	14	-
Spain	99	76	40	61	50
UK (England & Wales)	166	157	162	50[4]	38
UK (Scotland)	8,419	10,019	11,270	9,051	5,847
UK (N. Ireland)	7	52	40	17	13
Total	14,235	16,765	16,859	12,624	9,518
WG total	13,871	15,971	15,902	13,000	8,000

[1] Provisional.

[2] Includes Division VIb.

[3] Includes Divisions VIb and Vb.

[4] Foreign landings not included.

Table 3.5.7 Nominal catch (in tonnes) of WHITING in Division VIb, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Denmark	-	-	-	-	...[2]	-	-	-	-	-	
France	-	-	-	-	3	-	-	-	3	2	...[2]
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-	-	...[2]
Ireland	-	-	1	-	-	-	-	-	-	-	-
Spain	-	...[2]	-	-	-	196	112	88	16	123	-
UK (Engl.& Wales)	3	2	5	1	+	-	-	+	2	+[3]	-
UK (Scotland)	15	5	24	2	59	+	-	5	25	6	5
Total	18	7	30	3	62	196	112	93	46	131	5

[1] Provisional.
[2] Included in Division VIa.
[3] Foreign landings not included.

Table 3.5.8 Nominal catch (tonnes) of SAITHE in Sub-area VI from 1977-1986. (Data for 1977-1985 from Bulletin Statistique.)

Country	1977	1978	1979	1980	1981
Belgium	-	-	1	2	2
Denmark	-	-	-	-	-
Faroe Islands	11	-	14	4	3
France	19,686	21,519	15,662	15,427	16,654
Germany, Fed. Rep.	254	604	131	49	581
Ireland	240	266	246	295	250
Netherlands	531	623	256	91	-
Norway	91	122	20	62	25
Spain	346	-	-	-	120
UK (England and Wales)	2,758	3,193	1,765	1,594	1,364
UK (Northern Ireland)	9	27	11	9	10
UK (Scotland)	4,628	5,181	3,602	2,902	3,117
Total	28,554	31,535	21,708	20,435	22,126

Country	1982	1983	1984	1985	1986[1]
Belgium	-	-	-	2	-
Denmark	4	-	-	-	-
Faroe Islands	5	-	-	-	-
France	17,102	13,470	19,706	19,120	18,363[2]
Germany, Fed. Rep.	441	179	713	838	3,239
Ireland	322	698	599	670	582
Netherlands	-	32	-	-	-
Norway	19	55	66	22	79
Spain	243	330	882	624	-
UK (England and Wales)	1,966	2,760	1,800	435[3]	323
UK (Northern Ireland)	7	12	49	15	21
UK (Scotland)	2,141	2,642	3,170	3,118	2,862
Total	22,250	26,178	26,985	24,844	25,469

[1] Preliminary.
[2] Includes Division Vb.
[3] Foreign landings not included.

Table 3.5.9 Nominal catch (in tonnes) of COD in Divisions VIId and VIIe, 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	53	435	699	163	363
Denmark	1,120	2,160	2,052	660[2]	-
France	5,185	8,044	4,848	4,001	4,486
Netherlands	1	+	-	-	4
UK (England and Wales)	581	654	485	365	428
Total	6,940	11,293	8,084	5,189	5,281
Country	**1982**	**1983**	**1984**	**1985**	**1986[1]**
Belgium	293	389	346	513	568
Denmark	-	-	-	-	-
France	3,349	3,369	2,882	2,948	12,335[3]
Netherlands	1	4	-	1	-
UK (England and Wales)	568	650	518	569[4]	902
Total	4,211	4,412	3,746	4,031	13,805

[1] Provisional.

[2] Includes Divisions VIIb,c.

[3] Includes all of Sub-areas VII (except Division VIIa) and VIII.

[4] Foreign landings not included.

Table 3.5.10 Nominal catch (in tonnes) of WHITING in Divisions VIId and VIIe in 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	36	85	92	85	102
Denmark	–	1	2,585	6	2
France	8,886	8,010	5,352	7,690	8,842
Ireland	11	12	–	13	–
Netherlands	1	2	1	2	2
UK (England & Wales)	1,342	1,038	930	839	1,136
Total	10,276	9,148	8,960	8,635	10,084
Country	**1982**	**1983**	**1984**	**1985**	**1986[1]**
Belgium	101	94	83	84	67
Denmark	–	–	–	–	–
France	8,051	5,708	7,239	8,107	11,706[2]
Ireland	–	–	–	–	–
Netherlands	70	399	–	–	–
UK (England & Wales)	1,222	1,210	811	604[3]	741
Total	9,444	7,411	8,133	8,795	12,514

[1] Provisional.
[2] Includes all of Sub-areas VII (except Division VIIa) and VIII.
[3] Foreign landings not included.

Table 3.5.11.1 Nominal catch (in tonnes) of COD in Divisions VIIb,c and VIIh,j,k, 1977-1986. (Data for 1977-1985 as offically reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	1	-	-	-	-
Denmark	-	-	18	-	-
France	321	443	546	983	1,465
Germany, Fed. Rep.	-	-	-	7	-
Ireland	298	293	480	782	1,434
Netherlands	291	279	-	5	-
Norway	+	-	-	-	-
Poland	6	-	2	-	-
Spain	51	11	-	17	37
UK (England and Wales)	3	-	1	1	171
UK (Scotland)	-	2	1	12	+
Total	971	1,028	1,048	1,807	3,107
Country	1982	1983	1984	1985	1986[1]
Belgium	-	-	-	-	8
Denmark	-	-	-	-	-
France	587	636	946	1,115	...[2]
Germany, Fed. Rep.	-	-	-	-	-
Ireland	1,764	1,192	1,211	1,176	786
Netherlands	+	80	-	-	-
Norway	-	4	1	25[1]	102
Poland	-	-	-	-	-
Spain	29	28	-	-	-
UK (England and Wales)	304	41	408	135[3]	103
UK (Scotland)	-	-	45	-	9
Total	2,684	1,981	2,611	2,451	1,008

[1] Provisional.

[2] Included in Divisions VIId,e.

[3] Foreign landings not included.

Table 3.5.11.2 Nominal catch (in tonnes) of HADDOCK in Divisions VIId and VIIe, 1977-1986. (Data for 1977-1985 as officially reported to ICES).

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	1	-	1	+	2	1	1	-	3	2
Denmark	2	22	21	15	-	-	-	-	-	-
France	438	356	333	298	421	344	232	273	138	3,222[2]
Ireland	4	-	-	+	-	-	-	-	-	-
Netherlands	-	-	-	-	-	94	1	-	-	-
UK (Engl.& Wales)	29	22	51	59	119	60	41	26	27[3]	20
Total	474	400	406	372	542	499	275	299	168	3,244

[1] Provisional.

[2] Includes all of Sub-areas VII and VIII.

[3] Foreign landings not included.

Table 3.5.11.3 Nominal catch (in tonnes) of HADDOCK in Divisions VIIb,c and VIIg-k, 1977-1986. (Data for 1977-1985 as officially reported to ICES).

Country	1977	1978	1979	1980	1981
Belgium	13	5	2	2	3
Denmark	-	-	1	-	-
France	2,244	1,479	1,931	2,219	2,571
Ireland	153	111	155	274	679
Netherlands	1	-	16	-	-
Norway	-	-	-	-	-
Spain	294	-	-	5	277
UK (England and Wales)	18	13	19	50	92
UK (Scotland)	-	8	22	56	4
Total	2,273	1,616	2,146	2,606	3,626

Country	1982	1983	1984	1985	1986[1]
Belgium	3	1	-	2	2
Denmark	-	-	-	-	-
France	2,005	2,588	3,001	2,258	...[2]
Ireland	904	941	646	794	332
Netherlands	7	-	-	-[1]	-
Norway	-	57	17	46[1]	70
Spain	248	167	532	561	-
UK (England and Wales)	182	23	309	45[3]	636
UK (Scotland)	-	-	63	7	2,875
UK (Northern Ireland)	-	-	-	-	84
Total	3,349	3,777	4,568	3,713	3,999

[1] Provisional.
[2] Included in Divisions VIId,e.
[3] Foreign landings not included.

Table 3.5.11.4 Nominal catch (in tonnes) of WHITING in Divisions VIIb,c and VIIh-k, in 1977-1986. (Data for 1977-1985 as officially reported to ICES.)

Country	1977	1978	1979	1980	1981
Belgium	8	-	-	-	-
France	336	419	444	656	516
Germany, Fed. Rep.	1	45	-	+	-
Ireland	1,191	1,160	2,589	3,499	3,550
Netherlands	25	-	1	1	21
Spain	-	-	-	-	-
UK (England and Wales)	1	-	-	-	67
UK (Scotland)	2	1	1	80	1
Total	1,564	1,625	3,035	4,236	4,155

Country	1982	1983	1984	1985	1986[1]
Belgium	-	-	-	-	1
France	204	356	398	583	...[2]
Germany, Fed. Rep.	-	-	-	-	-
Ireland	4,011	2,590	1,872	2,719	2,198
Netherlands	78	363	169	90	-
Spain	85	91	57	76	-
UK (England and Wales)	49	18	58	71	36
UK (Scotland)	-	-	4	-	-
Total	4,427	3,418	2,558	3,539	2,235

[1] Provisional.
[2] Included in Divisions VIId,e.

Table 3.5.11.5 Nominal catch (in tonnes) of SAITHE in Sub-area VII for 1977-1986. (Data for 1977-1985 from Bulletin Statistique.)

Country	1977	1978	1979	1980	1981
Belgium	10	9	9	19	12
Denmark	1	19	7	6	-
France	2,591	2,105	1,699	2,317	4,563
Germany, Fed. Rep.	15	16	3	46	-
Ireland	1,083	1,451	1,632	2,220	2,197
Netherlands	52	44	35	84	100
Norway	-	-	-	-	-
Poland	1	-	-	-	-
Spain	632	-	-	-	266
UK (England & Wales)	144	89	61	109	236
UK (Isle of Man)	-	-	41	19	36
UK (N. Ireland)	423	343	276	301	577
UK (Scotland)	10	106	34	56	94
Total	4,962	4,182	3,797	5,177	8,081
Country	**1982**	**1983**	**1984**	**1985**	**1986[1]**
Belgium	13	6	10	31	22
Denmark	-	-	-	-[1]	-
France	4,061	4,760	3,697	6,101	4,979[3]
Germany, Fed. Rep.	-	11	5	-	-
Ireland	2,367	2,383	2,374	2,177	1,079
Netherlands	22	7	-	-	-
Norway	-	3	+	3[1]	35
Poland	-	-	-	-	-
Spain	179	70	118	118	-
UK (England & Wales)	526	235	974	250[2]	206
UK (Isle of Man)	34	16	27	9	6
UK (N. Ireland)	872	668	411	665	643
UK (Scotland)	119	138	140	477	355
Total	8,193	8,297	7,756	9,831	7,325

[1] Preliminary.
[2] Foreign landings not included.
[3] Includes Sub-area VIII.

Table 3.6.1 Nominal catch (t) of COD in Division VIIa, 1977-1986 as reported to ICES.

Country	Year									
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	135	144	174	246	395	269	139	135	185	205
Denmark	-	-	-	-	6	-	-	-	-	-
France	1,370	1,022	1,125	1,009	1,178	1,066	815	912	1,782	1,490
Ireland	3,862	3,128	3,755	4,421	6,552	4,758	4,032	2,885	4,121	2,380
Netherlands	32	15	11	36	94	48	34	38	104	-
UK (England & Wales)	1,186	875	980	1,918	2,712	2,544	1,405	1,253	1,200	836
UK (Isle of Man)	-	-	297	232	221	161	103	98	119	75
UK (N. Ireland)	1,409	1,064	1,898	2,591	3,360	3,852	3,463	2,658	2,541	3,012
UK (Scotland)	60	79	118	286	376	583	336	669	1,038	442
Total	8,054	6,328	8,358	10,739	14,894	13,281	10,327	8,648	11,090	8,440
Unallocated	-	-57[2]	13	37	13	-	-312[2]	-265[2]	-607[2]	1,296
Total figures used by Working Group for stock assessment	8,054	6,271	8,371	10,776	14,907	13,381	10,015	8,383	10,483	9,736

[1]Preliminary.

[2]Over reporting.

Table 3.6.2 Nominal catch (tonnes) of WHITING in Division VIIa, 1976-1986 as officially reported to ICES and Working Group estimates of human consumption and discards.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[2]
Belgium	63	51	42	45	85	45	78	99	100	58
France	1,952	2,098	1,897	1,616	1,254	1,375	1,021	930	956	1,071
Ireland	4,821	4,562	3,847	5,546	5,362	4,204	3,047	4,276	5,521	3,078
Netherlands	24	12	11	10	12	14	18	10[1]	30	-
UK (Engl.+ Wales)	1,008	1,105	842	1,000	816	1,195	1,200	1,224	1,379	977
UK (N. Ireland)	2,692	3,089	2,946	3,954	9,052	9,927	5,218	5,660	8,382	4,957
UK (Scotland)	161	152	154	251	102	189	120	275	368	128
UK (Isle of Man)	-	-	372	243	346	268	127	68	57	23
Total human consumption	10,721	11,069	10,111	12,665	17,029	16,989	10,829	12,542	16,793	10,292
Unallocated	-517	-665	-219	0	0	230	-321	-981	-841	-522
Total human consumption figures used by the Working Group for stock assessment	10,204	10,404	9,892	12,665	17,029	17,219	10,508	11,561	15,952	9,740
Estimated industrial catches (Ireland only) Denmark	760	927	-	-	-	-	-	-	-	-
Estimated discards from *Nephrops* fishery	-	-	-	3,302	3,577	893	1,837	3,674	2,284	2,329

[1]As reported to EC.
[2]Preliminary.

Table 3.6.3 Nominal landings (t) of PLAICE in Division VIIa, 1977-1986.
(Data for 1977-1985 as officially reported to ICES.)

Country	Year									
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	110	109	151	214	231	130	195	118	285	373
France	141	110	152	104	51	60	99	38	110	108
Ireland	953	1,025	1,032	1,086	1,243	923	1,384	1,420	2,000	1,377
Netherlands	24	15	18	60	40	29	73[2]	30[2]	1,091[2]	-
UK (England & Wales)	1,422	1,792	1,817	2,139	2,117	1,868	1,666	2,301	2,294	1,739
UK (Isle of Man)	-	-	52	20	27	12	11	11	26	12
UK (N. Ireland)	165	173	161	139	132	159	183	203	198	278
UK (Scotland)	89	89	106	141	64	47	42	86	118	119
Others	-	-	-	-	1	-	-	-	-	-
Total	2,904	3,313	3,489	3,903	3,906	3,228	3,653	4,207	6,122	4,006
Discards[3]	-	-	-	-	-	-	-	-	-	250
Total figures used by Working Group for stock assessment	2,904	3,231	3,428	3,903	3,906	3,237	3,639	4,241	5,075	4,782

[1] Preliminary.

[2] EC figures.

[3] Estimated discards as a result of UK (Eng.+Wales) beam trawl by-catch restriction.

Table 3.6.4 Irish Sea SOLE. Nominal catches (tonnes) 1977-1986 as officially reported to ICES.

Country	Year									
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	566	453	779	1,002	884	669	544	425	589	920
Denmark	-	-	-	-	15	-	-	-	-	-
France	39	65	48	41	13	9	3	10	9	6
Ireland	84	127	134	229	167	161	203	187	180	100
Netherlands	227	177	247	169	186	138	224	113	546	-
UK (England & Wales)	160	189	290	367	311	277	219	230	266	636
UK (Isle of Man)	-	-	30	18	7	10	10	6	12	2
UK (N. Ireland)	49	57	47	44	41	31	33	38	36	57
UK (Scotland)	21	30	42	68	45	44	29	17	28	46
Total	1,147	1,098	1,617	1,938	1,669	1,339	1,265	1,026	1,666	1,767
Total figures used by Working Group for stock assessment	1,147	1,106	1,614	1,941	1,667	1,338	1,169	1,058	1,146	1,979

[1] Preliminary.

Table 3.6.5 Nominal catches of COD in Divisions VIIf and VIIg as used by WG in 1987.

Country	Year									
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	107	88	110	172	285	172	244	229	451	350
France	2,088	2,567	3,244	5,036	7,473	5,984	4,602	4,900	5,237	6,916
Ireland	17	30	72	246	108	142	274	204	198	226
UK (England & Wales)	59	67	81	199	299	302	188	287	307	261
Others	-	-	-	7	-	-	-	-	-	-
Total	2,271	2,752	3,507	5,660	8,165	6,600	5,308	5,620	6,193	7,753

[1]Preliminary.

Table 3.6.6 Nominal catches of WHITING in Divisions VIIf and VIIg as used by the Working Group in 1987.

Country	Year									
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	97	66	100	72	102	70	120	154	164	101
France	5,737	6,620	5,666	7,933	7,993	7,172	8,080	6,552	6,798	6,197
Ireland	10	12	85	211	62	62	124	299	138	138
Netherlands	65	64	4	3	-	-	-	-	-	-
UK (England & Wales)	166	181	147	201	309	187	162	224	175	117
Total	6,075	6,943	6,002	8,420	8,466	7,491	8,486	7,229	7,275	6,533

[1] Preliminary.

Table 3.6.7 Nominal landings (t) of PLAICE in Divisions VIIf+g, 1977-1986.

Year	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	214	196	171	372	365	341	314	283	357	544
France	365	527	467	706	697	568	532	558	493	598
Ireland	28	-	49	61	64	198	48	72	91	59
UK (Engl.+ Wales)	150	152	176	227	251	196	279	366	466	324
UK (others)	-	-	-	7	-	-	-	-	-	21
Total	757	875	863	1,373	1,377	1,303	1,173	1,279	1,407	1,546
Total figures used by Working Group for stock assessment	757	875	863	1,373	1,377	1,303	1,173	1,205	1,617	1,715

[1] Provisional.

NB: ICES receives statistics only for Divisions VIIg-k combined and not for each division separately. The figures up to 1982 are provided by members of the Working Group; from 1983, they are figures submitted to the EC by member states.

Table 3.6.8 Celtic Sea SOLE. Divisions VIIf and VIIg. Nominal landings (tonnes) 1977-1986. Data used by the Working Group.

	Year									
Country	1977	1978	1979	1980	1981	1982	1983	1984	1985[1]	1986[1]
Belgium	779	506	693	981	938	819	871	786	786	1,036
France	80	160	153	141	91	100	124	115	126	92
Ireland	2	2	7	14	8	3	48	4	13	11
Netherlands	7	-	-	-	-	-	-	-	-	-
UK(Engl.& Wales)	93	112	101	178	175	206	330	361	403	392
Total	961	780	954	1,314	1,212	1,128	1,373	1,266	1,328	1,531

[1] Preliminary

Table 3.7.1 Nominal catch (tonnes) of SOLE in Sub-area IV, 1977-1986.

Country	1977	1978	1979	1980	1981
Belgium	1,671[1]	1,727[1]	2,044[1]	1,378[1]	1,363
Denmark	348	465	313[1]	710[1]	720
France	308	346	309[1]	232[1]	193
German Fed.Rep.	310	467	242[1]	338[1]	346
Netherlands	10,873[1]	6,749[1]	7,646[1]	12,695[1]	12,400
UK(Engl.& Wales)	491[1]	625[1]	649	452[1]	381
Other countries	2	1	40	2	-
Total reported	14,003	10,308	11,243	15,807	15,403
Unreported landings	4,000	9,900	11,354	-	-
Grand total	18,003	20,280	22,597	15,807	15,403

Country	1982	1983	1984	1985	1986[2]
Belgium	1,927	1,861	1,860	2,459	1,895
Denmark	522	694	582	660	420
France	686	332	580	578	490
German Fed.Rep.	290	619	1,033	306	156
Netherlands	17,749	16,057	15,050	15,574	9,430
UK(Engl.& Wales)	403	433	559	817	640
Other countries	-	-	1	-	-
Total reported	21,579	19,996	19,900	20,394	13,040
Unreported landings	-	4,943	6,706	3,800[3] 6,400[4]	???
Grand total	21,579	24,939	26,606	24,194[3] 26,794[4]	???

[1] Figures revised by ad hoc Flatfish Working Group 1982.

[2] Provisional Working Group estimates.

[3] Minimum estimate.

[4] Maximum estimate.

Table 3.7.2.1 Results of the simulations of North Sea Plaice for different options of the time period of the plaice box.

F at age from a cohort analysis of simulated landings.

Age	Time period (quarter) of plaice box						
	None	1	2	3	4	2+3	2+3[1]
1	0.00030	0.00029	0.00027	0.00027	0.00032	0.00024	0.00025
2	0.062	0.061	0.060	0.054	0.049	0.052	0.054
3	0.281	0.276	0.264	0.231	0.245	0.214	0.229
4	0.354	0.349	0.346	0.345	0.353	0.337	0.335
5	0.372	0.374	0.373	0.381	0.371	0.382	0.379
6	0.373	0.377	0.388	0.383	0.376	0.398	0.381
7	0.327	0.331	0.343	0.336	0.331	0.352	0.332
8	0.318	0.321	0.331	0.328	0.320	0.342	0.322
9	0.317	0.320	0.330	0.329	0.322	0.342	0.321
10	0.324	0.327	0.339	0.337	0.330	0.352	0.327

F at age from a cohort analysis of simulated catches (landings + discards).

Age	Time period (quarter) of plaice box						
	None	1	2	3	4	2+3	2+3[1]
1	0.092	0.090	0.083	0.070	0.083	0.062	0.060
2	0.288	0.279	0.238	0.210	0.238	0.160	0.169
3	0.413	0.399	0.361	0.328	0.361	0.276	0.296
4	0.366	0.360	0.356	0.355	0.356	0.345	0.343
5	0.372	0.374	0.373	0.381	0.373	0.382	0.379
6	0.373	0.377	0.388	0.383	0.388	0.398	0.381
7	0.327	0.330	0.343	0.336	0.343	0.352	0.332
8	0.318	0.321	0.331	0.328	0.331	0.342	0.322
9	0.317	0.320	0.330	0.329	0.330	0.342	0.321
10	0.324	0.327	0.339	0.336	0.339	0.352	0.327

[1] Effort reallocated in rectangles bordering the closed area.

Table 3.7.2.2 Results of the simulations of North Sea Plaice. Recruitment estimates, mean weight per recruit in the landings, and mean weight per recruit in the spawning stock, as calculated by the cohort analysis of simulated landings for the different management options. The recruitment at age 1, taking into account the discard rate, was arbitrarily set at 10,000.

Item	Time period (quarter) of closed area						
	None	1	2	3	4	2+3	2+3[1]
Recruitment at age 1 (no.)	6,301	6,431	6,910	7,173	6,749	7,874	7,781
Recruitment at age 1 (%)	100	102	110	114	107	125	124
Mean weight of the fish (kg) in the landings	0.290	0.291	0.292	0.295	0.294	0.297	0.295
Mean weight of the fish (kg) in the spawning stock	0.930	0.934	0.937	0.968	0.968	0.973	0.982

[1] Effort reallocated in rectangles bordering the closed area.

Table 3.7.2.3 Results of the simulation of the catches from the distribution of effort and fish in the reference period 1974-1977. With the simulated landings and with the simulated catches (landings + discards), a cohort analysis is carried out to calculate the F at age and stock numbers at age ($q = 0.042 \times 10^{-3}$). The simulated F at age is compared with that from the VPA of the observed landings.

Age	Observed landings	Simulated landings			Simulated landings + discards		
	F	Landings	F	Stock numbers	Landings + discards	F	Stock numbers
1	0.006	1.8	0.0003	6,301	838.5	0.092	10,000
2	0.115	325.0	0.062	5,700	1,970.0	0.288	8,252
3	0.260	1,134.0	0.281	4,848	1,808.9	0.413	5,598
4	0.381	943.3	0.354	3,311	981.2	0.366	3,351
5	0.449	622.9	0.372	2,102	622.9	0.372	2,102
6	0.356	390.0	0.373	1,311	390.0	0.373	1,311
7	0.317	217.5	0.327	817	217.5	0.327	817
8	0.317	138.5	0.318	533	138.5	0.318	533
9	0.297	91.0	0.317	351	91.0	0.317	351
10	0.312	61.1	0.324	231	61.1	0.324	231

Table 3.7.3 North Sea PLAICE.
Nominal catch (tonnes) in Sub-area IV, 1977-1986.

Country	1977	1978	1979	1980	1981
Belgium	7,321[1]	6,231[1]	7,687[1]	7,005[1]	6,346[1]
Denmark	20,900	21,285	27,497	27,057	22,026
Faroe Islands	1	-	-	-	-
France	598	750	856	711[1]	586[1]
Germany, Fed.Rep.	5,414[1]	4,595[1]	4,315[1]	4,319[1]	3,449[1]
Ireland	-	-	19	-	+
Netherlands	42,307	28,219	38.295	39,782	40,049
Norway	16	13	13	15	18
Sweden	-	-	7	7	3
UK (Engl.& Wales)	27,625[1]	27,862	25,825[1]	18,687[1]	17,129[1]
UK (Scotland)	3,622	3,877	4,126	4,345	4,390
Total	107,804	92,832	108,640	101,928	93,996
Unreported catches	11,384	21,152	36,707	38,023	45,751
Grand total	119,188	113,984	145,347	139,951	139,747

Country	1982	1983	1984	1985	1986
Belgium	6,755[1]	9,716	11,393	9,056	7,977
Denmark	24,532	18,749	22,154	25,626	24,892
Faroe Islands	-	-	-	-	-
France	1,046	1,185	604	576	804
Germany, Fed.Rep.	3,626	2,397	2,485	2,197	1,771
Ireland	-	-	-	-	-
Netherlands	41,208	51,328	61,478	91,915	72,834
Norway	17	15	16	23	21
Sweden	6	22	13	18	16
UK (Engl.& Wales)	16,385	13,241	12,681	11,330	12,410
UK (Scotland)	4,355	4,159	4,172	4,577	4,866
Total	112,439	100,812	115,715	145,318	125,591
Unreported catches	56,619	43,223	40,432	14,000[3] 25,000[4]	-
Grand total	154,551	144,035	156,147	159,538[3] 170,538[4]	-

[1] Figure revised by ad hoc Flatfish Working Group 1982.

[2] Preliminary.

[3] Minimum estimate.

[4] Maximum estimate.

Table 3.7.4 English Channel SOLE - Division VIId.
Nominal catch (tonnes), 1974-1986.

Year	Belgium	France	Netherlands	United Kingdom	Total	Unreported	Grand total
1974	159	706[1]	3	309	940[2]	-	940[2]
1975	132	464	1	244	841	52	893
1976	203	599	-	404	1,206	90	1,296
1977	225	737	-	315	1,277	69	1,346
1978	241	782	-	366	1,389	75	1,464
1979	311	1,129	-	402	1,842	83	1,925
1980	302	1,075	-	279	1,656	63	1,719
1981	491	1,513	-	210	2,214	43	2,257
1982	526	1,828	4	379	2,737	82	2,819
1983	541	2,077	-	419	3,038	134	3,172
1984	654	1,965	-	505	3,124	162	3,286
1985	567	2,620	-	513	3,700	170	3,870
1986	882	1,660	-	540	3,082	846	3,928

[1] Divisions VIId,e.

[2] Estimated.

Table 3.7.5 Division VIIe SOLE.
Nominal catches 1972-1986 (tonnes).[3]

Year	Belgium	France	UK (Engl.+ Wales)	Other	Total
1972	6	230[1]	201	-	437
1973	2	263[1]	194	-	459
1974	6	237[1]	181	3	427
1975	3	271	215	1	491
1976	4	352	259	-	616
1977	3	331	272	-	606
1978	4	384	452	20	861
1979	1	515	663	-	1,181
1980	45	447	760	13	1,269
1981	16	411	783	-	1,215
1982	97	321	1,012	-	1,446
1983	50	405	1,043	-	1,498
1984[2]	48	421	901	-	1,370
1985[2]	59	440	910	-	1,409
1986	64	459	838	-	1,361

[1] Estimated from Divisions VIId,e total.

[2] Provisional data.

[3] The table is based on figures provided by Working Group members and are not necessarily the officially reported landings.

Table 3.7.6 English Channel PLAICE. Nominal catch (tonnes) in Divisions VIId,e, 1974-1986.

Year	Belgium			Denmark		France			Netherlands	UK (England & Wales)			Total		
	VIId		VIIe	VIId	VIIe	VIId		VIIe	VIId VIIe	VIId		VIIe	VIId		VIIe
1974	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	-	-	-	1,742	-	-	6,265	-
1984	-	998	-	-	-	-	4,521	-	-	-	1,777	-	-	7,296	-
1985	-	1,076	-	-	-	-	4,279	-	-	-	1,973	-	-	7,328	-
1986	-	1,217[1]	-	-	-	-	4,613[1]	-	-	-	2,138[1]	-	-	7,374[1]	-

[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 3.7.7 Bay of Biscay SOLE. Nominal catch (tonnes) in Divisions VIIIa,b.

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Belgium	64	30	-	33	4	19	9	-	25	52
Denmark	-	-	5	-	-	-	-	-	-	-
France	1,959	2,308	2,376	2,549	2,581	1,618	2,590	2,968	3,425	3,165[1]
Netherlan	6	2	-	-	13	52	32	175	169	213[1]
Spain	241	283	62	107	96	57	38	40	308	75[1]
UK (Engl.& Wales)	-	-	-	-	+	+	-	+	-	-
Total	2,270	2,623	2,443	2,689	2,694	1,746	2,669	3,183	3,927	3,505
Unreported catches	-	-	-	127	-	1,776	607	476	-	384[1]
Total	2,270	2,623	2,443	2,816	2,694	3,522	3,276	3,659	3,927	3,889

[1]Preliminary data.

Table 4.1 Nominal HAKE landings ('000 t) as reported to ICES by country and sub-area, 1961-1986.

Year	Total	France					Portugal	Spain[1]					UK			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	106.4	23.5	2.2	10.0	11.3	-	15.3	62.7	6.5	19.8	15.6	20.8	2.6	2.2	0.4	2.3	1.7	0.6
1974	93.8	20.1	2.5	10.2	7.3	0.1	7.8	61.7	7.1	21.9	18.5	14.1	2.4	2.0	0.4	1.8	1.3	0.5
1975	99.6	22.2	3.2	11.0	7.9	0.1	9.4	63.9	6.4	20.5	18.0	19.0	2.8	2.2	0.6	1.3	0.6	0.7
1976	88.4	18.6	3.8	10.4	4.3	0.1	7.9	58.8	4.1	20.8	20.2	13.7	2.0	1.6	0.4	1.1	0.7	0.4
1977	64.2	15.3	2.6	6.1	6.6	-	5.5	41.0	1.6	5.3	16.6	17.5	1.8	1.5	0.3	0.6	0.3	0.3
1978	47.1	18.3	2.2	7.3	8.7	-	4.4	21.7	1.3	5.0	6.6	8.8	1.9	1.6	0.3	0.8	0.5	0.3
1979	59.8	20.1	2.5	6.9	10.7	-	5.3	32.0	1.1	6.1	16.7	8.1	1.7	1.4	0.3	0.7	0.3	0.4
1980	60.7	24.1	2.8	8.5	12.8	-	6.3	26.6	0.9	2.8	15.1	7.8	2.4	1.8	0.6	1.3	0.4	0.9
1981	60.0	22.3	2.2	9.2	10.9	-	5.4	25.3	0.7	2.6	16.4	5.6	5.6[6]	2.6	2.6	1.4	0.3	1.1
1982	57.0	16.0	1.5	7.7	6.8	-	6.8	29.0	1.8	3.1	14.8	9.3	3.7[6]	1.2	2.4	1.6	0.3	1.3
1983	64.0	20.0	2.2	7.0	10.8	-	7.3	31.8	2.0	2.9	14.8	12.1	3.2	1.2	2.0	1.7	0.2	1.5
1984	76.3	19.4	3.9	6.3	9.2	-	5.0	45.4	1.0	3.3	26.2	14.9	4.6[6]	1.8	2.7	1.9	0.5	1.4
1985	75.4	26.3	6.7	4.6	15.0	-	5.4	35.6	0.8	3.6	16.3	14.9	5.5	1.7	3.8	2.6	1.2	1.4
1986[5]	69.0	19.4	10.0		9.4		7.9	32.5	7.2		5.6	19.7	6.6	1.9	4.7	2.6	1.4	1.2

[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 t for Spain which were not reported by area.
[5]Preliminary.
[6]Includes Sub-area VIII.

Table 4.1.1 Revised estimates of landings ('000 t) 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, 1961-1986.

Year	Total	France				Spain[1]				UK			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	78.3	24.0	3.2	12.3	8.5	49.4	2.4	17.9	29.1	2.6	2.2	0.4	2.3	1.7	0.6
1974	73.1	21.3	2.8	11.9	6.6	47.6	3.6	16.1	27.9	2.4	2.0	0.4	1.8	1.3	0.5
1975	72.7	22.2	3.3	12.1	6.8	46.4	4.9	15.8	25.7	2.8	2.2	0.6	1.3	0.6	0.7
1976	65.5	18.3	3.8	10.3	4.2	44.1	4.2	15.6	24.3	2.0	1.6	0.4	1.1	0.7	0.4
1977	51.9	18.5	2.8	7.4	8.3	31.0	1.6	13.0	16.4	1.8	1.5	0.3	0.6	0.3	0.3
1978	50.6	18.2	2.2	7.3	8.7	29.6	1.4	12.4	15.8	1.9	1.6	0.3	0.8	0.5	0.3
1979	51.1	20.2	2.5	6.9	10.8	28.4	(2)	(10)	16.4	1.7	1.4	0.3	0.7	0.3	0.4
1980	57.3	25.0	2.8	8.5	13.7	28.7	(2)	(12)	14.7	2.4	1.8	0.6	1.3	0.4	0.9
1981	53.9	22.8	2.2	9.3	11.3	24.6	(1)	12.6	11.0	5.2	2.6	2.6	1.4	0.3	1.1
1982	55.0	22.8	1.6	9.0	12.2	27.3	0.8	12.5	14.0	3.6	1.2	2.4	1.6	0.3	1.3
1983	57.7	23.1	2.1	7.9	13.1	29.6	0.7	14.9	14.0	3.2	1.2	2.0	1.7	0.2	1.5
1984	63.2	22.0	4.9	6.9	10.2	35.1	0.4	22.0	12.7	4.4	1.7	2.7	1.7	0.3	1.4
1985	66.0	26.1	6.6	4.8	14.7	32.5	0.4	19.3	12.8	5.5	1.7	3.8	1.9	0.5	1.4
1986[2]	56.6	20.8	2.6	4.3	13.9	27.6	0.3	16.6	10.7	6.6	1.9	4.7	1.6	0.4	1.2

[1] Data for 1961-1972 not revised; revised figures for Sub-area VIII for 1973-1978 include data for Divisions VIIIa and b only.
Data for 1979-1981 are revised based on French surveillance data and supplemental catch information (see text).
[2] Preliminary.

Table 4.1.2 HAKE - Southern stock.
Revised landings estimates ('000 t) for the Southern HAKE stock (ICES Divisions VIIIc and IXa), by country and gear, as determined by the Working Group, 1972-1986.

	Spain						Portugal			France	
Year	Gill-net	Small gill-net	Long-line	Total artis-anal	Trawl	Total	Artis-anal	Trawl	Total	Total	Southern stock total
1972	-	-	-	7.1	10.2	17.3	4.7	4.1	8.8	-	26.1
1973	-	-	-	8.5	12.3	20.8	6.5	7.3	13.8	0.2	34.8
1974	2.6[1]	1.0[1]	2.2[1]	5.8	8.3	14.1	5.1	3.5	8.6	0.1	22.8
1975	3.5[1]	1.3[1]	3.0[1]	7.8	11.2	19.0	6.1	4.3	10.4	0.1	29.5
1976	3.1[1]	1.2[1]	2.6[1]	6.9	10.0	16.9	6.0	3.1	9.1	0.1	26.1
1977	1.5[1]	0.6[1]	1.3[1]	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	4.9	8.5	3.4	1.4	4.8	0.1	13.4
1979	1.7	0.2	2.1	4.0	7.2	11.2	3.9	1.9	5.8	-	17.0
1980	2.2	0.2	5.0	7.3	5.3	12.6	4.5	2.3	6.8	-	19.4
1981	1.5	0.3	4.6	6.4	4.1	10.5	4.1	1.9	6.0	-	16.5
1982	1.3	0.4	5.3	7.0	4.4	11.4	5.0	2.5	7.5	-	18.9
1983	1.5	0.9	7.2	9.6	7.0	16.6	5.2	2.9	8.1	-	24.7
1984	1.6	0.8	8.2	10.6	4.9	15.5	4.3	1.2	5.5	-	21.0
1985	1.8	0.8	4.4	7.0	5.3	12.3	3.8	2.0	5.8	-	18.1
1986	2.1	0.8	3.5	6.4	4.9	11.2	5.6	3.1	8.7	-	19.9

[1] Estimated.

Table 4.2.1 Summary of the characteristics of the demersal fishery units.

Fishery unit	Country	Number of boats	KW	GRT	Target species	By-catch
"Western Approaches"						
1. Long line in medium to deep water	France	8	100	50	skate, dogfish ling	
	Ireland	6	470	150	hake	ling, greater forkbeard, cod
	Spain	50	405	199	hake	ling
	UK	21	670	221	hake, cod	whiting
2. Long line in shallow water	France	8	110-300	35-50	cod	skate, dogfish ling
	UK	3	120	62.5	gadoids, skates	
3. Gill net	France	30	110-300	35-50	hake	pollack
	UK	28	120	20	hake, monk	cod
4. Non-Nephrops trawling in medium to deep water	France	120	250/600	50-180	monk, megrim	hake, skates, gadoids
	Ireland	11	740	250	hake, megrim	monk, cod, witch
	Spain	135	520	-	hake, megrim, monk	
	UK	95	460	196	hake, monk	megrim
5. Non-Nephrops trawling shallow water	France	70	600	200	gadoids	monk, skates, dogfish
	Ireland	< 130	230	65 (50-175	gadoids	megrim, monk, ray plaice, sole
	UK	110	100	20	gadoids	monk, skates, flatfish
6. Beam trawling in shallow water (B/T)	Belgium	15	740	-	sole	plaice, raise
	Netherlands	?	?	?	?	?
	UK	73	450	81	monk, sole	megrim

Table 4.2.1 (cont'd)

Fishery unit	Country	Number of boats	KW	GRT	Target species	By-catch
7. Nephrops trawling in deep water	France	30	350	50/80	Nephrops	
	Spain	8	400	-	Nephrops	hake, megrim, monk
8. Nephrops trawling in medium depth	France	100	350	50	Nephrops	hake, gadoids, monk, megrim
	Ireland	< 25	330	70	Nephrops	whiting, hake monk, megrim
		< 17	400	110	Nephrops	unknown
		< 20	330	60	Nephrops	hake, monk, whiting, megrim
"Bay of Biscay"						
9. Nephrops trawling in shallow and medium depths	France	330	150	30	Nephrops	hake, monk
10. Trawling in shallow and medium depths	France	100	120 180	20 30	sole, hake, monk, cephalopods	whiting, gurnards, bib, red mullet
11. Beam trawling in shallow water (B/T)	Belgium	7			sole	
	Netherlands	6	1 470		sole	?
12. Long line in deep water	Spain	72	370	130	hake	bib, pollack
13. Gill net in medium and shallow depths	France	20 35	130 300	10-15 60	hake	pollack
14. Trawling in deep and medium depths (DM)	France	75	250	40	monk	skates, hake megrim
	Spain	65	715	-	hake	monk, megrim scad

Table 4.2.2 Fishery units in ICES Sub-areas VII and VIII. Average total fishing mortalities.

Stock unit	σ	Range[1]	Average F	M	M/K
Sole Celtic	σ	25-30	0.33	0.10	0.294
	ϱ	25-30	0.18	0.10	0.400
Sole Biscay	σ	20-24	0.22	0.15	0.375
	ϱ	21-29	0.27	0.15	0.500
Hake northern		10-25	0.21	0.20	2.353
L. piscatorius		34-44	0.20	0.15	1.471
L. budegassa		26-36	0.14	0.15	1.667
Megrim		22-28	0.21	0.20	2.222
Cod Celtic		40-60	0.64	0.20	0.526
Whiting Celtic		27-35	0.73	0.20	1.111
Nephrops Celtic	σ	28-33	0.15	0.30	2.500
	ϱ	28-34	0.14	0.30	1.765
Nephrops Biscay	σ	17-21	0.39	0.30	2.727
	ϱ	15-19	0.36	0.30	2.143

[1] cm total length, except mm cephalothorax for *Nephrops*.

RESULTS OVER ALL SPECIES

Table 4.2.3

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EFFECTS of CHANGES of MESH-SIZE, FISHING EFFORT and/or LEGAL LANDING SIZE
REGIME # : 1 ENFORCE CURRENT MESH REG. (not land. sizes)

RESULTS ARE EXPRESSED IN WEIGHT

UNIT	METIER	OLD MESH	NEW MESH	MULTIP EFFORT	LANDINGS REFERENCE	!	IMMEDIATE EFFECT LANDINGS	%	!	LONG TERM EFFECT LANDINGS	%	!
1	LINE DEEP7	1.00	1.00	1.000	10502.3	!	10502.4	0	!	11594.1	10	!
2	LINE SHAL7	1.00	1.00	1.000	62.1	!	62.1	0	!	68.5	10	!
3	GILL SHAL7	1.00	1.00	1.000	507.6	!	507.6	0	!	560.2	10	!
4	NONEP DEEP	80.00	80.00	1.000	47891.8	!	47891.8	0	!	49333.6	3	!
5	NONEP SHAL	80.00	80.00	1.000	26133.0	!	26133.1	0	!	26602.7	2	!
6	BEAM SHAL7	80.00	80.00	1.000	5688.2	!	5688.2	0	!	5706.5	0	!
7	NEPH DEEP7	75.00	75.00	1.000	61.1	!	61.1	0	!	67.4	10	!
8	NEPH MED7	70.00	70.00	1.000	12685.5	!	12685.5	0	!	12751.3	1	!
9	TRAWL MED8	45.00	50.00	1.000	9641.0	!	8928.3	-7	!	10179.9	6	!
10	TRAWL SHA8	50.00	65.00	1.000	7139.0	!	6854.0	-4	!	7415.3	4	!
11	BEAM SHAL8	1.00	1.00	1.000	.0	!	.0	0	!	.0	0	!
12	LINE DEEP8	1.00	1.00	1.000	5967.3	!	5967.2	0	!	6587.2	10	!
13	GILL MED8	1.00	1.00	1.000	3279.8	!	3279.8	0	!	3620.0	10	!
14	TRAWL DEEP	60.00	65.00	1.000	11199.7	!	10896.9	-3	!	11477.0	2	!
	MISCELL8	1.00	1.00	1.000	4516.8	!	4516.8	0	!	4856.0	8	!
	OUTSIDERS	80.00	80.00	1.000	6950.0	!	6949.9	0	!	7672.1	10	!
	TOTAL				152225.1	!	150924.7	-1	!	158491.8	4	!

Table 4.3 Landings of HORSE MACKEREL by sub-area (tonnes).

Sub-area	1975	1976	1977	1978	1979	1980
IV	9,933	8,668	1,326	4,920	1,412	2,151
VI	3,272	4,194	670	408	7,791	8,724
VII	117,599	177,010	28,855	26,060	43,525	45,697
VIII	86,738	129,558	124,906	83,804	47,155	37,495
IX	48,725	55,471	67,125	45,371	37,619	36,903
Total	266,267	374,901	222,882	160,563	137,502	130,970
Sub-area	1981	1982	1983	1984	1985	1986
IV	6,825	5,115	4,420	25,987	24,243	18,063
VI	11,134	5,036	24,881	31,716	51,245	25,824
VII	34,749	33,478	40,527	42,367	36,798	76,320
VIII	40,073	22,684	28,223	25,629	27,597	33,914
IX	35,873	39,726	48,740	23,891	20,237	41,787
Total	128,654	106,039	146,791	149,590	160,120	195,908

Table 4.3.2 Landings of HORSE MACKEREL in Sub-area IV by country (tonnes).

Country	1975	1976	1977	1978	1979	1980
Belgium	23	15	14	15	9	8
Denmark	-	-	63	1,543	496	199
Faroe Islands	156	116	130	3	0	260
France	140	147	325	182	221	292
German Dem. Rep.	-	4	-	-	-	-
Germany, Fed. Rep.	696	162	2	1,993	376	+
Ireland	-	-	-	-	-	1,161
Netherlands	173	82	223	106	88	101
Norway	2,174	4,842	450	1,037	199	119
Poland	-	11	6	-	-	-
Sweden	+	-	-	-	+	-
UK (Engl. & Wales)	3	11	22	36	23	11
UK (Scotland)	2	+	4	5	+	-
USSR	6,566	3,278	87	-	-	-
Total	9,933	8,668	1,326	4,920	1,412	2,151
Country	**1981**	**1982**	**1983**	**1984**	**1985**	**1986[1]**
Belgium	34	7	55	20	13	13
Denmark	3,576	1,612	1,590	23,730	22,495	13,472[2]
Faroe Islands	-	2,327	-	-	-	1,992
France	2	567	366	827	298	947[3]
German Dem. Rep.	-	-	-	-	-	-
Germany, Fed. Rep.	139	30	52	+	+	-
Ireland	412	-	-	-	-	-
Netherlands	355	559	2,029	824	160	600
Norway	2,292	7	322	94	171[1]	698
Poland	-	-	2	-	-	-
Sweden	-	-	-	-	-	48
UK (Engl. & Wales)	15	6	4	3	8	3
UK (Scotland)	-	-	-	489	998	290
USSR	-	-	-	-	-	-
Total	6,825	5,115	4,420	25,987	24,143	18,063

[1] Preliminary.

[2] Includes Division IIIa.

[3] Includes Division IIa.

Table 4.3.3.1 Landings of HORSE MACKEREL in Sub-area VI by country (tonnes).

Country	1975	1976	1977	1978	1979	1980
Denmark	-	-	-	-	443	734
Faroe Islands	2	2	-	-	-	-
France	-	293	113	91	151	45
Ireland	-	-	-	59	-	-
Germany, Fed. Rep.	263	5	-	-	155	5,550[2]
Netherlands	106	69	19	114	6,910	2,385[2]
Norway	869	90	-	-	-	-
Poland	479	48	-	-	-	-
Spain	150	175	147	91	20	-
UK (Engl. & Wales)	6	37	40	44	73	9
UK (Scotland)	187	85	105	9	39	1
USSR	1,210	3,390	246	-	-	-
Total	3,272	4,194	670	408	7,791	8,724

Country	1981	1982	1983	1984	1985	1986[1]
Denmark	341	2,785	7	-	-[3]	-[3]
Faroe Islands	-	1,248	-	-	4,014	-
France	454	4	10	14	13	-[3]
Ireland	-	-	15,086	13,858	27,102	21,835
Germany, Fed. Rep.	10,212[2]	2,113[2]	4,146[2]	130[2]	191[2]	355[2]
Netherlands	100[2]	50[2]	5,500[2]	17,500[2]	18,450[2]	3,450[2]
Norway	5	-	94	31[1]	48[1]	46
Poland	-	+	-	-	-	-
Spain	-	-	-	-	-	-[3]
UK (Engl. & Wales)	5	+	-	+	-	+
UK (Scotland)	17	83	38	214	1,427	138
USSR	-	-	-	-	-	-
Total	11,134	5,036	24,881	31,716	51,245	25,824

[1] Preliminary.

[2] Estimated from biological sampling.

[3] Included in Sub-area VII.

Table 4.3.3.2 Landings of HORSE MACKEREL in Sub-area VII by country (tonnes).

Country	1975	1976	1977	1978	1979	1980
Belgium	4	2	1	1	3	-
Denmark	-	-	-	2,104	4,287	5,045
France	2,443	3,800	2,448	3,564	4,407	1,983
German Dem. Rep.	-	92	45	-	-	-
Germany, Fed. Rep.	521	3	308	2,923	5,333	2,289
Ireland	-	-	1,133	3,388	-	-
Netherlands	41	280	2,088	10,556	25,174	23,002
Norway	-	-	-	29	959	394
Poland	1,869	2,967	640	61	-	-
Spain	10,890	17,124	483	516	676	50
UK (Engl.& Wales)	438	2,014	1,343	2,918	2,686	12,933
UK (Scotland)	-	-	-	-	-	1
USSR	101,393	150,728	20,366	-	-	-
Total	117,599	177,010	28,855	26,060	43,525	45,697
Country	**1981**	**1982**	**1983**	**1984**	**1985**	**1986[1]**
Belgium	1	1	-	-	+	-
Denmark	3,099	877	993	732	1,477[3]	30,000[3]
France	2,800	2,314	1,834	1,802	845[3]	3,718[3]
German Dem. Rep.	-	-	-	-	-	-
Germany, Fed. Rep.	1,079	12	1,977	228	-	5
Ireland	16	-	-	65	100	1,440
Netherlands	25,000[2]	27,500[2]	34,350[2]	38,700[2]	33,550[2]	40,750[2]
Norway	-	-	-	-	-	-
Poland	-	-	-	-	-	-
Spain	234	104	142	560	275	164[3]
UK (Engl.& Wales)	2,520	2,670	1,230	279	430	243
UK (Scotland)	-	-	-	1	1	+
USSR	-	-	-	-	120	-
Total	34,749	33,478	40,526	42,367	36,798	76,320

[1]Provisional.

[2]Estimated from biological sampling.

[3]Includes Sub-area VI.

Table 4.3.3.3 Landings of HORSE MACKEREL in Sub-areas VIII and IX by country (tonnes).

Country	1975	1976	1977	1978	1979	1980
Sub-area VIII						
Denmark	-	-	-	-	127	-
France	2,386	3,380	4,881	3,643	4,240	3,361
German Dem. Rep	-	14	-	-	-	-
Netherlands	-	-	-	19	-	-
Spain	72,916	95,401	104,812	80,139	42,766	34,134
UK (Engl.& Wales)	-	-	-	-	22	-
USSR	11,436	30,763	15,213	3	-	-
Total	86,738	129,558	124,906	83,804	47,155	37,495
Sub-area IX						
Poland	-	-	168	-	-	-
Portugal	46,421	51,488	51,078	30,203	24,489	25,224
Spain	1,882	3,339	981	14,787	12,880	11,679
USSR	422	644	14,898	381	250	-
Total	48,725	55,471	67,125	45,371	37,619	36,903

Country	1981	1982	1983	1984	1985	1986
Sub-area VIII						
Denmark	-	-	-	-	-	1,000
France	3,711	3,073	2,643	2,489	4,305	1,578
German Dem. Rep	-	-	-	-	-	-
Netherlands	-	-	-	-[2]	-[2]	-[2]
Spain	36,362	19,610	25,580	23,119[3]	23,292[3]	31,033
UK (Engl.& Wales)	+	1	-	1	-	-
USSR	-	-	-	20	-	303
Total	40,073	22,683	28,223	25,629	27,597	33,914
Sub-area IX						
Poland	-	-	-	-	-	-
Portugal	23,753	30,886	30,951	17,307	9,420	28,310
Spain	12,120	8,840	17,782	5,871	10,817[3]	13,477
USSR	-	-	-	-	-	-
Total	35,873	39,726	48,733	23,178	20,237	41,787

[1] Preliminary.

[2] Included in Sub-area VII.

[3] Data provided by the Working Group members.

Table 5.1 Total nominal catch (tonnes) of SARDINE by countries in Divisions VIIIc and IXa.

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
1985	111,709	25,907	66,491	92,398	204,107
1986	103,451	39,195	37,960	77,155	180,606

Table 5.2.1 Landings (tonnes) of MACKEREL in Division VIIIc, 1975-1986.

Country	1975	1976	1977	1978	1979	1980
Spain	23,408	18,480	19,852	18,543	15.013	11,316
Total	23,408	18,480	19,852	18,543	15,013	11,316

Country	1981	1982	1983	1984	1985	1986[1]
Spain	12,834	15,621	10,390	13,852	11,810	16,533
Total	12,834	15,621	10,390	13,852	11,810	16,533

[1] Preliminary.

Table 5.2.2 Landings (tonnes) of MACKEREL in Sub-area IX, 1975-1986.

Country	1975	1976	1977	1978	1979	1980
Portugal	2,224	2,595[2]	1,743[2]	1,555[2]	1,071[2]	1,929[2]
Spain	3,345	2,520	2,935	6,221	6,280	2,719
France	1	-	-	-	-	-
Poland	-	-	8	-	-	-
USSR	44	466	2,879	189	111	-
Total	5,614	5,581	7,565	7,965	7,462	4,648

Country	1981	1982	1983	1984	1985	1986
Portugal	3,108[2]	3,018[2]	2,239[2]	2,250	4,178[2]	5,565[3]
Spain	2,111	2,437	2,224	4,206	2,000[2]	1,837[2]
France	-	-	-	-	-	-
Poland	-	-	-	-	-	-
USSR	-	-	-	-	-	-
Total	5,219	5,455	4,463	6,456	6,178	7,402

[1] Preliminary.
[2] Working Group estimate.
[3] Official numbers.

Table 6.1.1 Nominal catch (t) of MACKEREL in the North Sea, Skagerrak, and Kattegat (Sub-area IV and Division IIIa) 1977-1986. (Data were submitted by Working Group members.)

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[1]
Belgium	49	10	10	5	55	102	93	68	-	48
Denmark	21,833	18,068	19,171	13,234	9,982	2,034	11,285	10,088	12,424	24,497
Faroe Islands	42,836	33,911	28,118	1,770	-	720	-	-	1,356	-
France	2,529	3,452	3,620	2,238	3,755	3,041	2,248	-	322	1,200
German Dem. Rep.	41	233	-	-	-	-	-	-	-	-
Germany, Fed. Rep.	-	284	211	56	59	28	10	112	217	1,856
Iceland	-	-	-	-	-	-	-	-	-	-
Ireland	-	-	-	738	733	-	-	-	-	-
Netherlands	2,673	1,065	1,009	853	1,706	390	866	340	2,340	9,380
Norway	180,800	82,959	90,720	44,781	28,341	27,966	24,464	27,311	30,835	50,600
Poland	298	-	-	-	-	-	-	-	-	-
Sweden	4,012	4,501	3,935	1,666	2,446	692	1,903	1,440	760	1,258
UK (Engl.& Wales)	105	142	95	76	6,520	16	16	2	143	18
UK (Scotland)	1,590	3,704	5,272	9,514	10,575	44	4	13	7	490
USSR	2,765	488	162	-	-	-	-	-	-	-
Unallocated + discards	-	-	500	-	3,216	450	96	202	2,042	-
Total	259,531	148,817	152,823	87,931	67,388	35,483	40,985	39,576	50,124	89,347

[1] 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 6.1.2 Nominal catches (t) of MACKEREL in the Norwegian Sea (Division IIa), 1977-1986 (catches from Division Vb included).

Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986[6]
Denmark[2]	-	-	-	-	801	1,008	10,427[3]	11,787[4]	7,610[5]	3,283[7]
Faroe Islands[1]	-	283	6	270	-	180	-	138	-	-
France[2]	-	2	-	-	6	8	-	-	16	-
Germany, Fed. Rep.[2]	-	-	-	-	51	-	5	-	-	-
German Dem. Rep.[2]	-	53	174	2	-	-	-	-	-	16
Norway[1]	1,400	3,867	6,887	6,618	12,941	34,540	38,453	82,005	61,065	85,400
Poland[2]	-	-	-	-	-	231	-	-	-	-
UK (Engl. & Wales)[1]	+	1	-	-	255	-	-	-	-	-
UK (Scotland)[2]	-	-	-	296[2]	968[2]	-	-	-	-	2,131[7]
USSR[2]	-	-	5	1,450	3,640	1,641	65	4,292	9,405	11,404[8]
Total	1,400	4,206	7,072	8,340	18,662	37,608	48,950	98,222	78,096	102,234

[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.

[5] Includes 4,920 tonnes caught in Division Vb.

[6] Preliminary.

[7] From Division Vb.

[8] Includes 2,253 t caught in Division Vb.

Table 6.1.3 Nominal catch (tonnes) of MACKEREL in the Western area (Sub-areas VI and VII and Divisions VIIIa,b). (Data for 1977 as officially reported to ICES; data for 1978-1986 estimated by Working Group.)

Country	1977	1978	1979	1980	1981
Belgium	1	1	3	3	-
Denmark	698	8,677	8,535	14,932	13,464
Faroe Islands	3,978	15,076	10,609	15,234	9,070
France	35,702	34,860	31,510	23,907	14,829
German Dem. Rep.	431	-	-	-	-
Germany, Fed.Rep.	446	28,873	21,493	21,088	29,221
Ireland	23,022	27,508	24,217	40,791	92,271
Netherlands	35,766	50,815	62,396	91,081	88,117
Norway	362	1,900	25,414	25,500	21,610
Poland	2,240	-	92	-	1
Spain	2,001	599	543	3,684	1,365
UK (England + Wales)	132,320	213,344	244,293	150,598	75,722
UK (N. Ireland)	97	46	25	-	4,153
UK (Scotland)	52,662	103,671	103,160	108,372	109,153
USSR	16,396	-	-	-	-
Unallocated	-	-	54,000	98,258	140,322
Total, ICES members	306,122	485,370	586,290	593,448	599,298
Bulgaria	-	-	-	-	-
Rumania	-	-	-	-	-
Discard	-	50,700	60,600	21,600	42,300
Grand total	306,122	536,070	646,890	615,048	641,598

(cont'd)

Table 6.1.3 (cont'd)

Country	1982	1983	1984	1985	1986[3] [4]
Belgium	-	+	-	-	+
Denmark	15,100	15,000	200	400	300
Faroe Islands	11,100[2]	14,900[2]	9,200	9,900	1,400
France	12,300	11,000	12,500	7,400	11,200
German Dem. Rep.	-	-	-	-	-
Germany, Fed.Rep.	11,200	23,000	11,200	11,800	7,500
Ireland	109,700	110,000	84,100	91,400	70,000
Netherlands	67,200	73,600	99,000	37,000	49,800
Norway	19,000	19,900	34,700	24,300	21,000
Poland	-	-	-	-	-
Spain	-	-	100	+	-
UK (England + Wales)	82,900	62,000	30,000	9,600	8,900
UK (N. Ireland)	9,600	800	1,100	-	+
UK (Scotland)	147,400	120,100	167,200	196,300	143,300
USSR	-	+	200	+	-
Unallocated	97,300	105,500	18,000	75,100	64,600
Total, ICES members	582,800	555,800	467,500	463,200	378,000
Bulgaria	-	-	-	-	-
Rumania	-	-	-	-	-
Discard	24,900	11,300	12,100	4,500	-
Grand total	607,700	567,100	479,600	467,700	378,000

[1] Sub-area VIII does not include Division VIIIc. Spanish catches have been adjusted accordingly since 1977.

[2] Faroese catches have been revised for 1982 and 1983.

[3] Preliminary.

[4] Includes catches misreported from Division IVa.

Table 6.2.1.1. Landings (tonnes) of BLUE WHITING from the main fisheries, 1977-1986.

Area	1977	1978	1979	1980	1981
Norwegian Sea fishery (Sub-areas I+II and Divisions Va, XIVa+XIVb)	56,999	236,226	741,042	766,798	520,738
Fishery in the spawning area (Divisions Vb, VIa, VIb and VIIb + VIIc)	136,787	229,228	284,547	250,693	288,316
Icelandic industrial fishery (Division Va)	5,838	9,484	2,500	-	-
Industrial mixed fishery (Divisions IVa-c,Vb,IIIa)	38,389	99,874	63,333	75,129	61,754
Subtotal northern fishery	238,013	574,812	1,091,422	1,092,620	870,808
Southern fishery (Sub-areas VIII + IX, Divisions VIId,e + VIIg-k)	30,723	33,898	27,176	29,944	38,748
Total	268,736	608,710	1,118,598	1,122,564	909,556

Area	1982	1983	1984	1985	1986[1]
Norwegian Sea fishery (Sub-areas I+II and Divisions Va, XIVa+XIVb)	110,685	52,961	65,932	90,742	160,061
Fishery in the spawning area (Divisions Vb, VIa, VIb and VIIb + VIIc)	361,656	361,537	415,940	456,388	497,729
Icelandic industrial fishery (Division Va)	-	7,000	-	-	-
Industrial mixed fishery (Divisions IVa-c,Vb,IIIa)	117,578	117,737	122,806	97,769	99,580
Subtotal northern fishery	589,919	539,235	604,678	644,899	757,370
Southern fishery (Sub-areas VIII + IX, Divisions VIId,e + VIIg-k)	31,590	30,835	37,098	51,292	69,605
Total	621,509	570,070	641,776	696,191	826,975

[1] 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, 1977-1986, as estimated by the Working Group.

Country	1977	1978	1979	1980	1981
Denmark	-	-	-	-	-
Faroes	593	2,810	762	-	11,131
France	-	-	-	-	5,093
German Dem.Rep.	2,031	7,301	22,502	14,234	15,607
Germany, Fed.Rep.[2]	6,777	8,421	1,157	8,919	17,385
Greenland	-	-	-	-	-
Iceland	4,768	17,756	12,428	4,562	4,808
Norway	-	-	33,588[3]	902	187
Poland	1,536	5,083	4,346	11,307	2,434
UK (Engl.& Wales)	165	11	-	-	-
USSR	41,129	194,844	666,259	726,874	464,093
Total	56,999	236,226	741,042	766,798	520,738

Country	1982	1983	1984	1985	1986[1]
Denmark	473	-	93	-	-
Faroes	-	11,316	-	-	-
France	2,067	2,890	-	-	-
German Dem.Rep.	3,042	5,553	8,193	1,689	3,541
Germany, Fed.Rep.[2]	890	2	35	75	106
Greenland	-	-	-	-	10
Iceland	-	-	105	-	-
Norway	-	5,061	689	-	-
Poland	443	-	-	-	-
UK (Engl.& Wales)	-	-	-	-	-
USSR	103,770	28,141	56,817	88,978	156,404
Total	110,685	52,961	65,932	90,742	160,061

[1] Preliminary.

[2] Including catches off East Greenland (Division XIVb) (3,217 t in 1977, 698 t in 1978, 204 t in 1979, and 8,757 t in 1980).

[3] Including purse seine catches of 29,162 t of juvenile blue whiting.

Table 6.2.1.3 Landings (tonnes) of BLUE WHITING from directed fisheries in the spawning area (Divisions Vb, VIa,b and VIIb,c), 1977-1986, as estimated by the Working Group.

Country	1977	1978	1979	1980	1981
Denmark	18,745	23,498	21,200	19,272	11,361
Faroes	29,096	39,491	35,780	37,488	23,107
France	-	-	-	-	-
German Dem.Rep.	1,094	1,714	172	181	6,562
Germany, Fed.Rep.	3,260	6,363	3,304	709	935
Iceland	5,172	7,537	4,864	5,375	10,213
Ireland	-	-	-	-	-
Netherlands	-	1,172	154	-	222
Norway	38,214	116,815	186,737	133,754	166,168
Poland	3,996	2,469	4,643	-	2,279
Spain	183	14	-	-	-
Sweden	6,391	6,260	-	3,185	-
UK (Engl.& Wales)	1,475	5,287	4,136	3,878	6,000
UK (Scotland)	3,001	1,599	1,466	6,819	2,611
USSR	26,160	17,009	22,091	40,032	58,858
Total	136,787	229,228	284,547	250,693	288,316

Country	1982	1983	1984	1985	1986[1]
Denmark	23,164	28,680	26,445	21,424	11,364
Faroes	38,958	56,168	62,264	72,316	80,564
France	1,212	3,600	3,882	-	-
German Dem.Rep.	7,771	3,284	1,171	6,427	1,753
Germany, Fed.Rep.	701	825	693	626	-
Iceland	1,689	1,176	-	-	-
Ireland	-	-	-	668	16,440
Netherlands	200	150	1,000	1,248	5,283
Norway	169,700	185,646	211,773	234,137	283,162[2]
Poland	-	-	-	-	-
Spain	-	318	-	-	-
Sweden	-	-	-	-	-
UK (Engl.& Wales)	-	-	-	-	-
UK (Scotland)	-	-	-	-	3,472
USSR	73,171	81,690	108,712	119,542	95,691[3]
Total	316,656	361,537	415,940	456,388	497,729

[1] Preliminary.

[2] Including directed fishery also in Division IVa.

[3] Including directed fishery also in Sub-area XII.

Table 6.2.1.4 Landings (t) of BLUE WHITING from the Icelandic mixed industrial trawl fisheries in Division Va, 1977-1986.

Country	1977	1978	1979	1980	1981
Iceland	8,220	5,838	9,484	2,500	-

Country	1982	1983	1984	1985	1986[1]
Iceland	-	7,000	-	-	-

[1] 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 Divisions IIIa, IVa-c, Vb and IIa, 1977-1986, as estimated by the Working Group.

Country	1977	1978	1979	1980	1981
Denmark	16,071	54,804	28,932	49,947	35,066
Faroes	-	1,177	1,489	1,895	3,133
France	-	-	-	-	-
German Dem.Rep.[2]	-	988	49	-	-
Germany, Fed.Rep.[2]	76	1,514	13	252	-
Ireland	-	-	-	-	2,744
Netherlands	-	-	-	-[3]	18,627
Norway	20,737	39,989	30,930	21,962[3]	-
Poland[2]	838	601	-	-	229
Sweden[4]	639	648	1,249	1,071	1,955
UK (Engl.& Wales)[2]	3	+	-	-	-
UK (Scotland)	25	153	37	2	-
USSR[2]	-	-	634	-	-
Total	38,389	99,874	63,333	75,129	61,754

Country	1982	1983	1984	1985	1986[1]
Denmark	34,463	38,290	48,939	35,843[5]	57,315[5]
Faroes	27,269	12,757	9,740	3,606[5]	5,678[5]
France	1,417	249	-	-	-
German Dem.Rep.[2]	-	-	-	-	-
Germany, Fed.Rep.[2]	93	-	566	52	-
Ireland	-	-	-	-	-
Norway	47,856	62,591	58,038	54,522	26,941
Netherlands	-	-	122	130	1,114
Poland[2]	550	-	-	-	-
Sweden[4]	1,241	3,850	5,401	3,616	8,532
UK (Engl.& Wales)[2]	4,689	-	-	-	-
UK (Scotland)	-	-	-	-	-
USSR[2]	-	-	-	-	-
Total	117,578	117,737	122,806	97,769	99,580

[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.

[5] Including catches in Division Vb.

Table 6.2.2.1 Landings (tonnes) of BLUE WHITING from the southern areas (Sub-areas VIII and IX and Divisions VIIg-k and VIId,e), 1977-1986, as estimated by the Working Group.

Country	1977	1978	1979	1980	1981
Denmark	-	-	-	-	-
German Dem.Rep.	-	-	-	-	-
Germany, Fed.Rep	-	25	-	-	-
Ireland	-	-	1	-	-
Netherlands	-	7	-	31	633
Poland	169	53	-	-	-
Portugal	1,557	2,381	2,096	6,051	7,387
Spain[2]	25,259	31,428	25,016	23,862	30,728
UK (Engl.& Wales)	+	-	-	-	-
UK (Scotland)	-	-	63	-	-
USSR	3,738	4	-	-	-
Total	30,723	33,898	27,176	29,944	38,748

Country	1982	1983	1984	1985	1986[1]
Denmark	-	-	-	280[3]	-
German Dem.Rep.	-	-	-	412[3]	997[3]
Germany, Fed.Rep.	-	50	301[3]	-	-
Ireland	-	-	-	-	-
Netherlands	200	-	-	553[3]	3,605[3]
Poland	-	-	-	-	-
Portugal	3,890	4,748	5,252	6,989	8,116
Spain[2]	27,500	26,037	25,921	35,828	24,965
UK (Engl.& Wales)	-	-	33[3]	-	-
UK (Scotland)	-	-	-	-	-
USSR	-	-	5,591[3]	7,230[3]	31,922[3]
Total	31,590	30,835	37,098	51,292	69,605

[1] Preliminary.

[2] Significant quantities taken in Divisions VIIg-k not included in the table are discarded every year.

[3] Catches supposed to be taken from the northern stock.

Table 6.2.3.1 Total catches of BLUE WHITING in 1978-1988 divided into areas within and beyond areas of national fisheries jurisdiction of NEAFC contracting parties. Percentage in ( ).

Year	Inter-national	Svalbard	Jan Mayen	Norway	Iceland	Greenland	Faroes	EEC	Total (t)	Total from off. 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
1985	38,978 (6.07)	-	-	114,785 (17.88)	-	-	196,003 (30.52)	292,345 (45.53)	642,111	644,899	99.6
1986	20,665 (2.74)	-	-	187,768 (24.87)	-	116 (0.02)	171,074 (22.66)	375,257 (49.71)	754,880	757,370	99.7

Table 6.2.3.2 Biomass estimates of BLUE WHITING obtained during the acoustic surveys in the Norwegian Sea[2], 1980-1986, divided into national zones, expressed as percentages of total.

Area	1980	1981	1982	1983	1984	1985	1986
International	18.9	26.0	14.7	5.6	4.8	8.2	8.4
Svalbard[1]	5.4	2.0	1.1	1.1	0.1	-	0.1
Jan Mayen	16.8	8.8	5.9	3.4	0.6	2.5	2.3
Norway	40.7	38.7	45.9	38.2	39.2	22.7	54.5
Iceland	8.6	14.2	10.8	25.0	18.4	13.7	6.8
Greenland	0.1	-	-	-	-	0.9	-
Faroe Islands	4.7	8.3	16.9	19.4	25.9	37.4	19.2
EEC	4.8	2.0	7.7	7.2	11.1	14.7	7.8
Sweden	-	-	-	-	-	-	0.9

[1] Spitsbergen, Bear Island, and Hopen Island.

[2] Divisions IIa and Vb, together with adjacent parts of Divisions IVa, Va, VIa, and XIVa (with part of Division IIIa in 1986).

Table 6.3.1.1

Landings of SQUID by area as officially reported to ICES, 1970-1985.

Year	Sub-area		Division							Sub-area			Total
	I + II	IV	Va	Vb	VIa	VIb	VIIa	VIIb, c,f, g-k	VIId,e	VIII	IX	X	
1970	-	190	-	32	79	903	211[2]	40	82	837	3,083	1	5,458
1971	371	119	-	66	100	1,146	259[2]	48	5,577	6,056	-	-	13,742
1972	-	102	-	132	115	359	30	27	2,981	6,636	1,124	-	11,506
1973	-	569	-	484	2,197	2,326	111	2,558	4,368	850	1,509	-	14,972
1974	-	801	-	380	696	630	43	4,822	362	1,492	2,855	-	12,081
1975	-	322	1	203	253	8	114	1,930	2,191	3,544	2,027	-	10,593
1976	-	88	-	474	381	159	246	2,647	2,161	2,956	1,585	-	10,697
1977	260	280	-	15	757	9	526	2,004	1,729	1,670	2,916	2	10,168
1978	345	257	-	15	647	81	230	1,133	1,391	1,939	4,760	22	10,820
1979	1,668	123	436	51	98	5	50	185	326	618	687	312	4,559
1980	2,974	78	16	532	221	19	78	789	1,052	2,768	1,859	20	10,406
1981	11,630	419	7	2,146	335	85	279	686	1,260	1,827	1,593	12	20,279
1982	17,972	1,075	14	249	658	3	517	1,227	2,376	1,291	1,054	107	26,543
1983	17,737	590	4	200	312	6	257	868	2,468	3,602	2,095	249	28,388
1984	7,520	972	1,634	1,147	310	9	294	1,487	839	2,511	1,329	206	18,258
1985[1]	13,524	466	2	32	413	324	386	679	972	2,583	869	364	20,614

[1] Preliminary.
[2] Includes Division VIIf.

Table 6.3.1.2

Landings of squid by country as officially reported to ICES.

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Sub-areas I + II										
France	-	-	-	1	-	-	-	-	-	-
Germany Fed.Rep.	-	-	-	-	-	3	3	-	-	-
Norway	-	260	345	1,667	2,973	9,525	17,626	17,682	7,167	13,524
UK (England & Wales)	-	-	-	-	1	2	1	2	353	-
USSR	-	-	-	-	-	2,100	342	53	-	-
Total	-	260	345	1,668	2,974	11,630	17,972	17,737	7,520	13,524
Sub-area IV										
Belgium	25	225	59	21	7	30	43	114	89	93[1]
France	5	31	82	60	30	16	53	33	19	39
Germany Fed.Rep.	-	-	-	-	-	1	1	2	-	-
Norway	-	-	-	-	5	255	759	342	635	279
UK (England & Wales)	16	8	18	20	8	15	10	3	11	1
UK (Scotland)	42	16	98	22	28	102	209	96	218	54
Total	88	280	257	123	78	419	1,075	590	972	466
Division Va										
Belgium	-	+	-	-	-	-	1	-	-	-[1]
Iceland	-	-	+	436	16	7	13	4	1,634	2
UK (England & Wales)	+	-	-	-	-	-	-	-	-	-
Total	+	+	+	436	16	7	14	4	1,634	2
Division Vb										
Faroe Islands	-	-	11	49	504	2,132	249	200	1,147	32
France	-	8	3	2	2	-	-	-	-	-
UK (England & Wales)	236	3	-	-	4	-	-	-	-	-
UK (Scotland)	238	4	1	-	22	14	-	-	-	-
Total	474	15	15	51	532	2,146	249	200	1,147	32
Division VIa										
Belgium	1	-	-	-	-	-	-	-	-	-[1]
France	153	350	478	-	121	126	290	199	130	185
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-	+
Ireland	-	4	12	14	38	99	140	43	64	81
Spain	81	251[2]	4	3[2]	-	-	40	12	1	28
UK (England & Wales)	33	19	22	21	9	9	9	+	1	2
UK (N.Ireland)	-	-	-	-	-	-	1	+	+	-
UK (Scotland)	113	133	131	60	53	101	178	58	114	117
Total	381	757	647	98	221	335	658	312	310	413
Division VIb										
France	-	-	1	+	-	2	3	4	-	-
Spain	-	...[3]	63	...[3]	19	80	-	-	2	159
UK (England & Wales)	96	8	7	5	+	3	-	2	1	91
UK (Scotland)	63	1	10	-	-	+	-	+	6	74
Total	159	9	81	5	19	85	3	6	9	324

[1] Includes common cuttlefish.
[2] Includes Division VIb.
[3] Included in Division VIa.

...Contd.

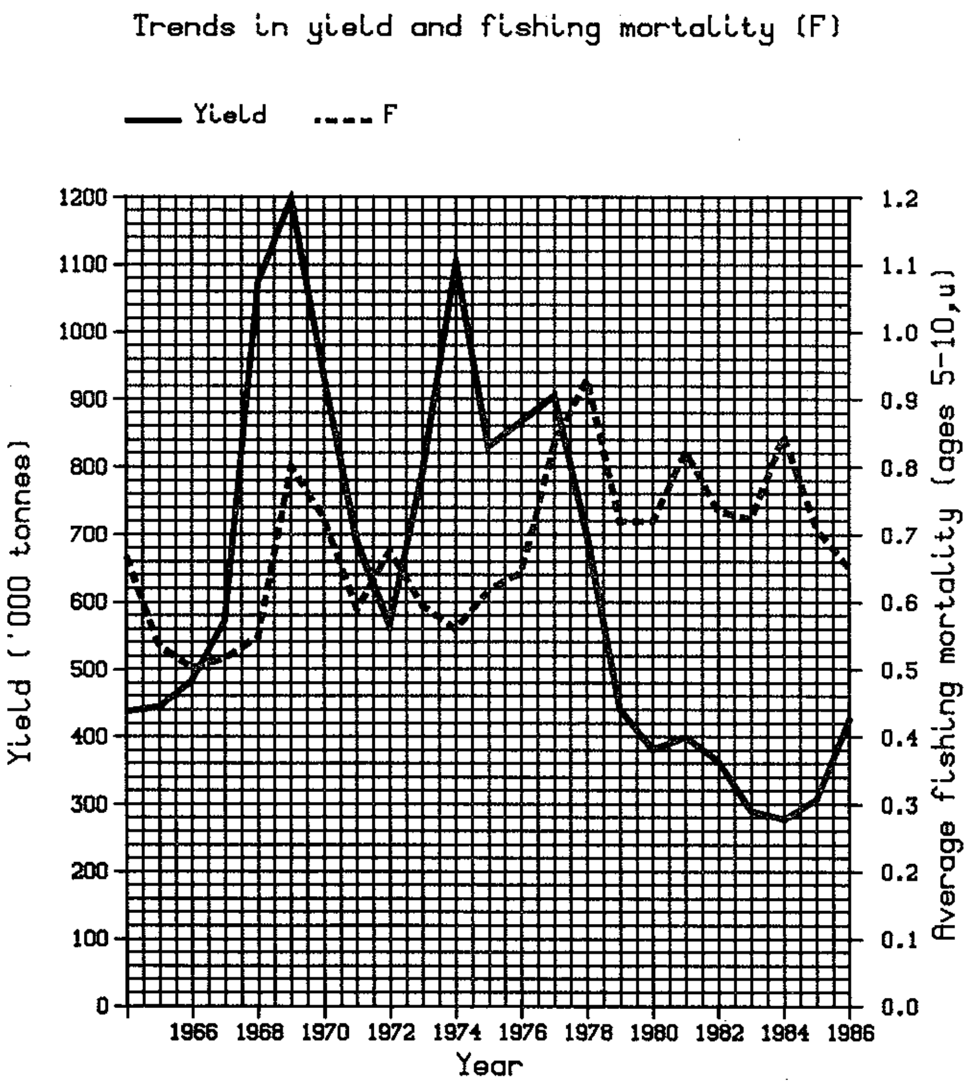
Table 6.3.1.2 (cont'd)

Country	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Division VIIa										
Belgium	4	9	2	1	+	1	4	40	3	15[1]
France	53	57	30	-	10	21	47	17	29	38
Ireland	7	154	54	26	34	101	204	121	177	159
UK (England & Wales)	57	67	24	6	7	35	80	20	24	103
UK (Isle of Man)	-	-	-	1	3	9	16	4	6	5
UK (N.Ireland)	119	230	118	16	23	112	164	54	52	60
UK (Scotland)	6	9	2	+	1	+	2	1	3	6
Total	246	526	230	50	78	279	517	257	294	386
Divisions VIIb,c,f,g-k										
Belgium	51	29	17	9	11	11	25	62	26	62[1]
France	669	1,619	914	102	699	518	1,029	712	287	469
Ireland	-	8	2	11	27	53	48	34	23	34
Spain	1,893	242	122	15	22	47	33	19	1,084	50
UK (England & Wales)	34	106	78	48	30	57	92	41	67	64
Total	2,647	2,004	1,133	185	789	686	1,227	868	1,487	679
Divisions VIId,e										
Belgium	16	15	8	6	4	16	43	92	120	71[1]
France	1,709	880	1,213	162	833	973	1,888	1,948	563	738
Ireland	-	3	2	-	1	-	-	-	-	-
UK (England & Wales)	436	831	168	158	214	271	445	428	156	163
Total	2,161	1,729	1,391	326	1,052	1,260	2,376	2,468	839	972
Sub-area VIII										
Belgium	+	+	+	-	-	-	+	-	-	1[1]
France	1,843	957	494	242	868	380	811	2,861	1,526	1,590
Spain	1,113	713	1,445	376	1,900	1,447	480	741	974	992
UK (England & Wales)	-	-	-	-	-	+	+	-	11	-
Total	2,956	1,670	1,939	618	2,768	1,827	1,291	3,602	2,511	2,583
Sub-area IX										
Portugal	591	1,039	694	687	1,423	1,228	677	1,192	726	406
Spain	994	1,877	4,066	-	436	365	377	903	603	463
Total	1,585	2,916	4,760	687	1,859	1,593	1,054	2,095	1,329	869
Sub-area X										
Portugal	-	2	22	148	17	12	107	249	206	364
Spain	-	-	-	164	3	-	-	-	-	-
Total	-	2	22	312	20	12	107	249	206	364

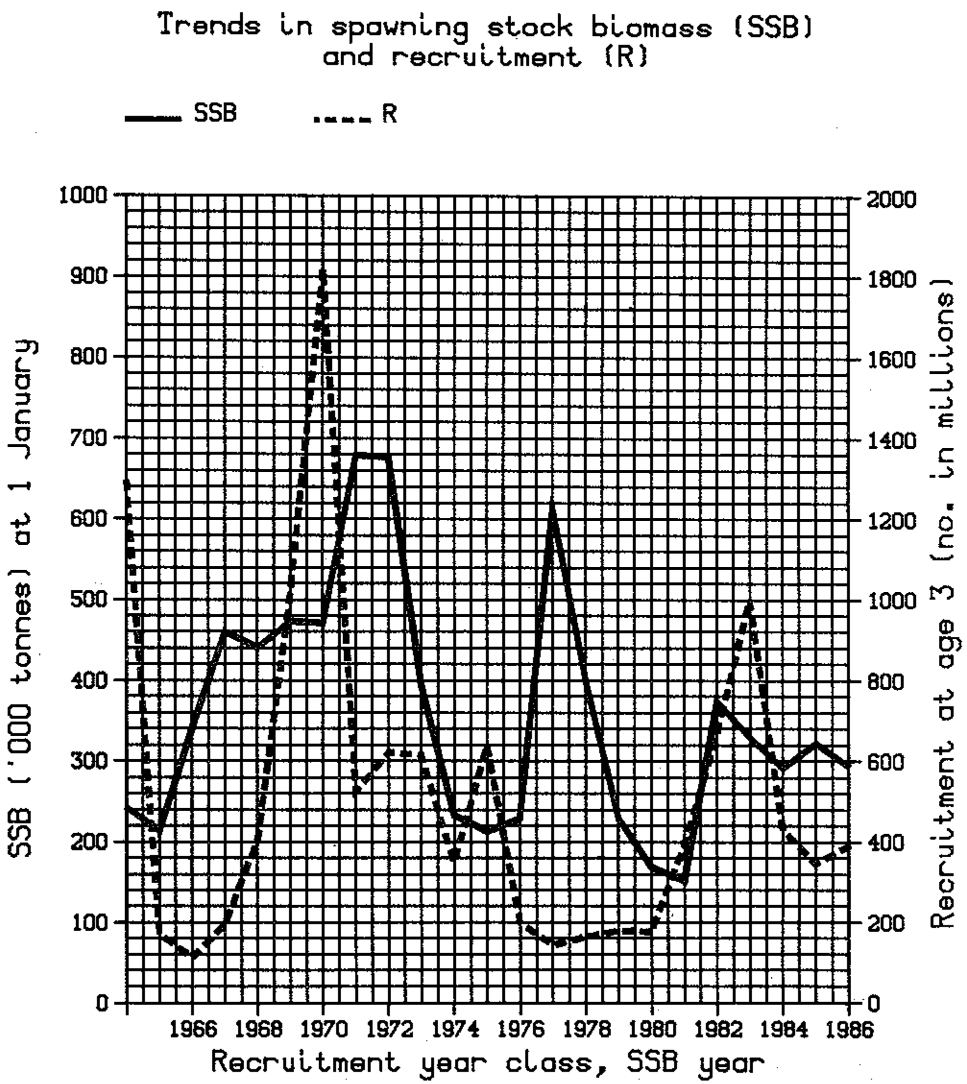
[1] Includes common cuttlefish.

Figure 2.1

FISH STOCK SUMMARY
STOCK: North–East Arctic Cod
14–10–1987



A

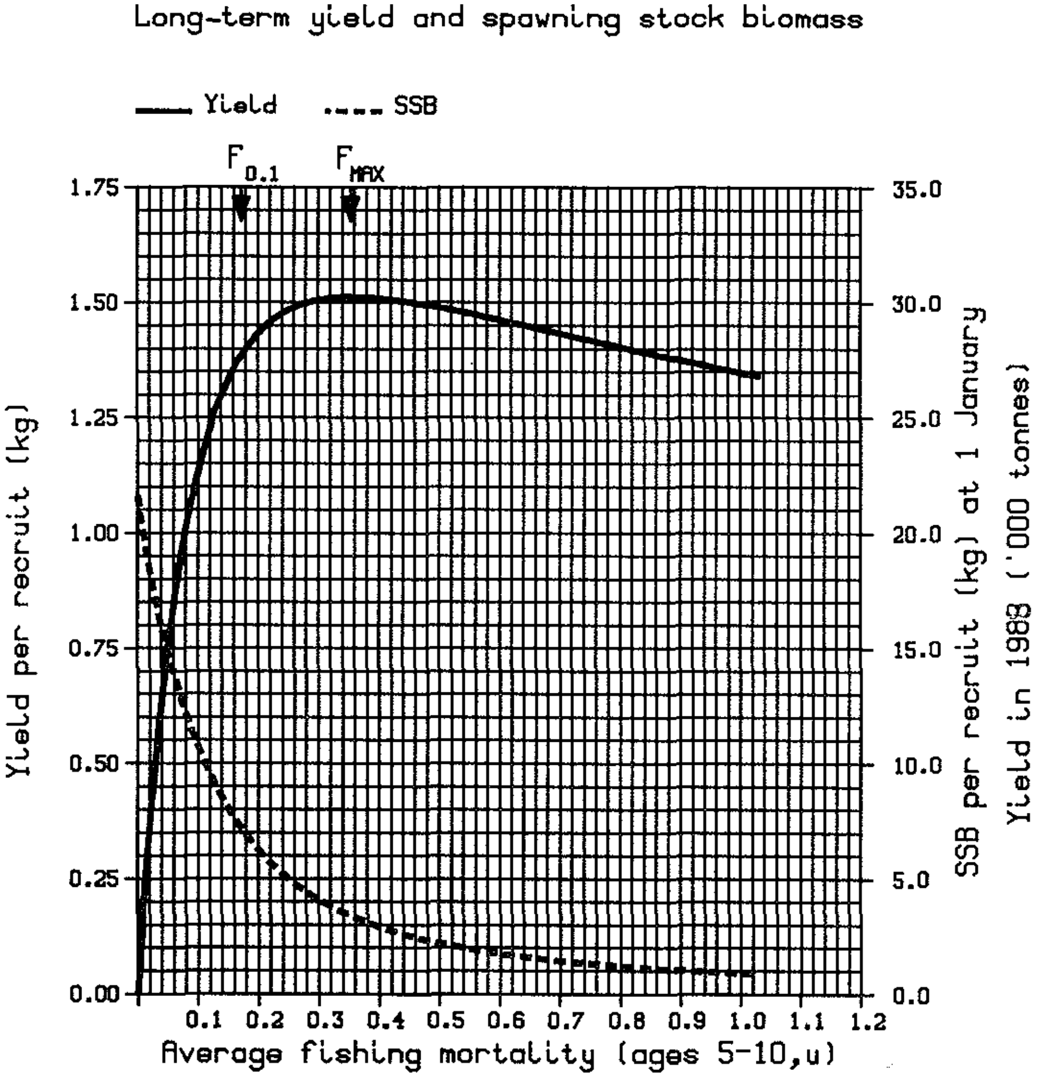


B

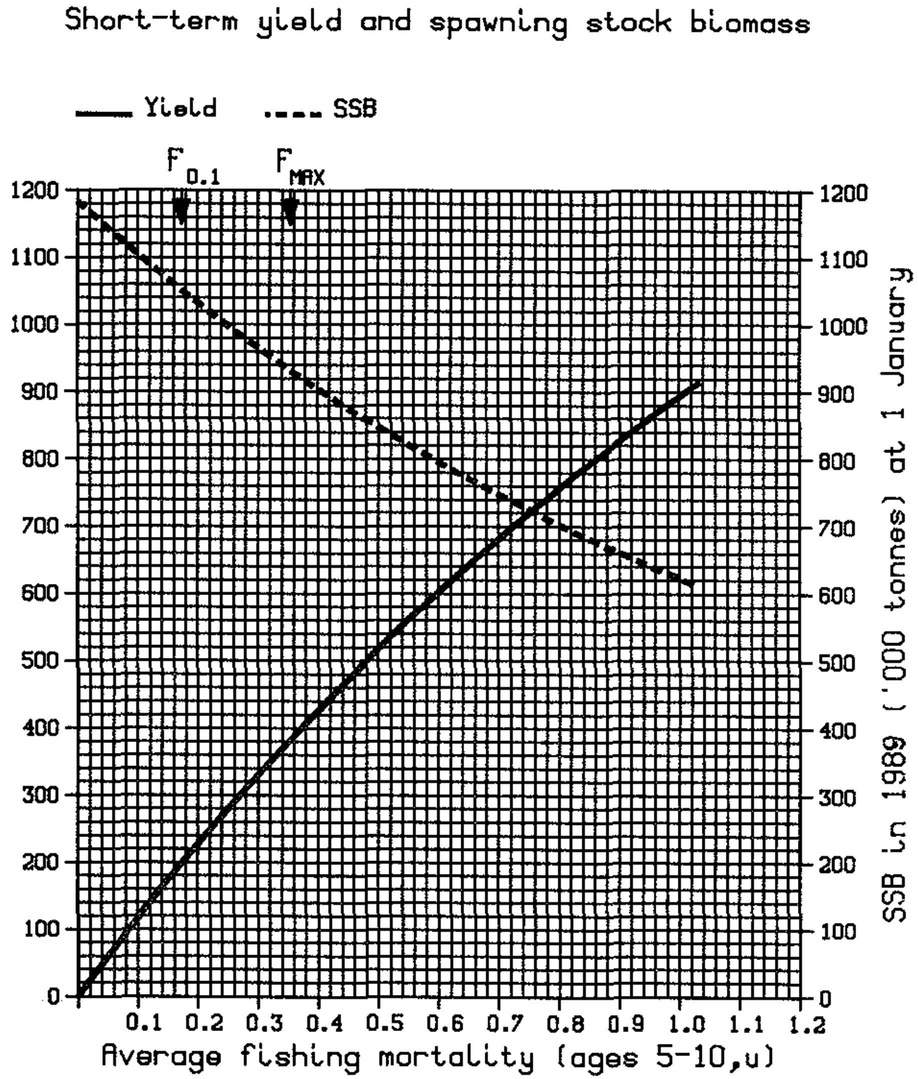
(cont'd)

Figure 2.1 (cont'd)

FISH STOCK SUMMARY
STOCK: North–East Arctic Cod
14–10–1987



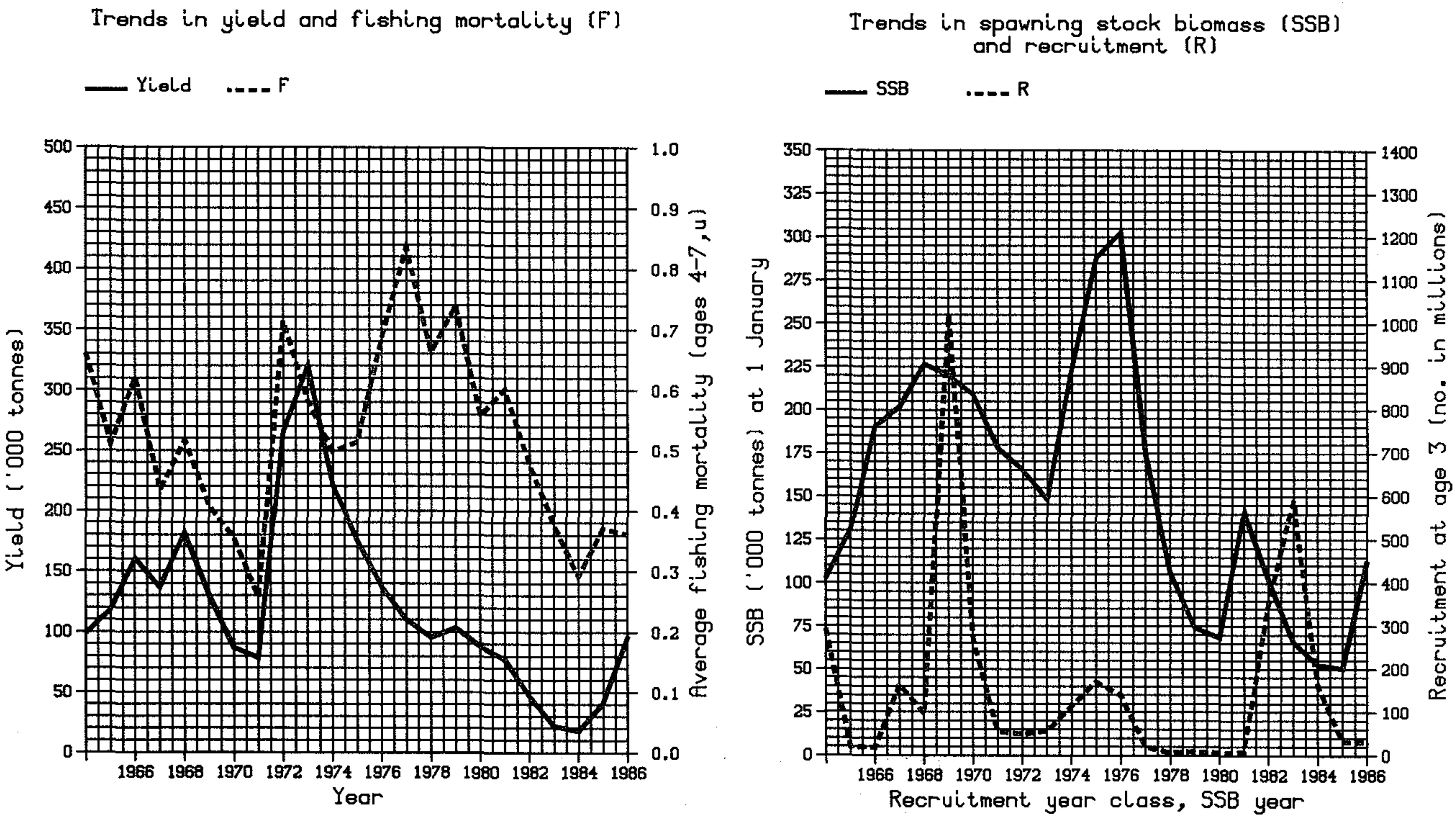
C



D

Figure 2.2

FISH STOCK SUMMARY
STOCK: North–East Arctic Haddock
15–10–1987



A B

(cont'd)

Figure 2.2 (cont'd)

FISH STOCK SUMMARY
STOCK: North-East Arctic Haddock
15-10-1987

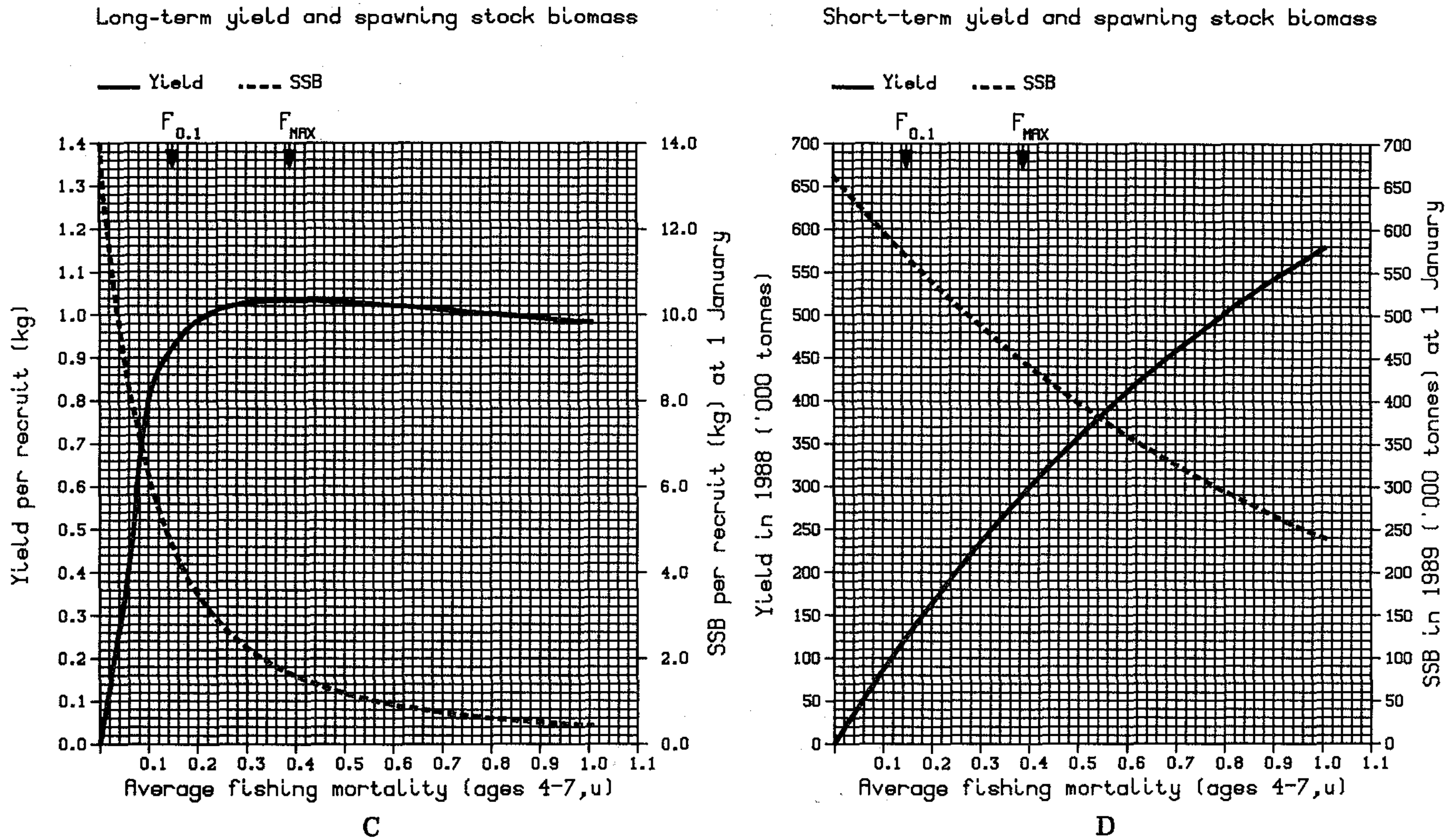
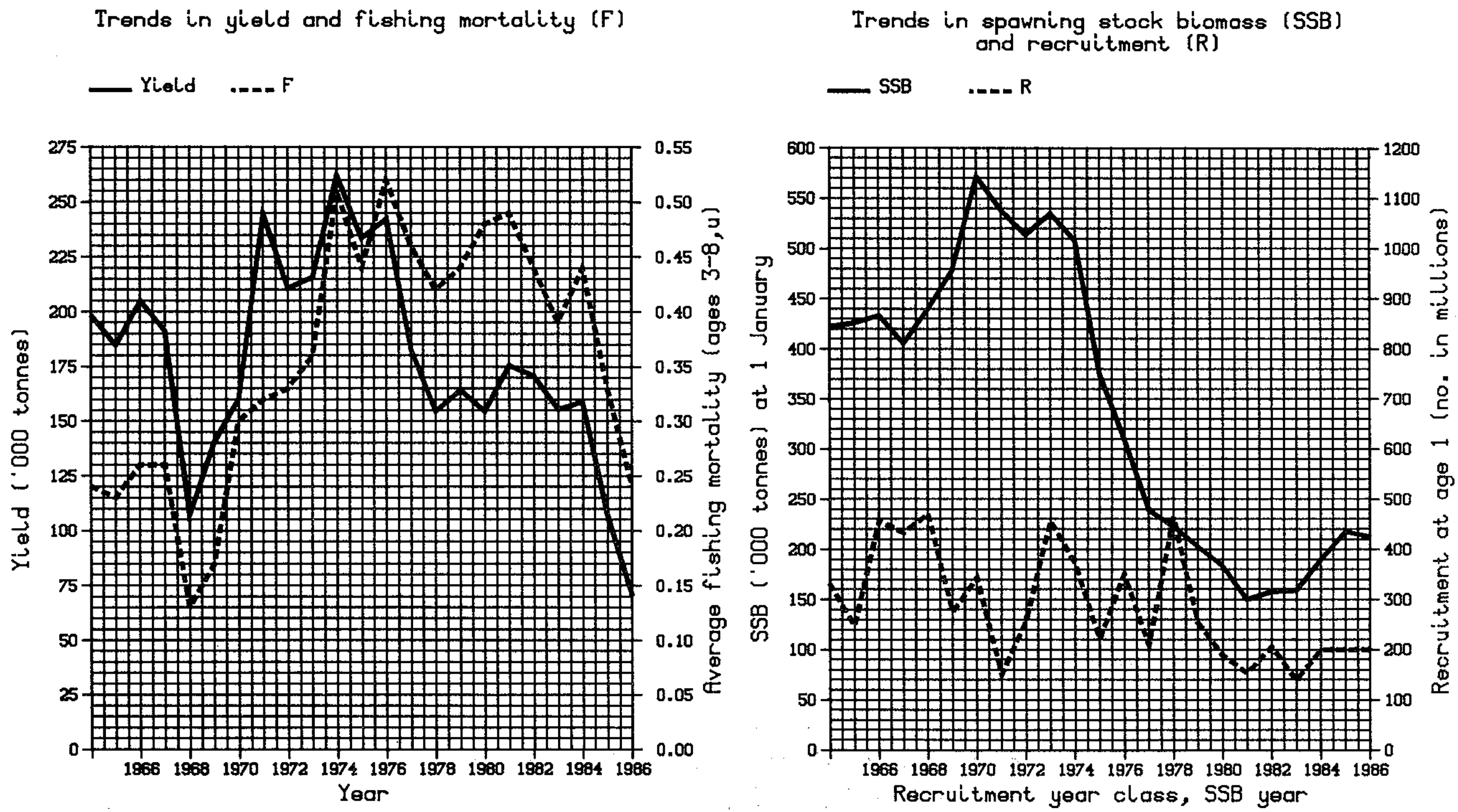


Figure 2.3

FISH STOCK SUMMARY
STOCK: NE Arctic Saithe
15–10–1987



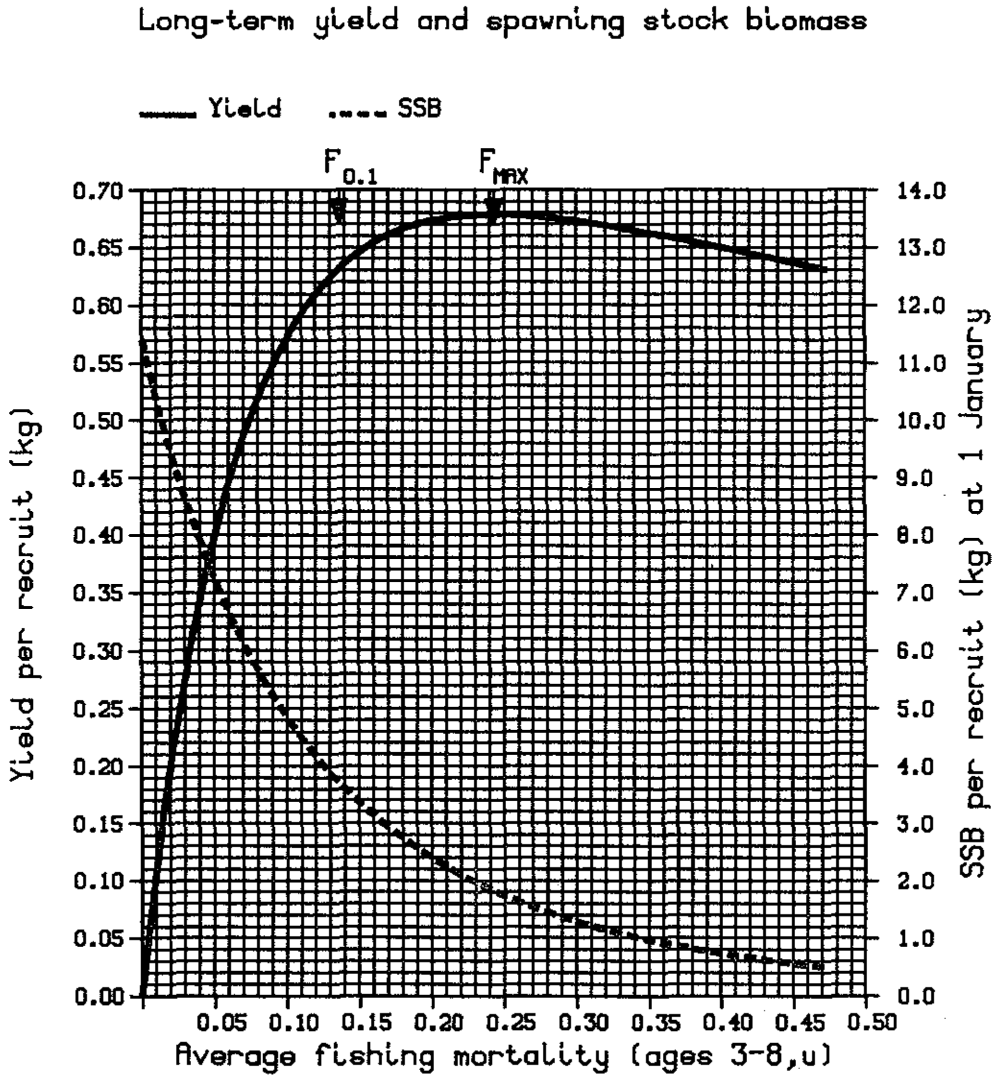
A

B

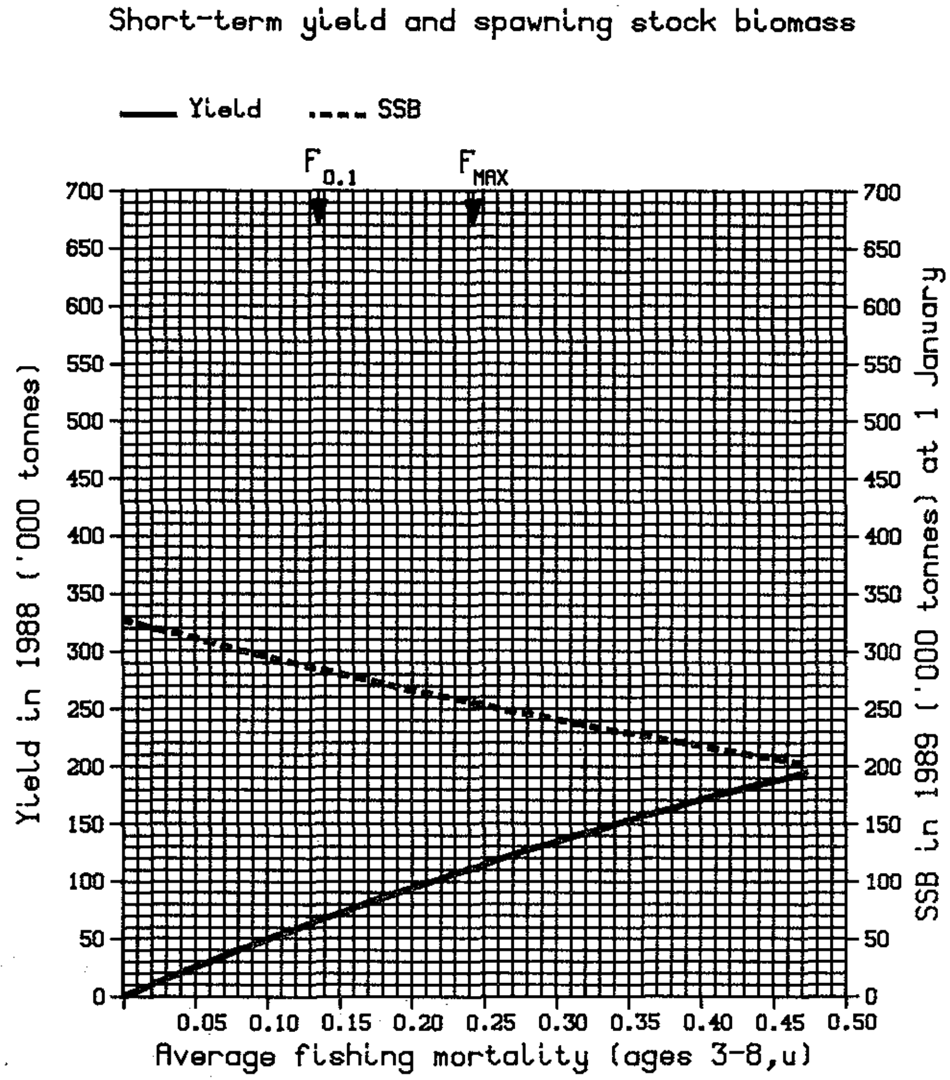
(cont'd)

Figure 2.3 (cont'd)

FISH STOCK SUMMARY
STOCK: NE Arctic Saithe
15–10–1987



C



D

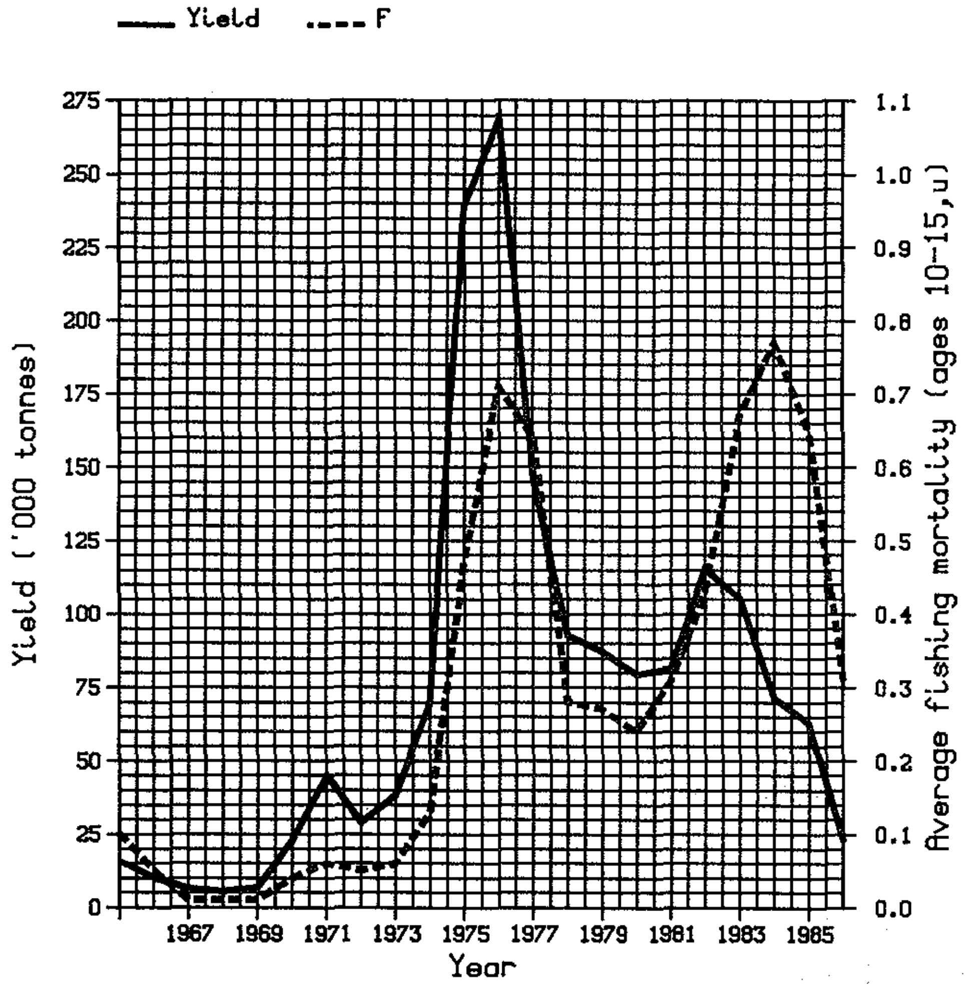
Figure 2.4.1

FISH STOCK SUMMARY

STOCK: Sebastes Mentella in area IIA and IIB

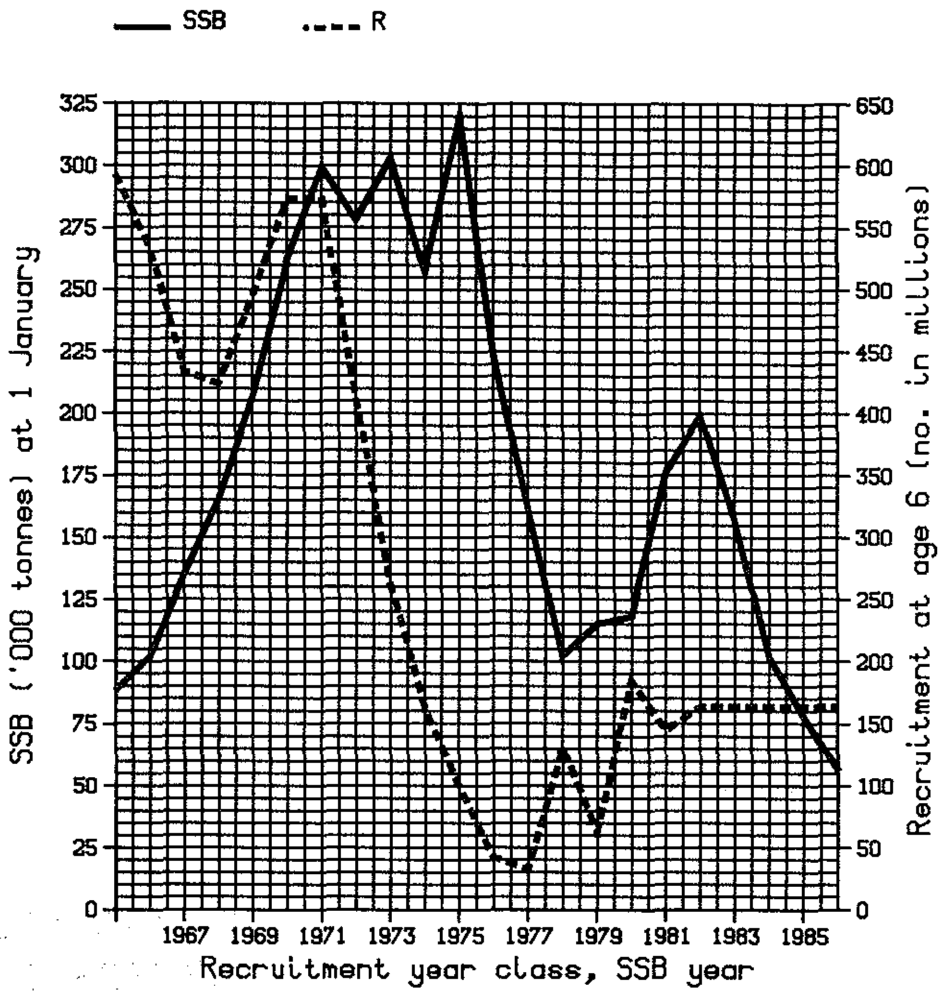
19–10–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)

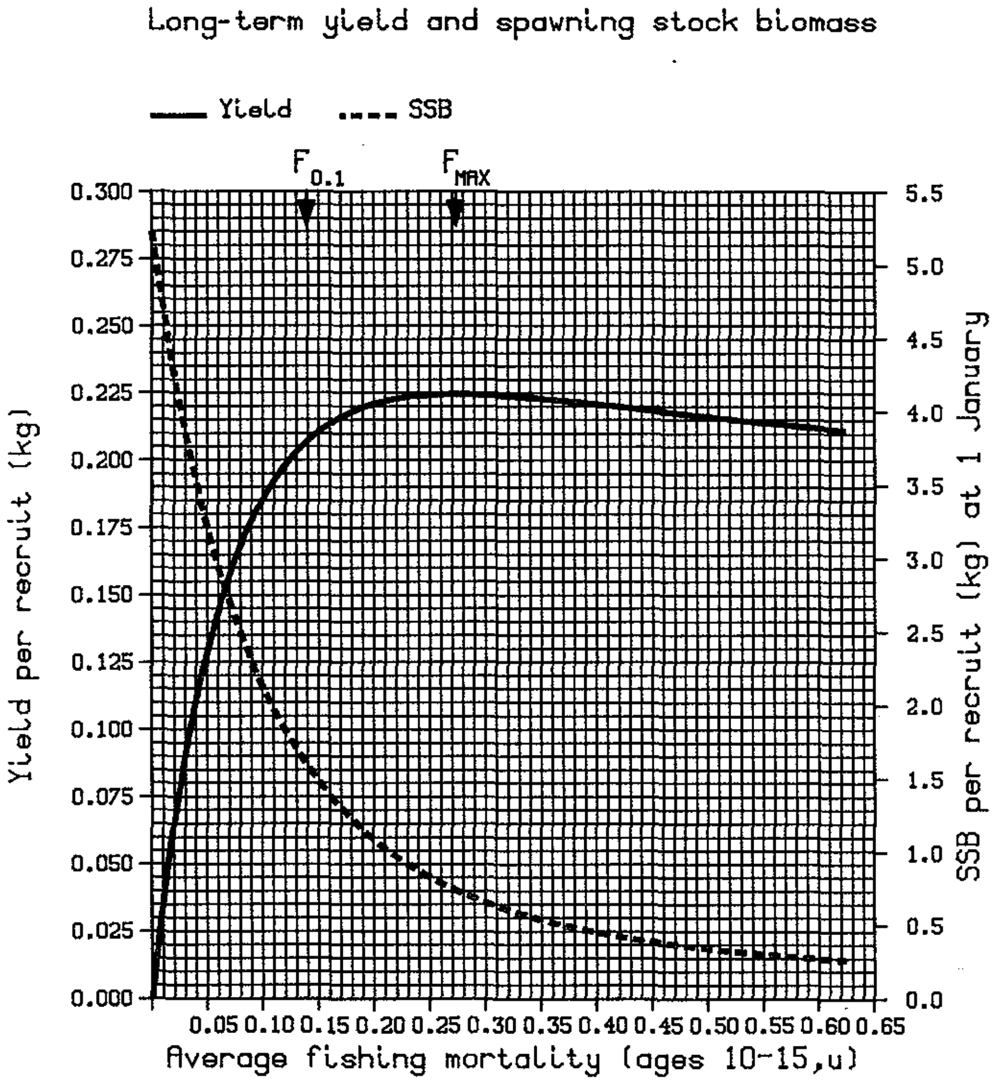


B

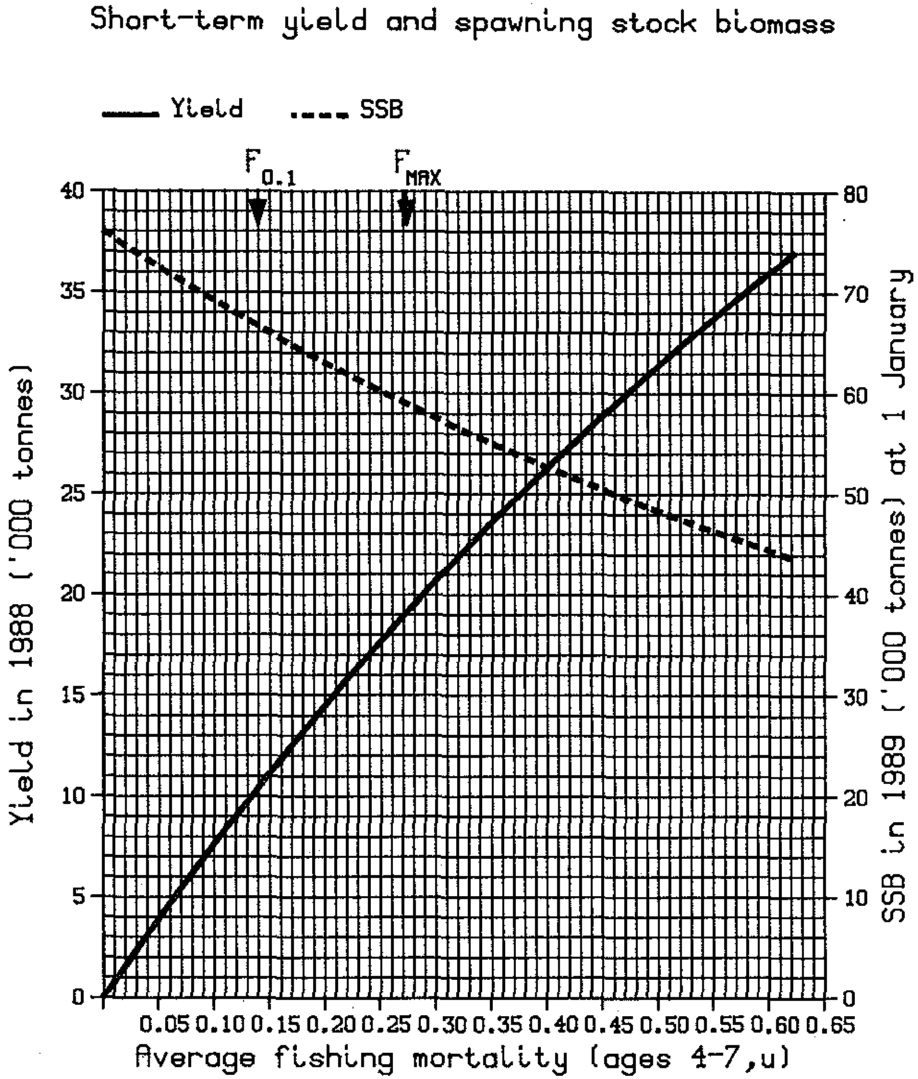
(cont'd)

Figure 2.4.1 (cont'd)

FISH STOCK SUMMARY
STOCK: Sebastes Mentella in area IIA and IIB
19–10–1987



C



D

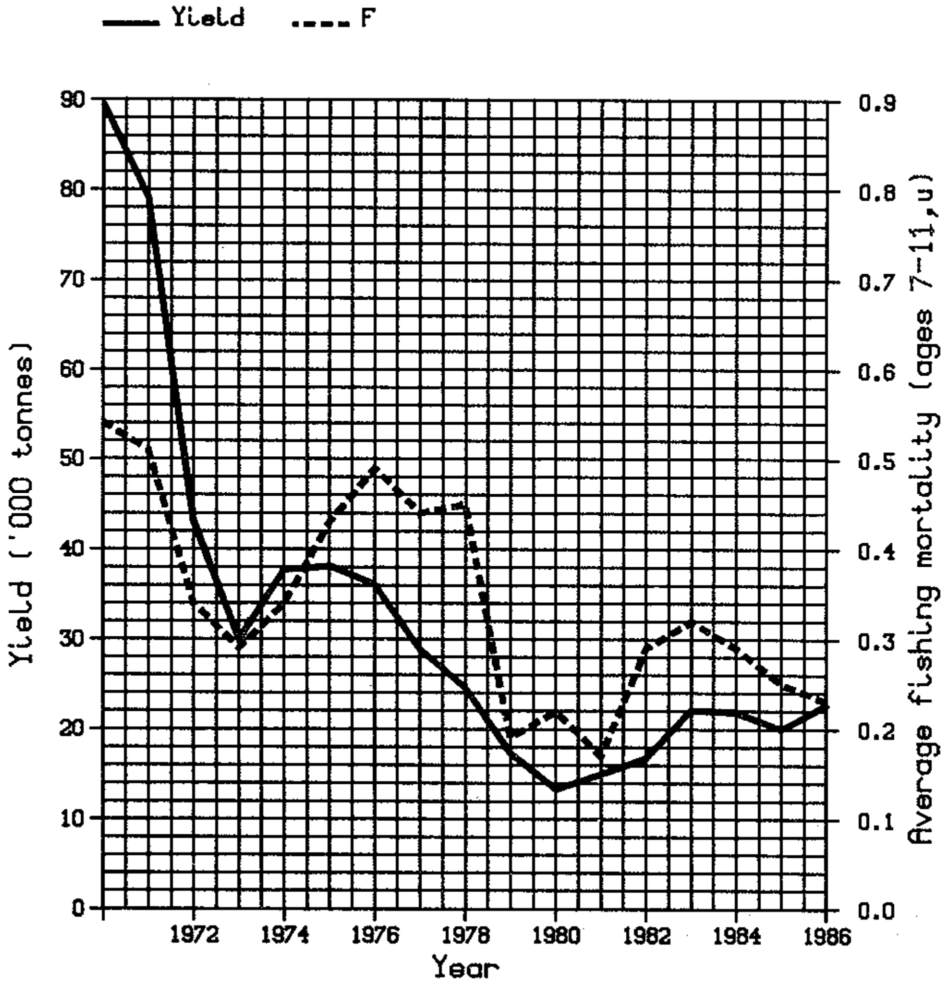
Figure 2.5

FISH STOCK SUMMARY

STOCK: Greenland Halibut in Sub-areas I and II

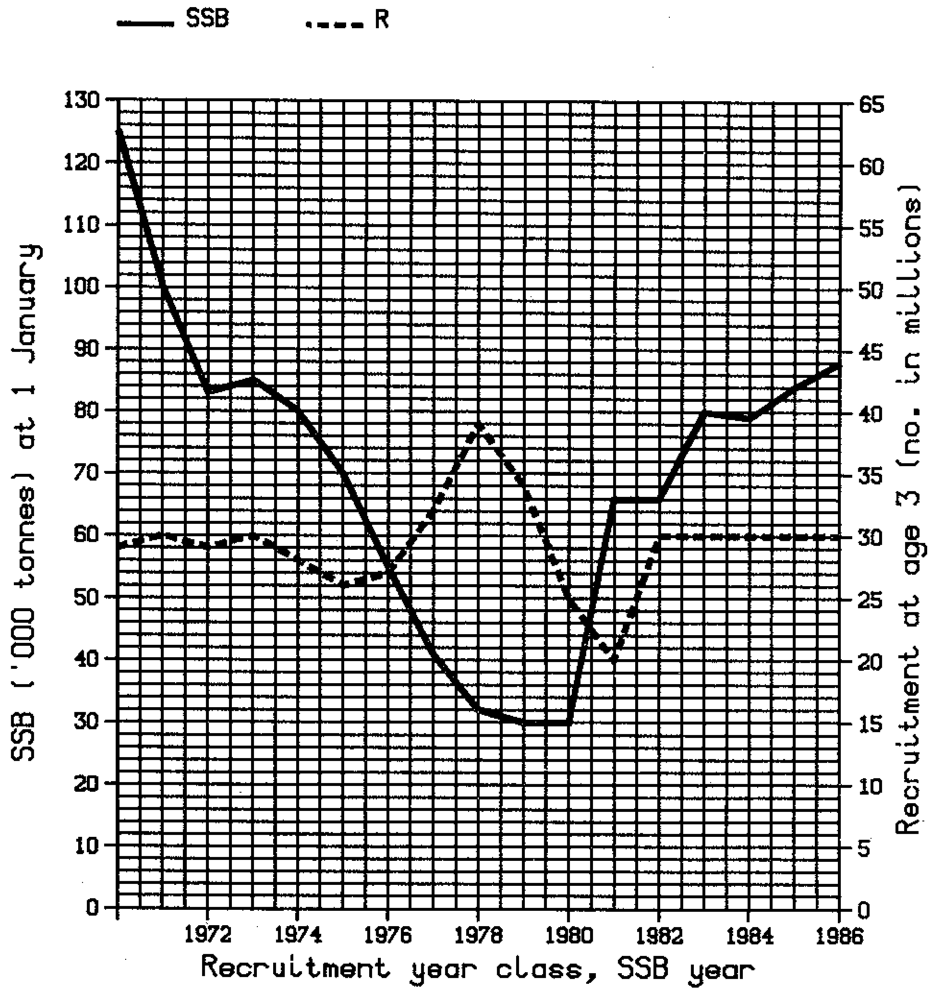
15–10–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

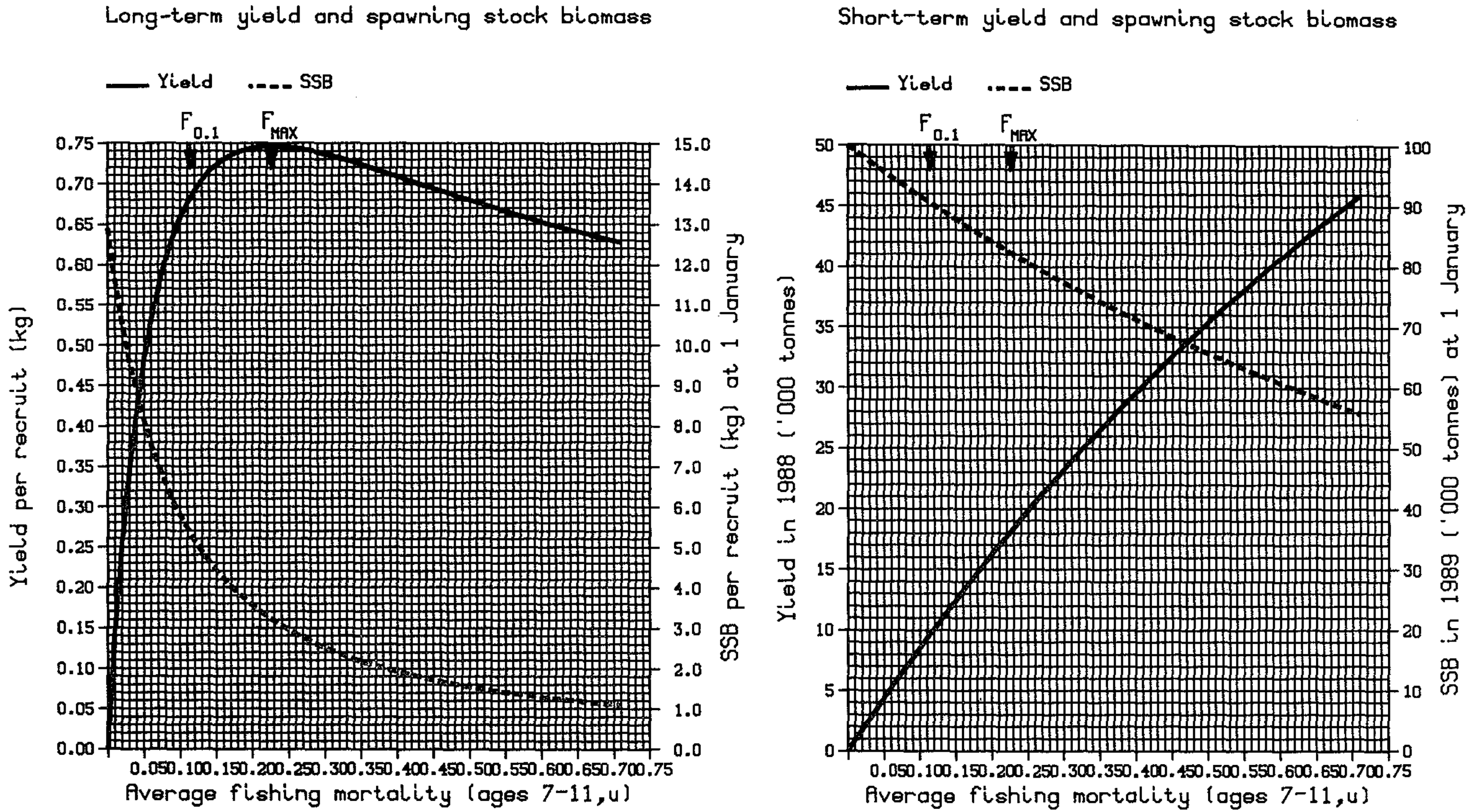
(cont'd)

Figure 2.5 (cont'd)

FISH STOCK SUMMARY

STOCK: Greenland Halibut in Sub-areas I and II

15–10–1987



C

D

Figure 2.6.1.1 East Greenland cod. Catch in 1987 and spawning stock biomass at the beginning of 1988 for different levels of fishing mortality in 1987. The calculated SSB does not include estimates of immigrants in 1988.

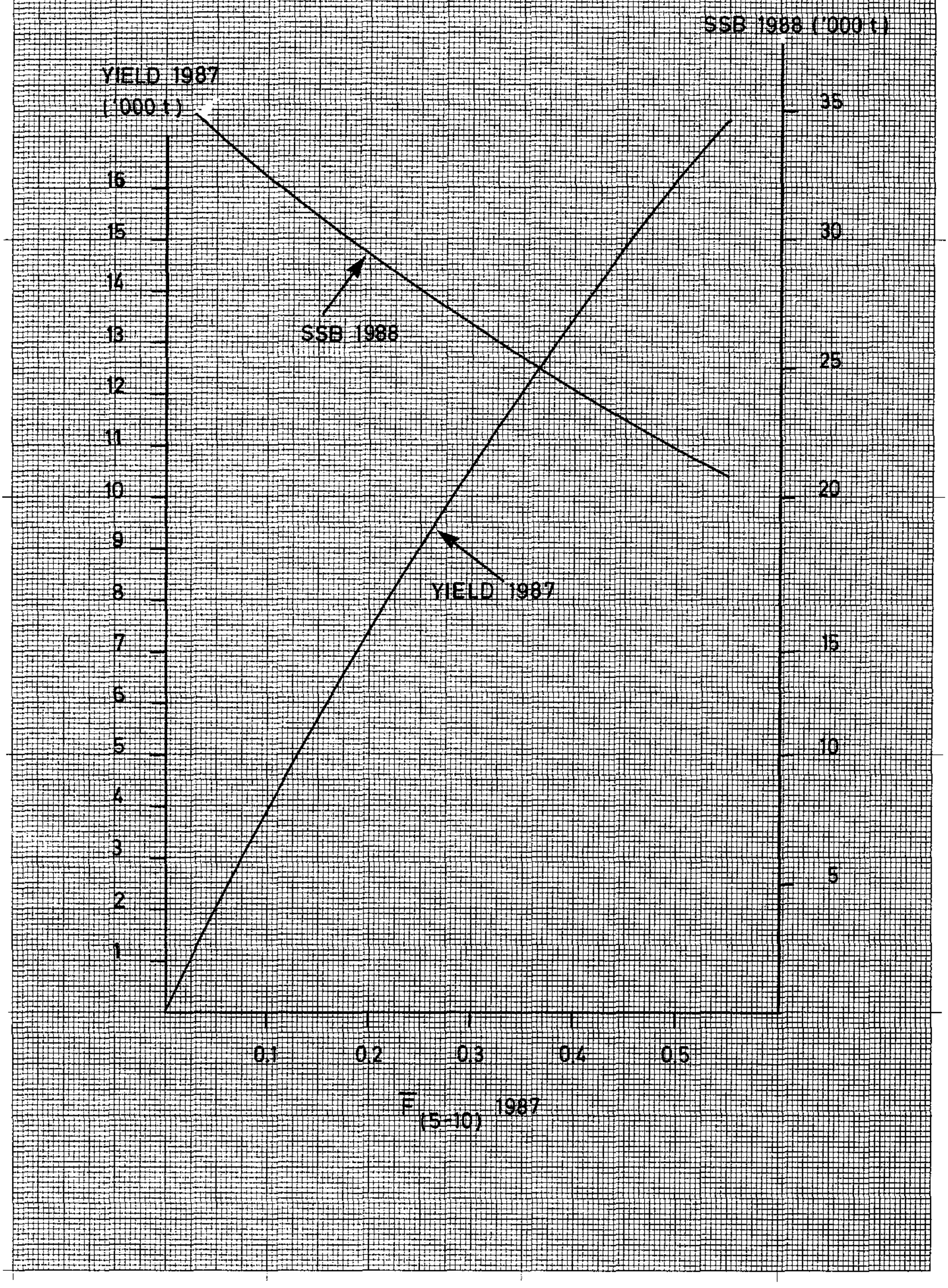
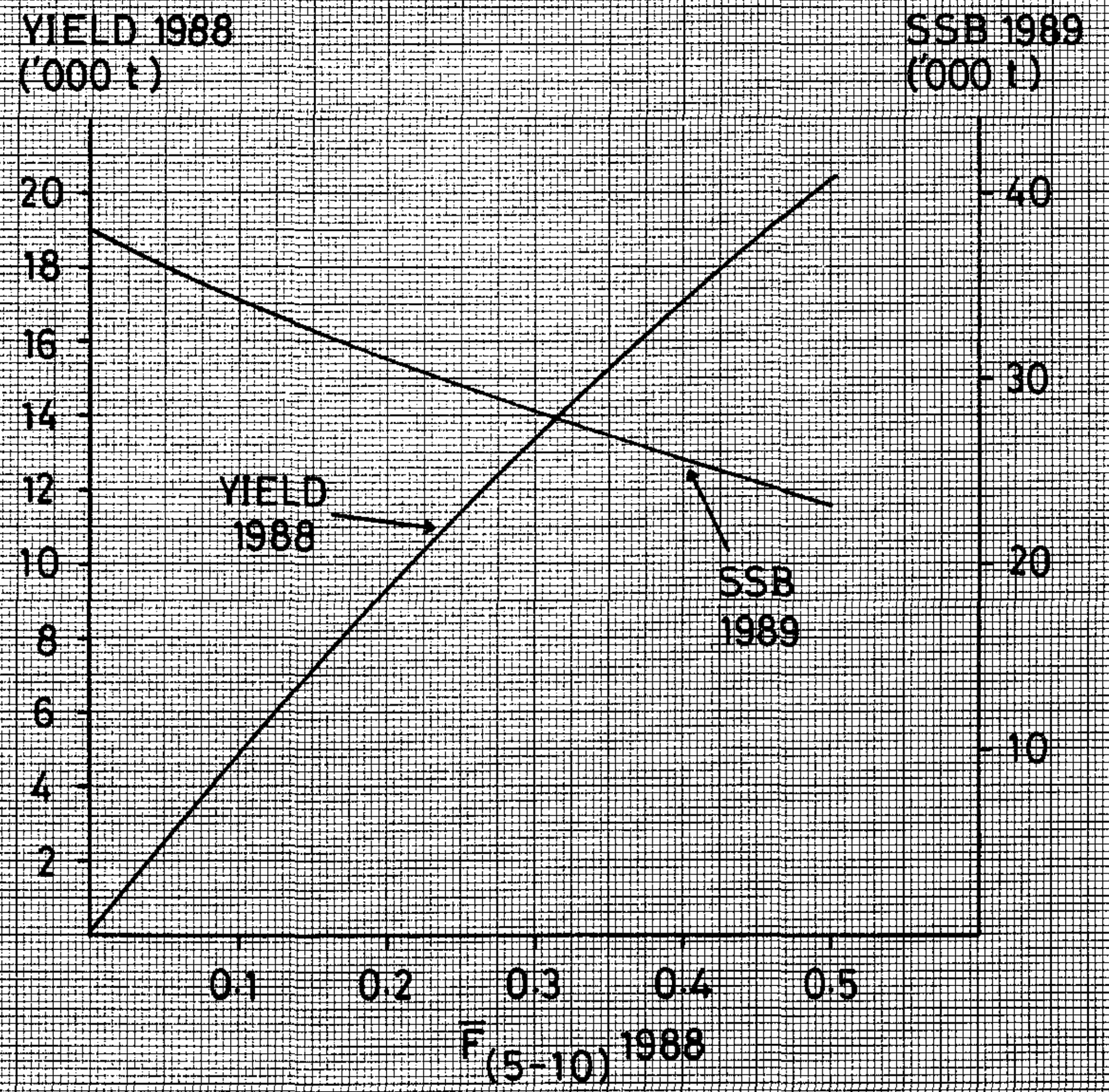


Figure 2.6.1.2 East Greenland COD.
Catch in 1988 and spawning stock biomass at the beginning of 1989 for different levels of fishing mortality in 1988. The calculated SSB does not include estimates of immigrants in 1989.



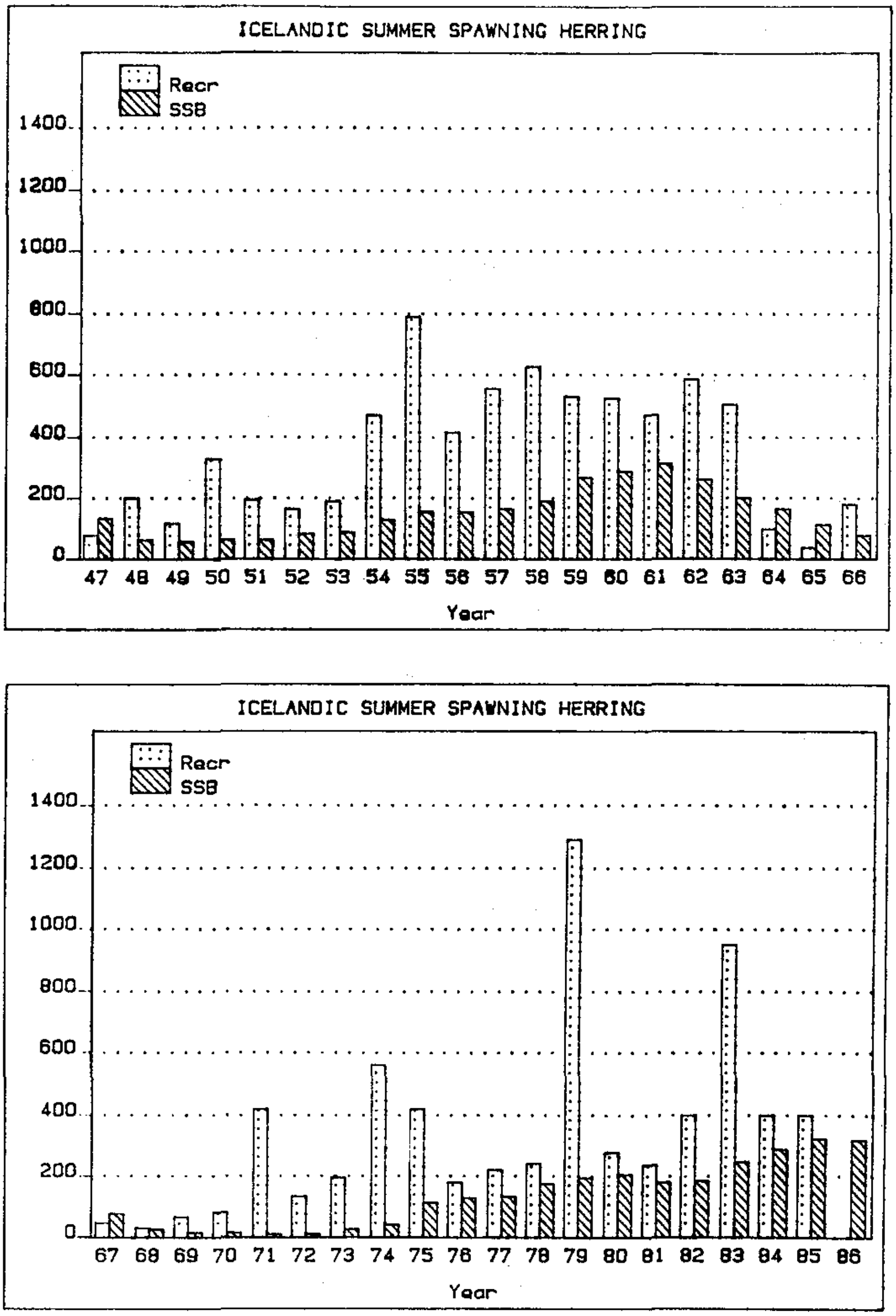
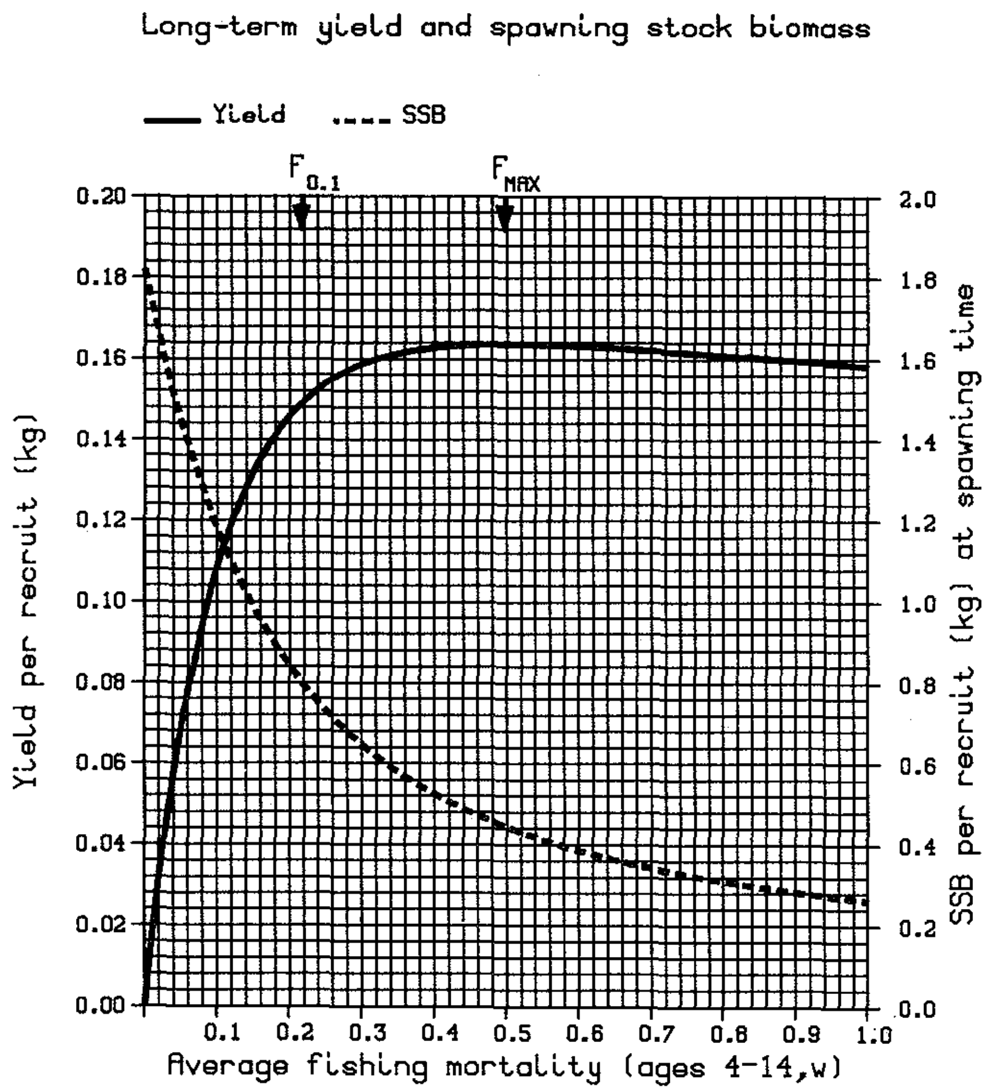


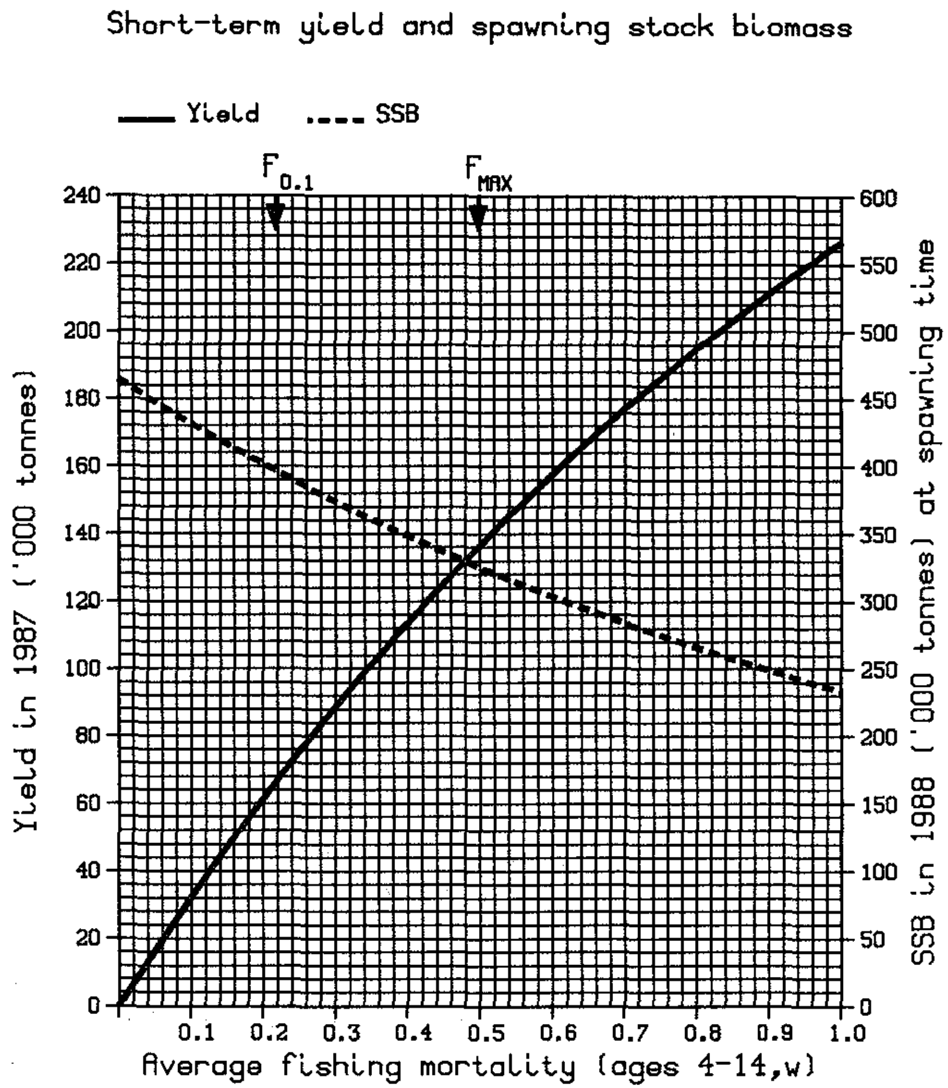
Figure 2.11.2.1 Trends in spawning stock biomass (SSB) and recruitment (Recr) for the Icelandic summer-spawning herring. Recruitment, year class as number 1-ringers x10^{-6}. SSB, year in '000 tonnes.

Figure 2.11.2.2:

FISH STOCK SUMMARY
STOCK: Herring – Va (Summer)
13–04–1987



C

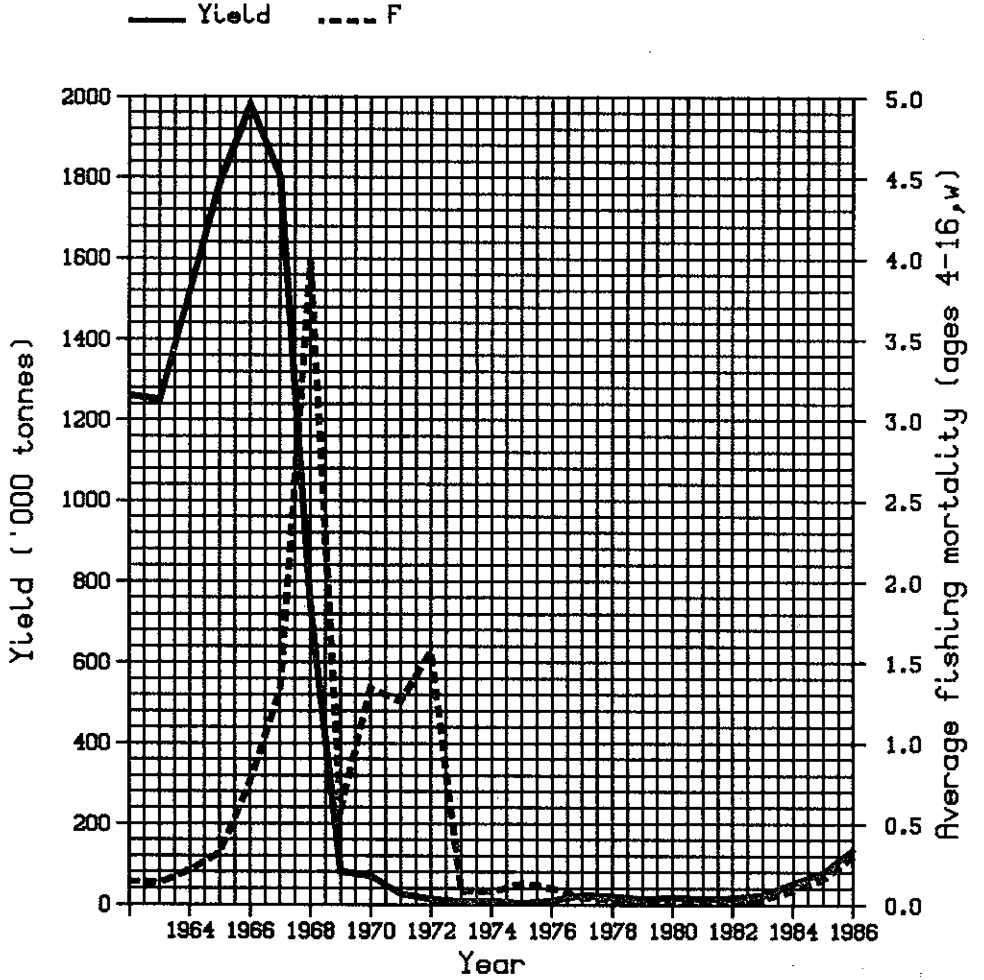


D

Figure 2.11.3

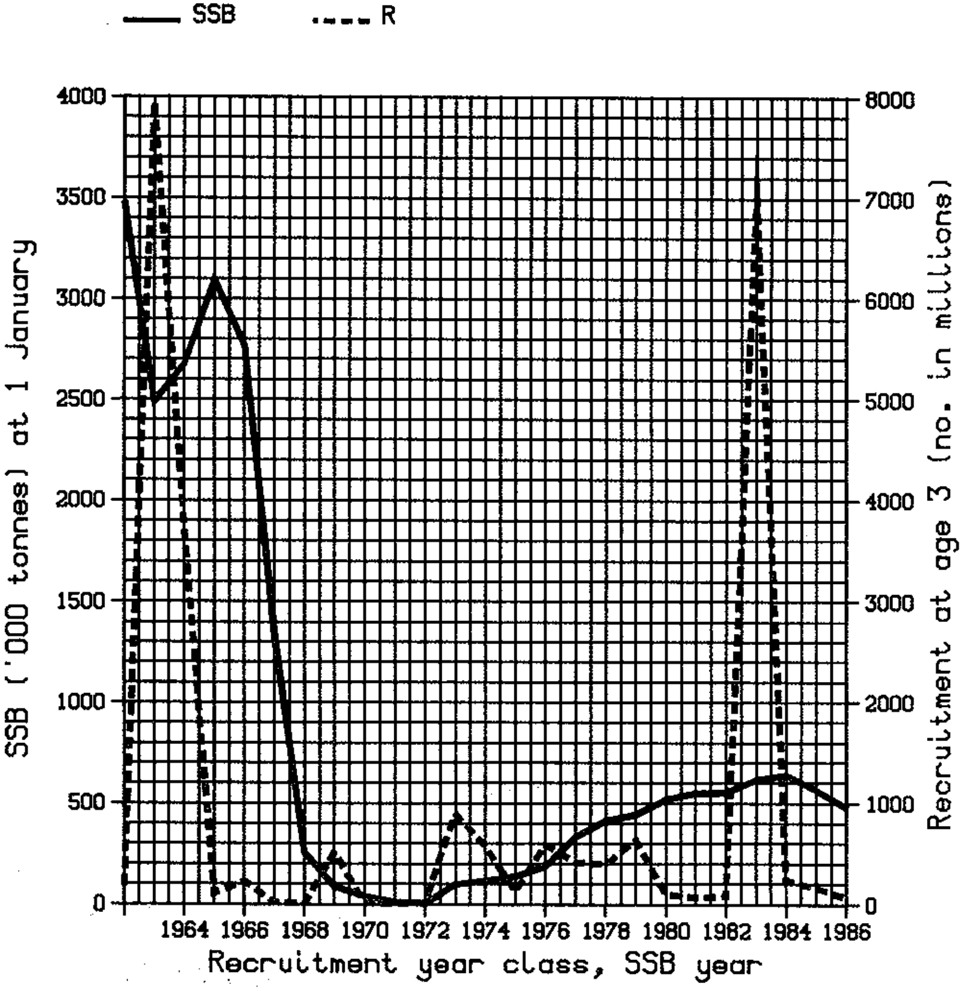
FISH STOCK SUMMARY
STOCK: Norwegian Spring–Spawning Herring
02–11–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)

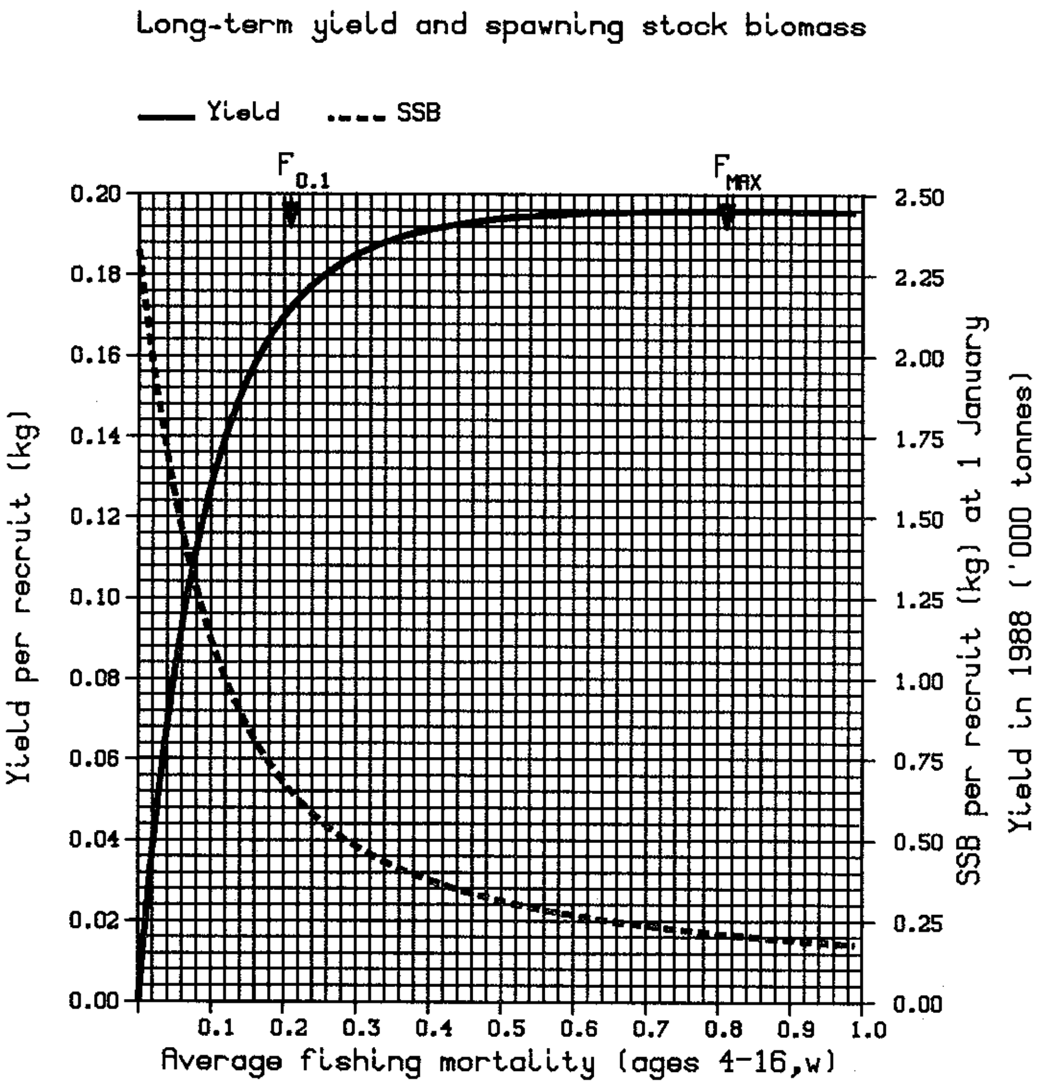


B

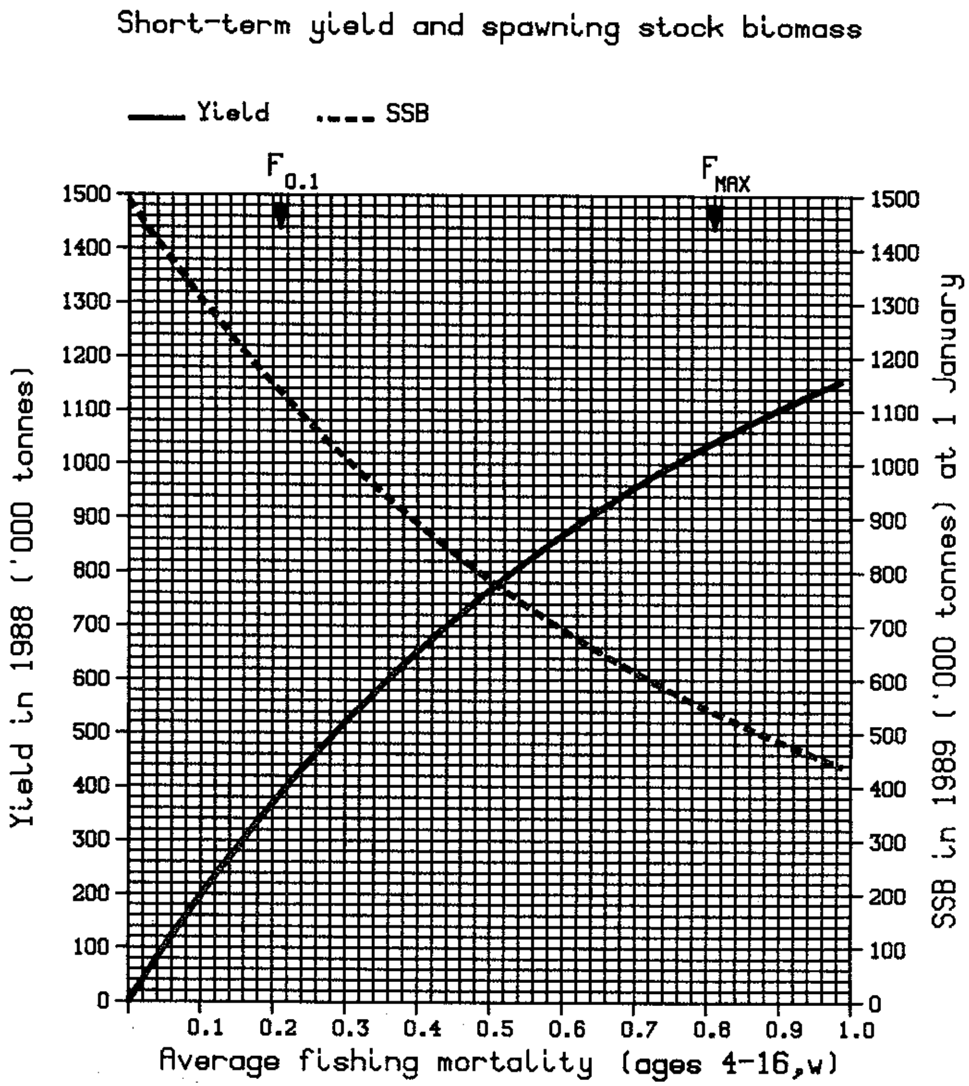
ctd.

Figure 2.11.3 (ctd.)

FISH STOCK SUMMARY
STOCK: Norwegian Spring-Spawning Herring
02-11-1987



C



D

Figure 3.1.2.1

FISH STOCK SUMMARY
STOCK: Herring – North Sea (Sub–area IV)
13–04–1987

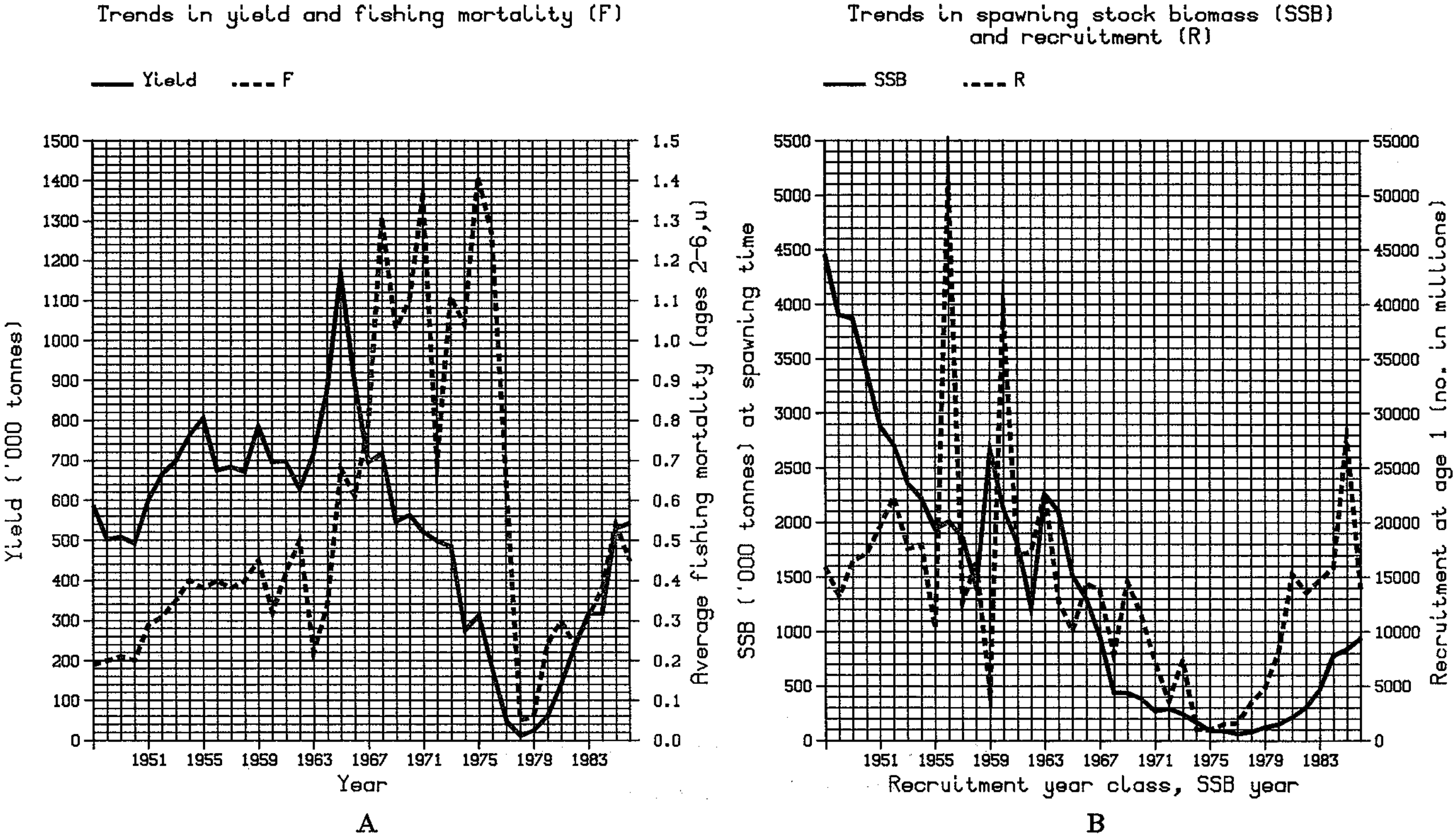


Figure 3.1.2.2

FISH STOCK SUMMARY
STOCK: Herring – IVA and IVB
13–04–1987

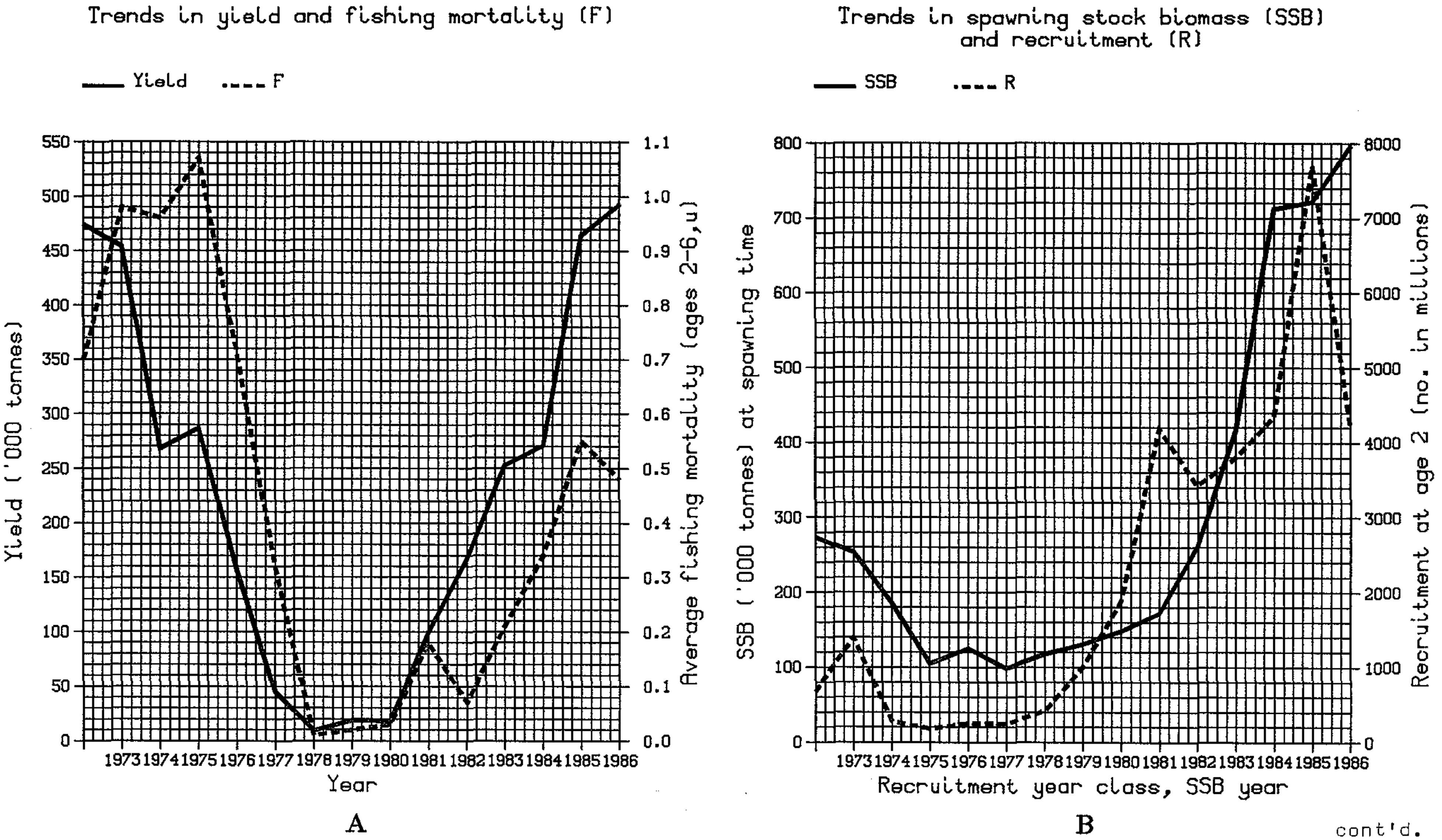


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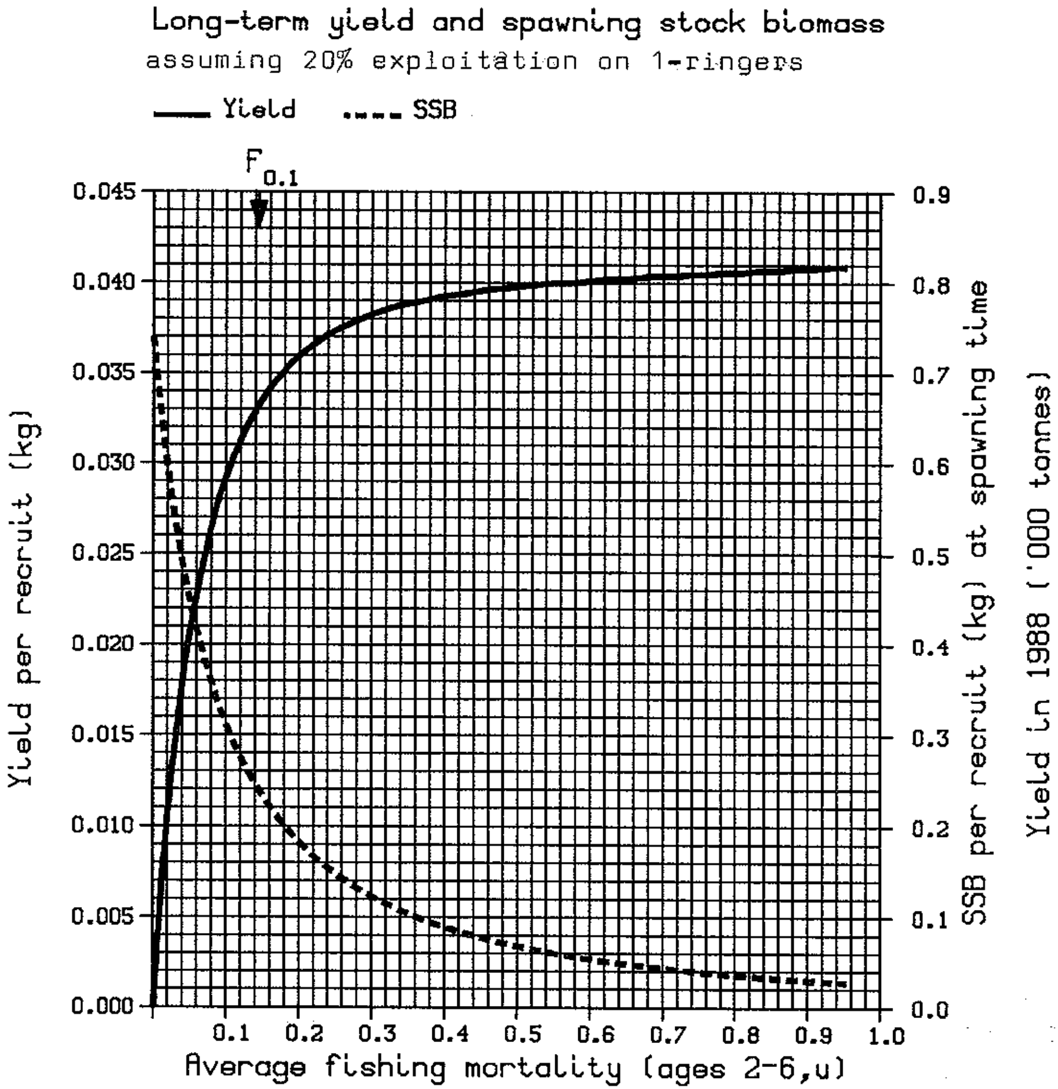
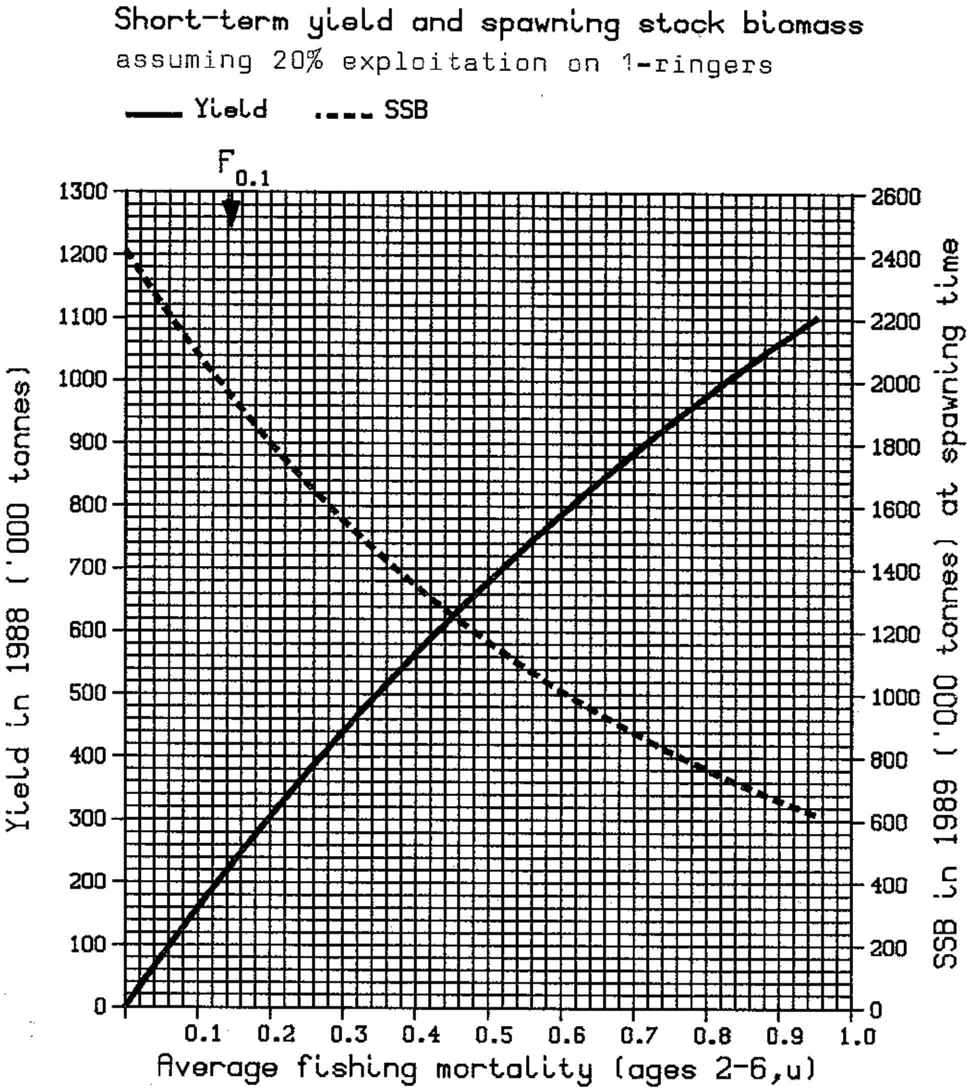
Figure 3.1.2.2 cont'd.

FISH STOCK SUMMARY
STOCK: Herring – IVA and IVB
13–04–1987



C

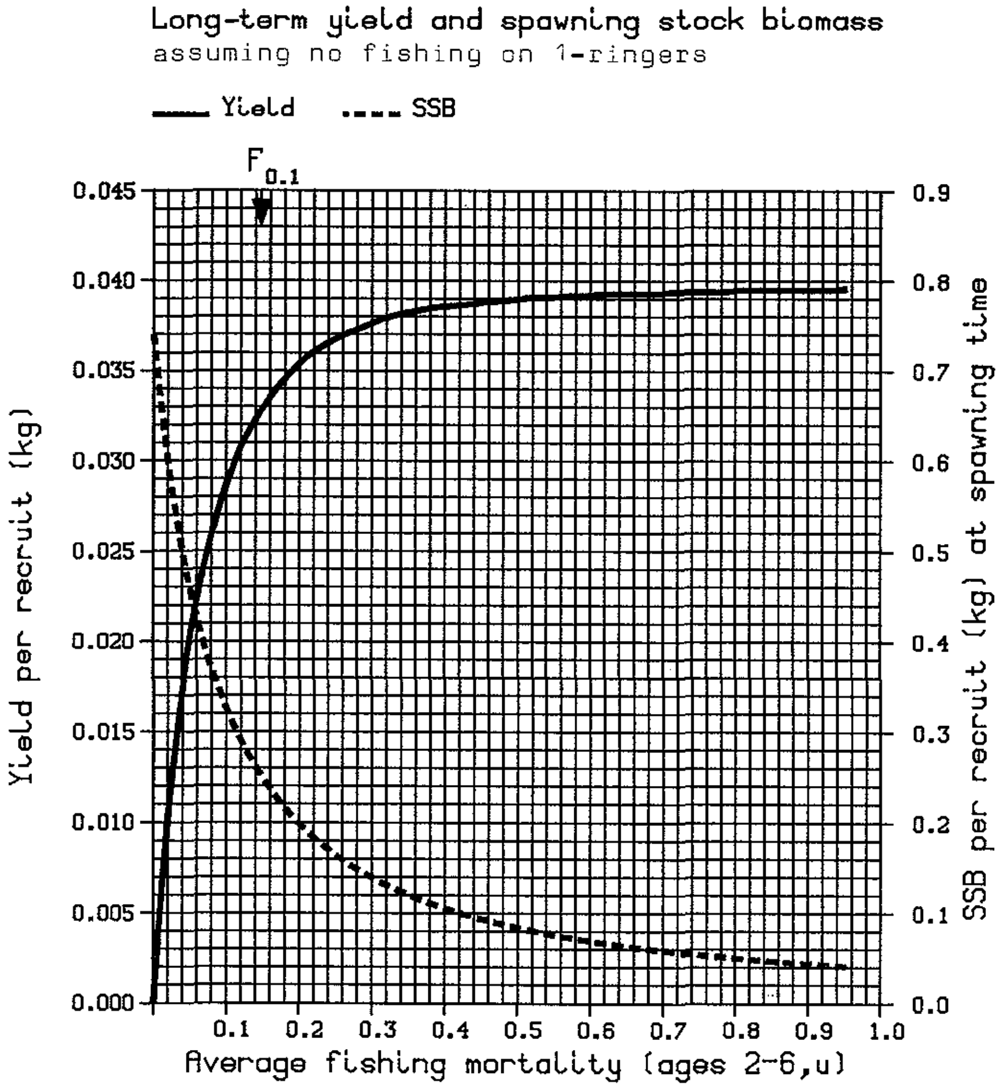


D

cont'd

FISH STOCK SUMMARY
STOCK: Herring – IVA and IVB
13–04–1987

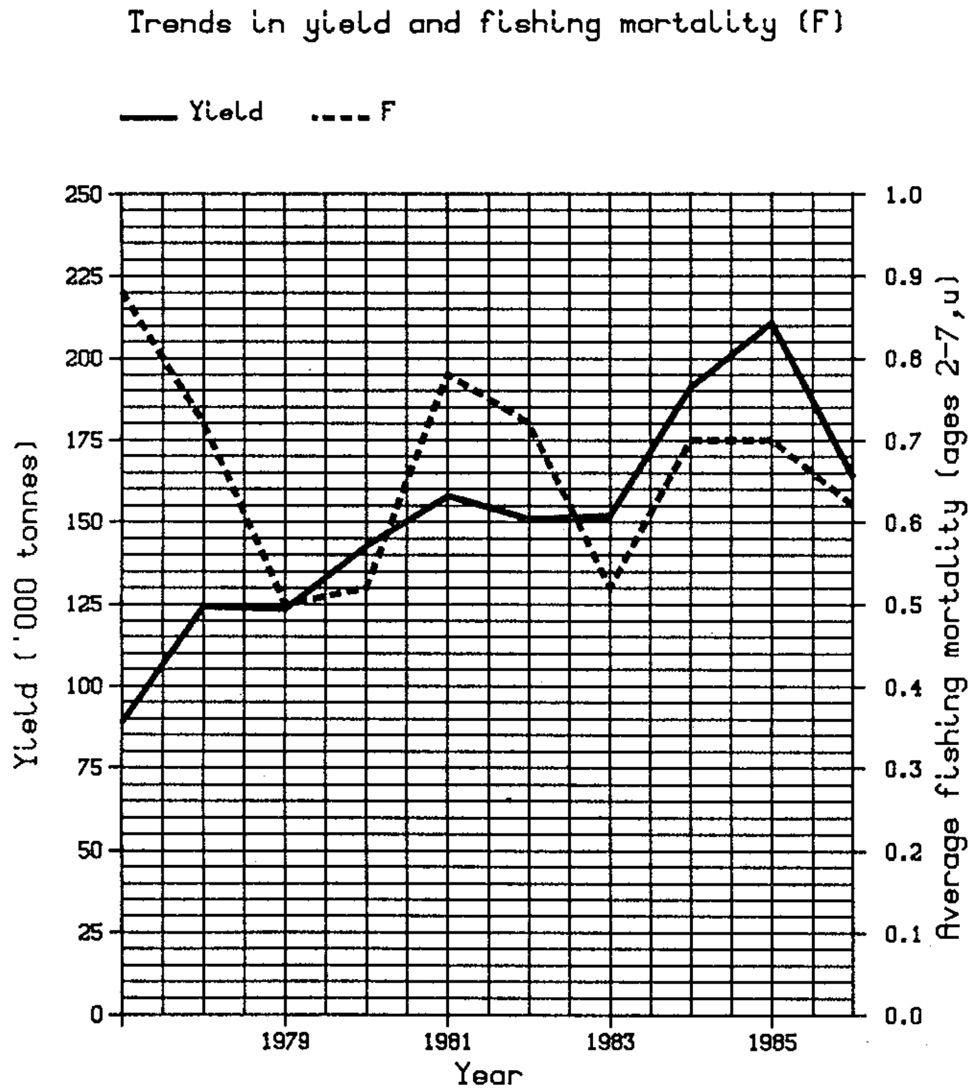
Figure 3.1.2.2 cont'd.



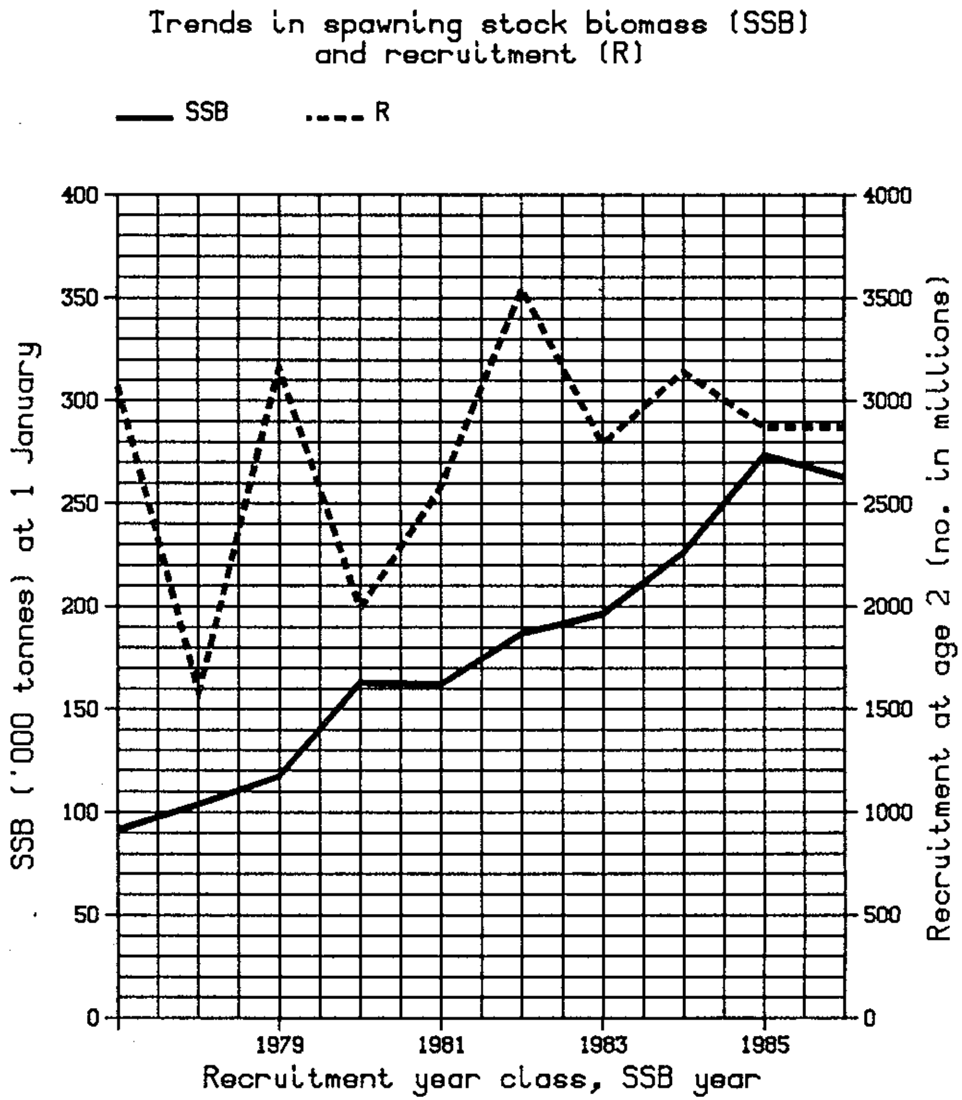
C

FISH STOCK SUMMARY
STOCK: Herring – Div. IIIa and Sub–divs. 22–24
22–04–1987

Figure 3.1.4



A



B

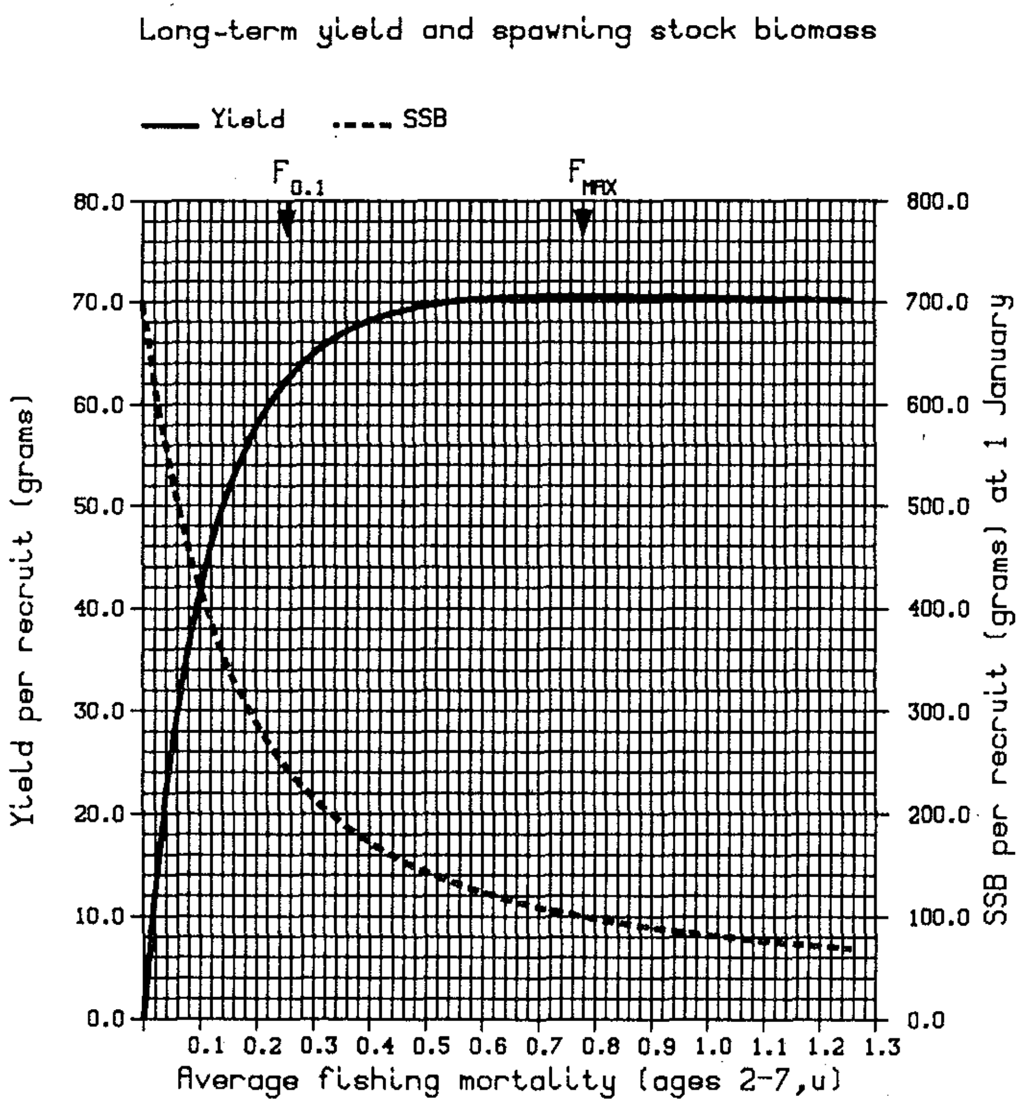
cont'd.

FISH STOCK SUMMARY

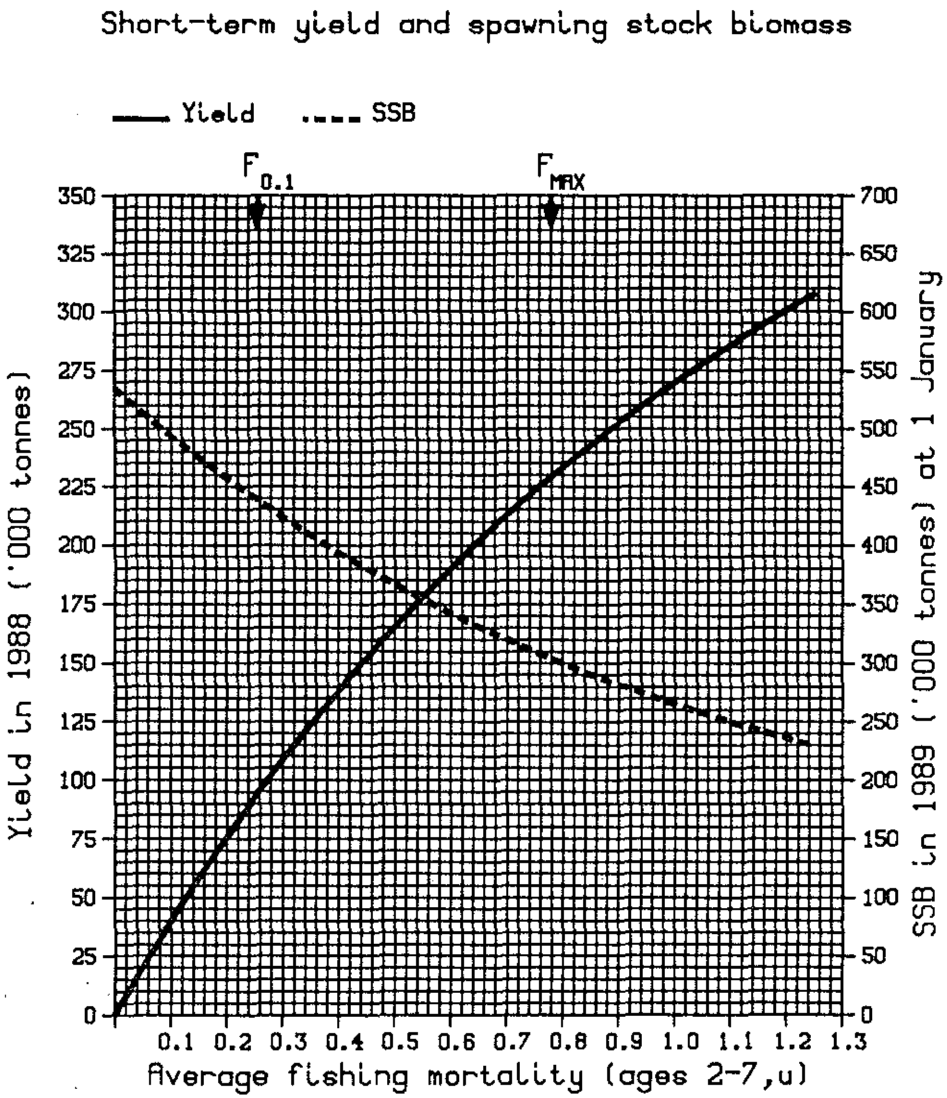
STOCK: Herring – Div. IIIa and Sub–divs. 22–24

22–04–1987

Figure 3.1.4 cont'd.



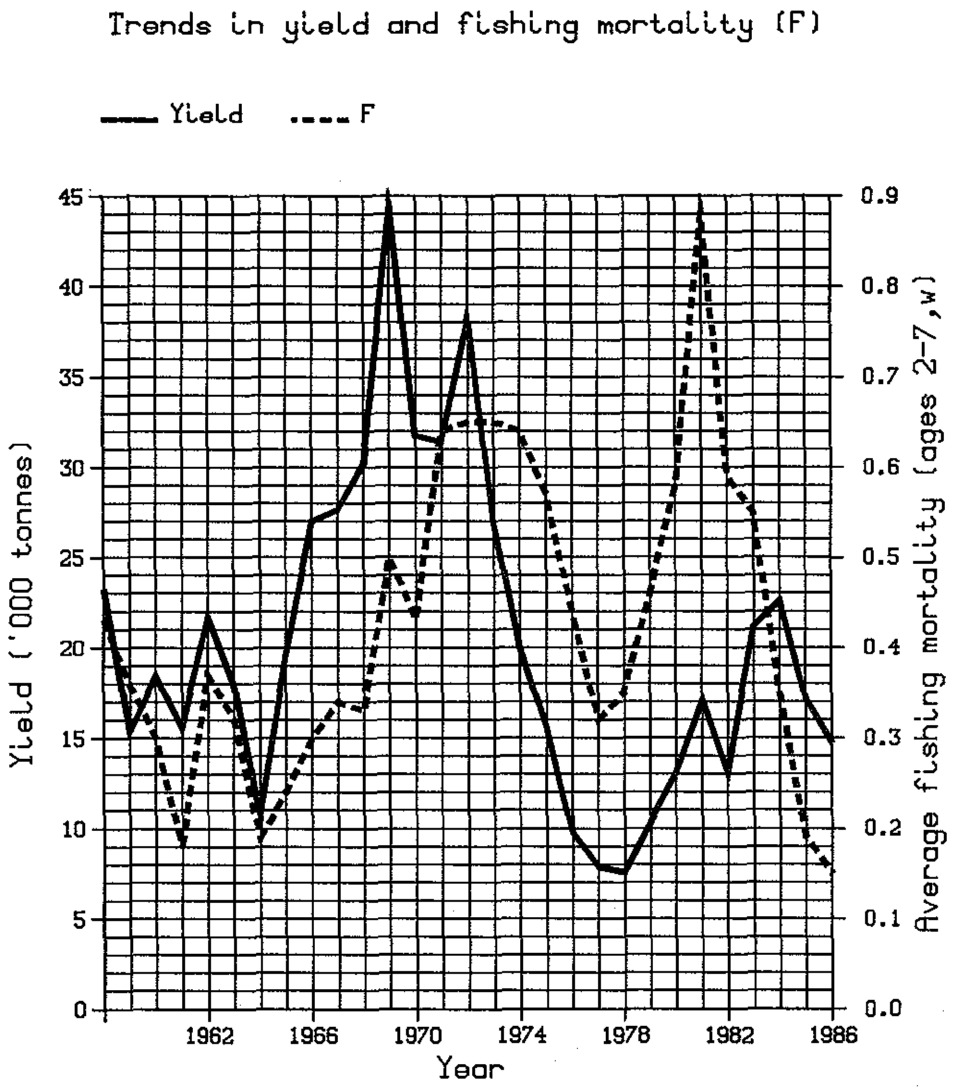
C



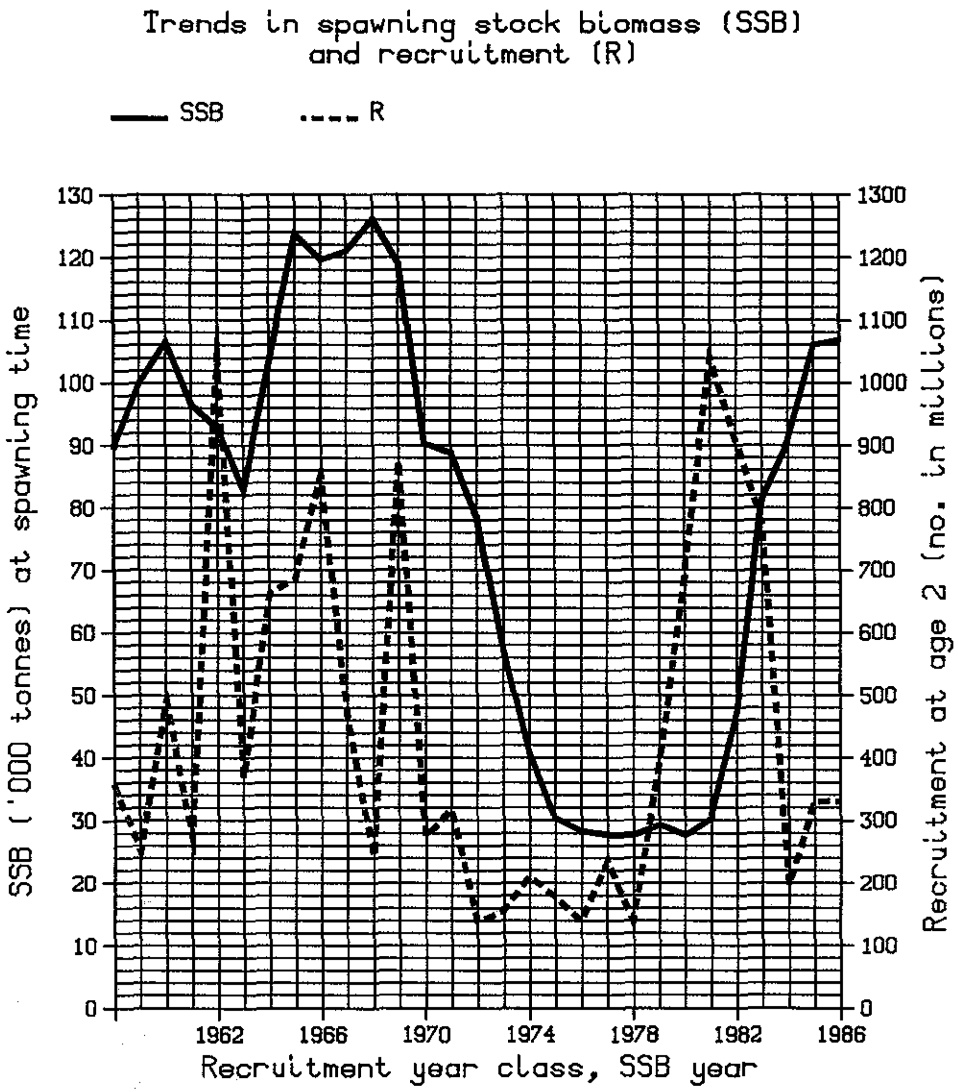
D

Figure 3.1.5

FISH STOCK SUMMARY
STOCK: Herring – Celtic Sea and VIIj
14–04–1987



A

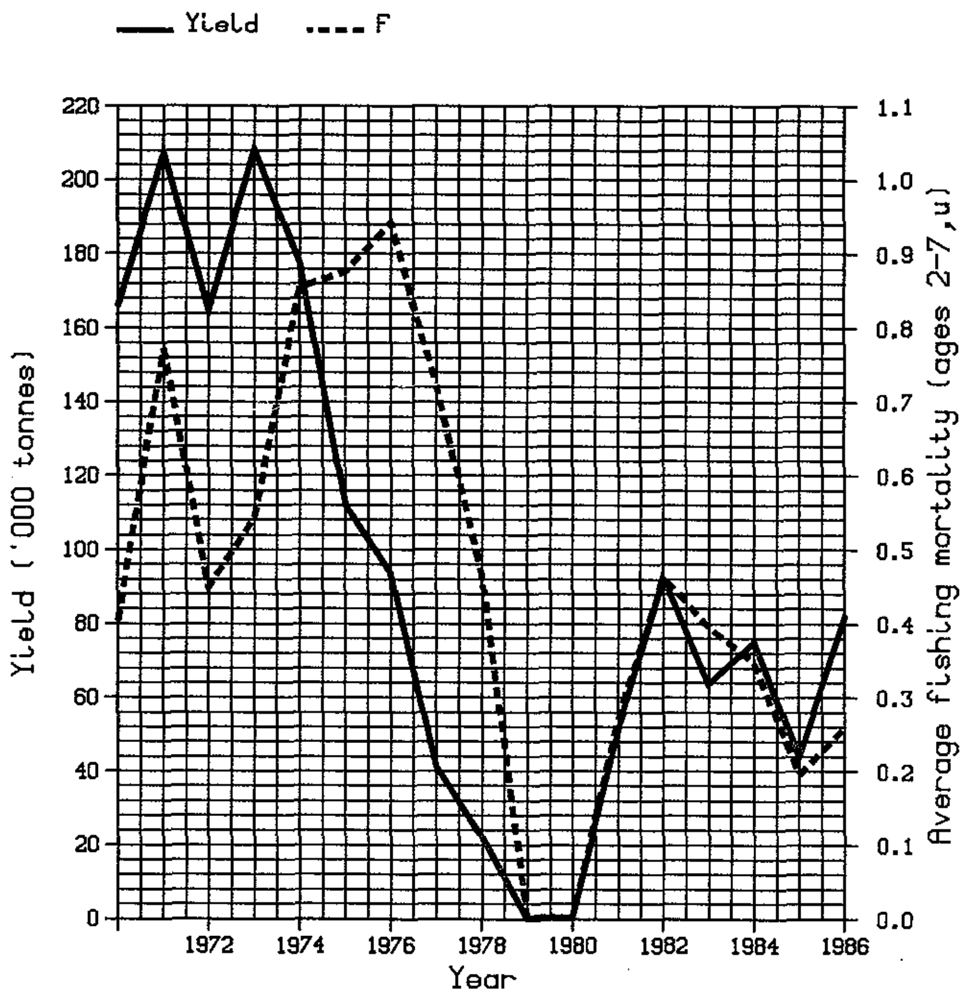


B

Figure 3.1.6

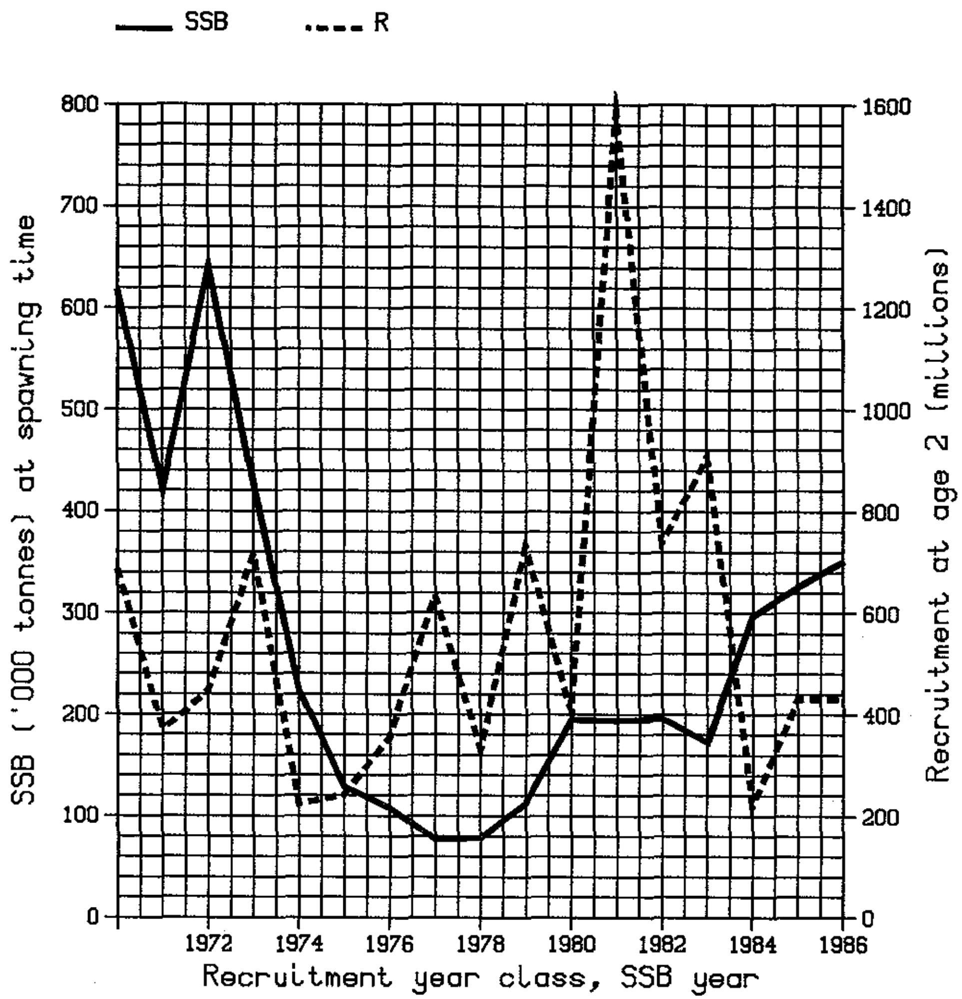
FISH STOCK SUMMARY
STOCK: Herring – VIa North
14–04–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



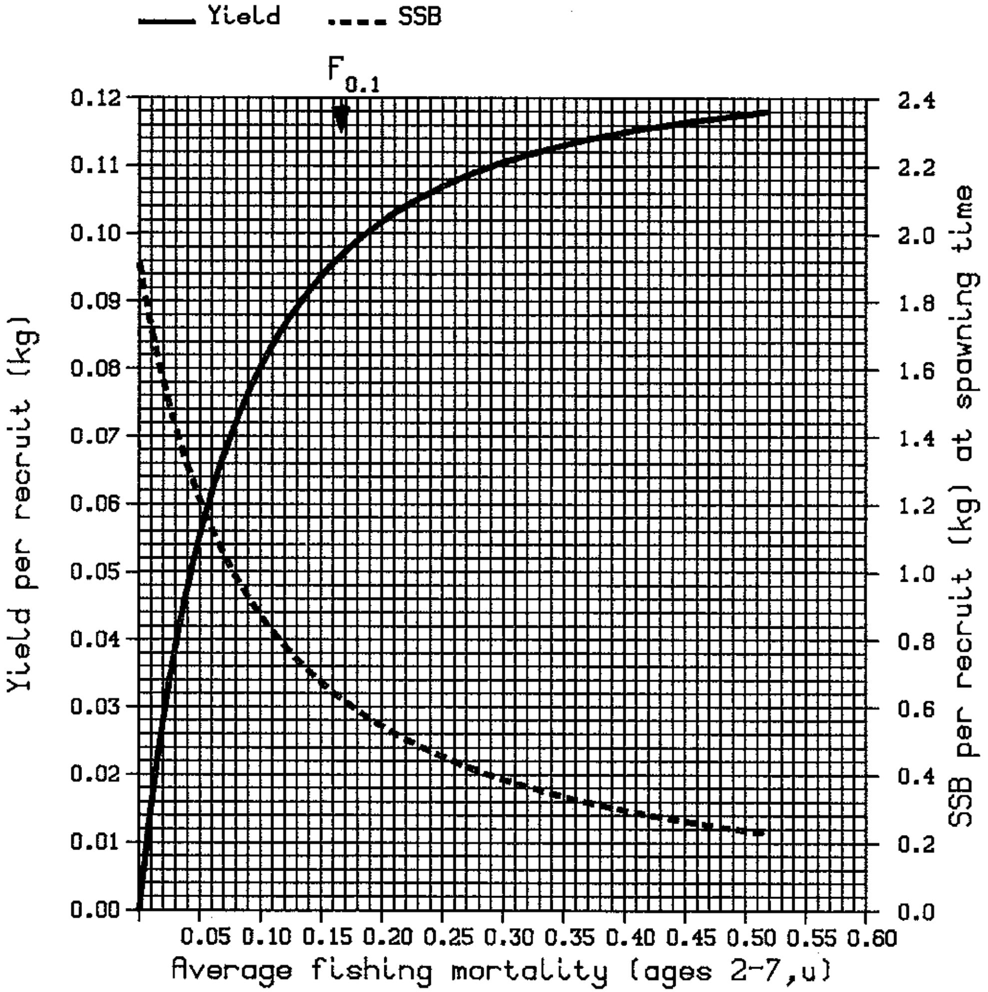
B

cont'd.

FISH STOCK SUMMARY
STOCK: Herring – VIa North
14–04–1987

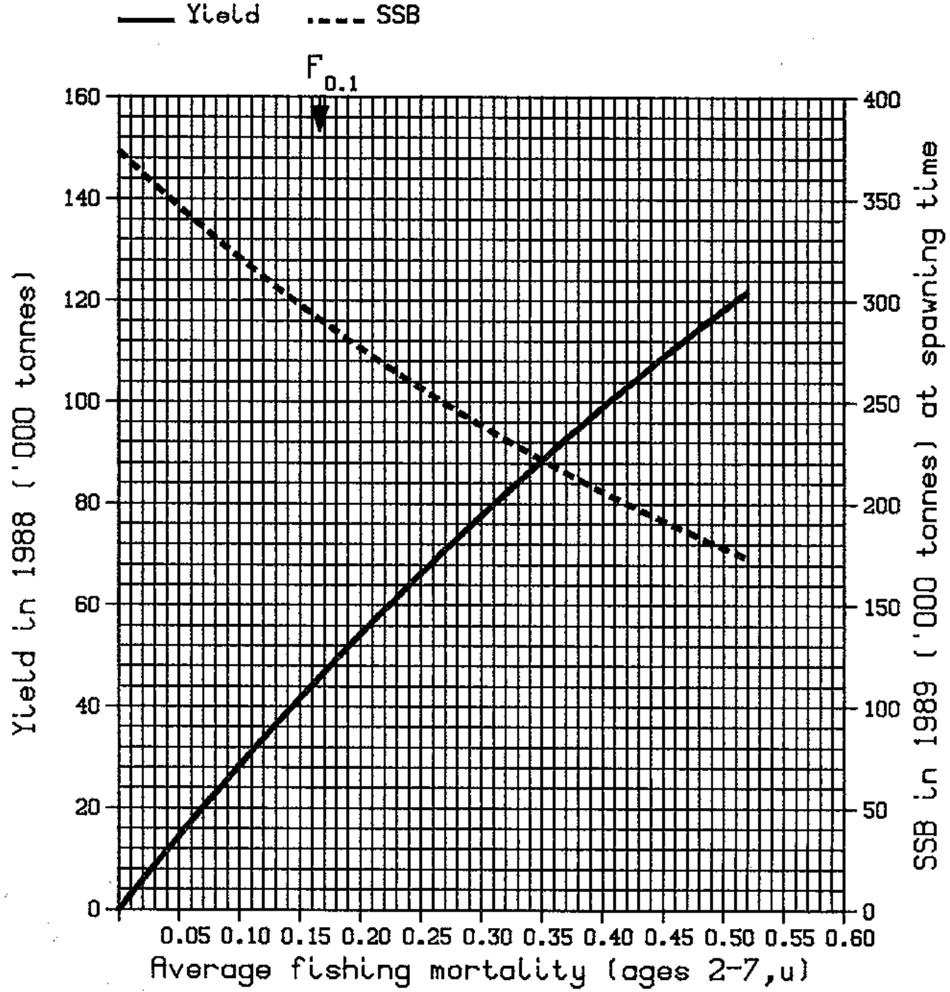
Figure 3.1.6 cont'd.

Long-term yield and spawning stock biomass



C

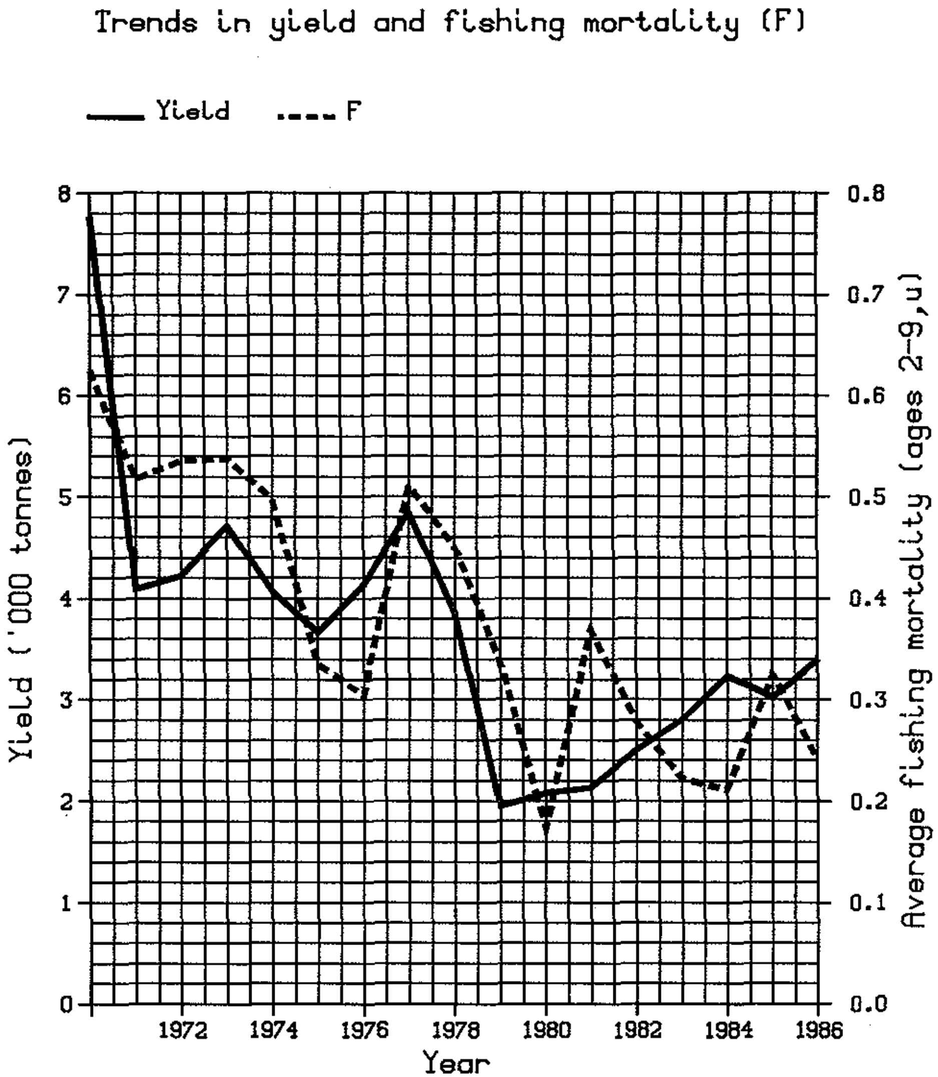
Short-term yield and spawning stock biomass



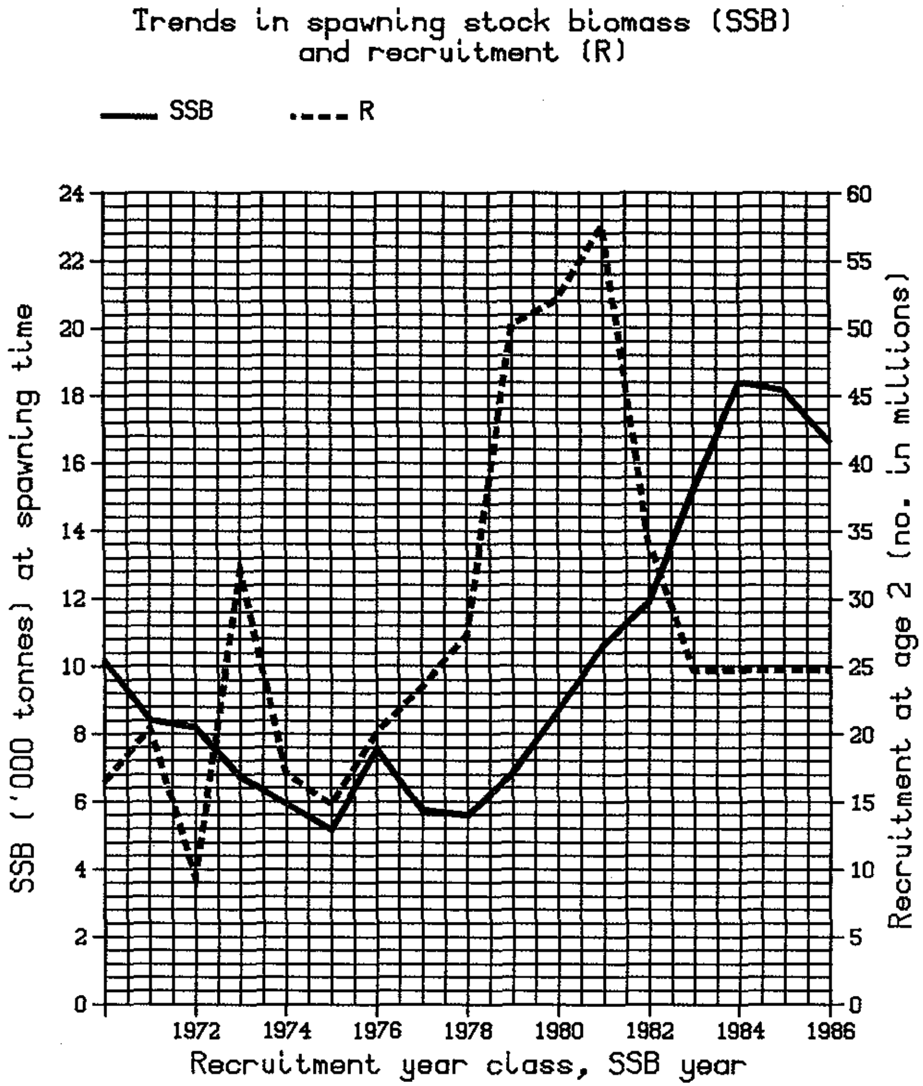
D

Figure 3.1.7

FISH STOCK SUMMARY
STOCK: Clyde Herring
14–04–1987



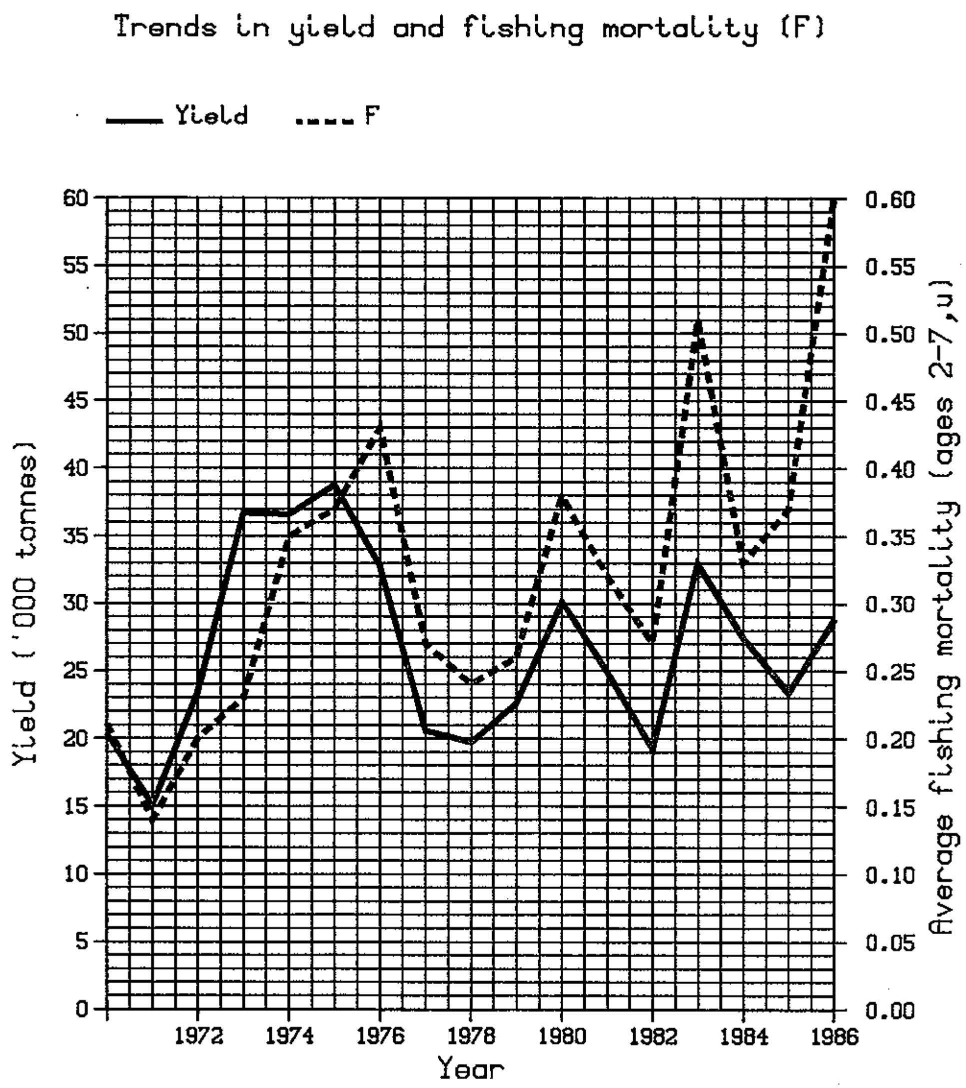
A



B

Figure 3.1.8

FISH STOCK SUMMARY
STOCK: Herring – VIaS and VIIb,c
14–04–1987



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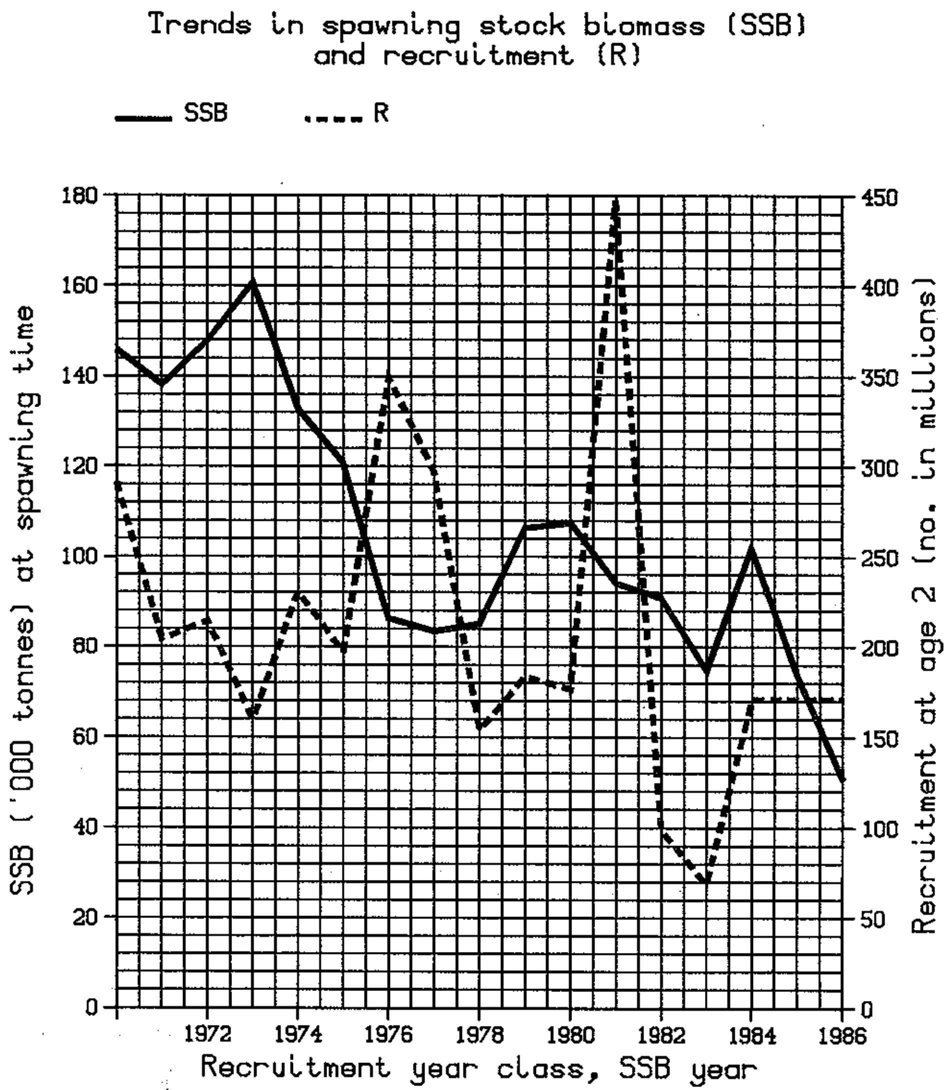


B

cont'd.

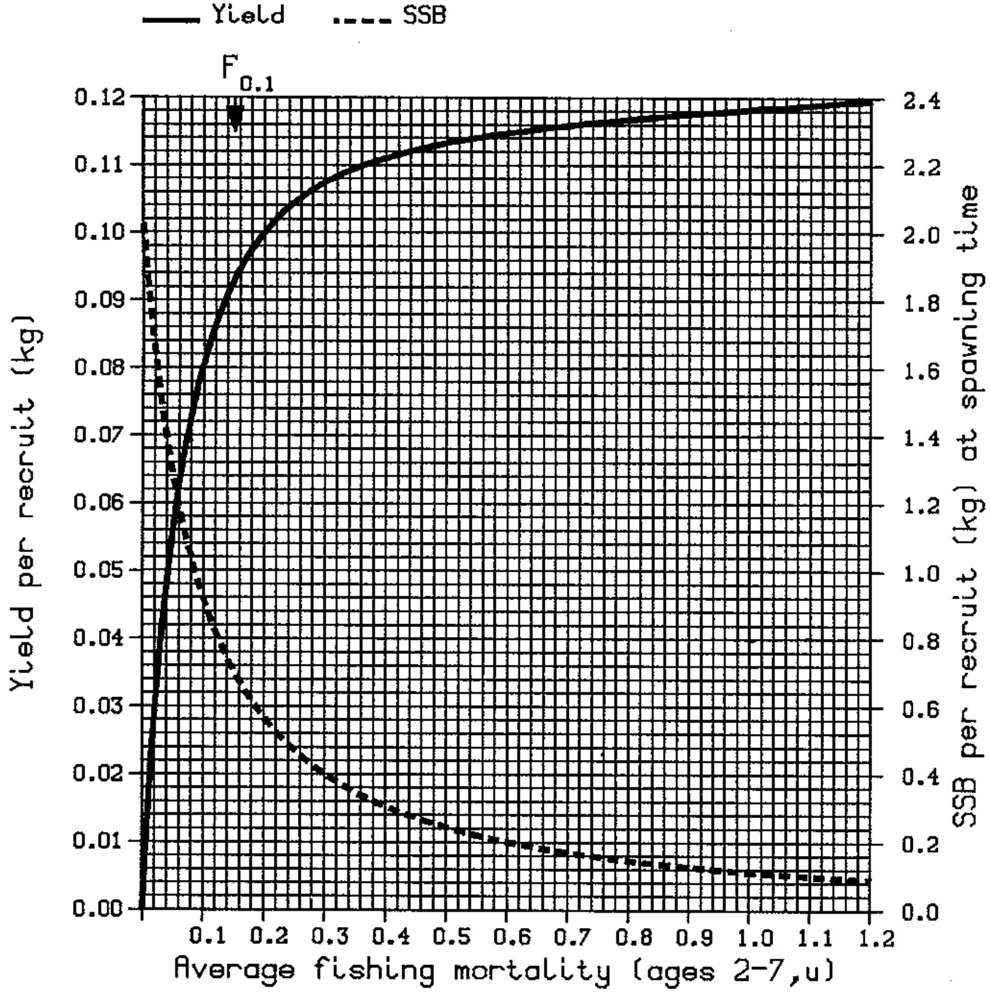
FISH STOCK SUMMARY

STOCK: Herring – VIaS and VIIb,c

14–04–1987

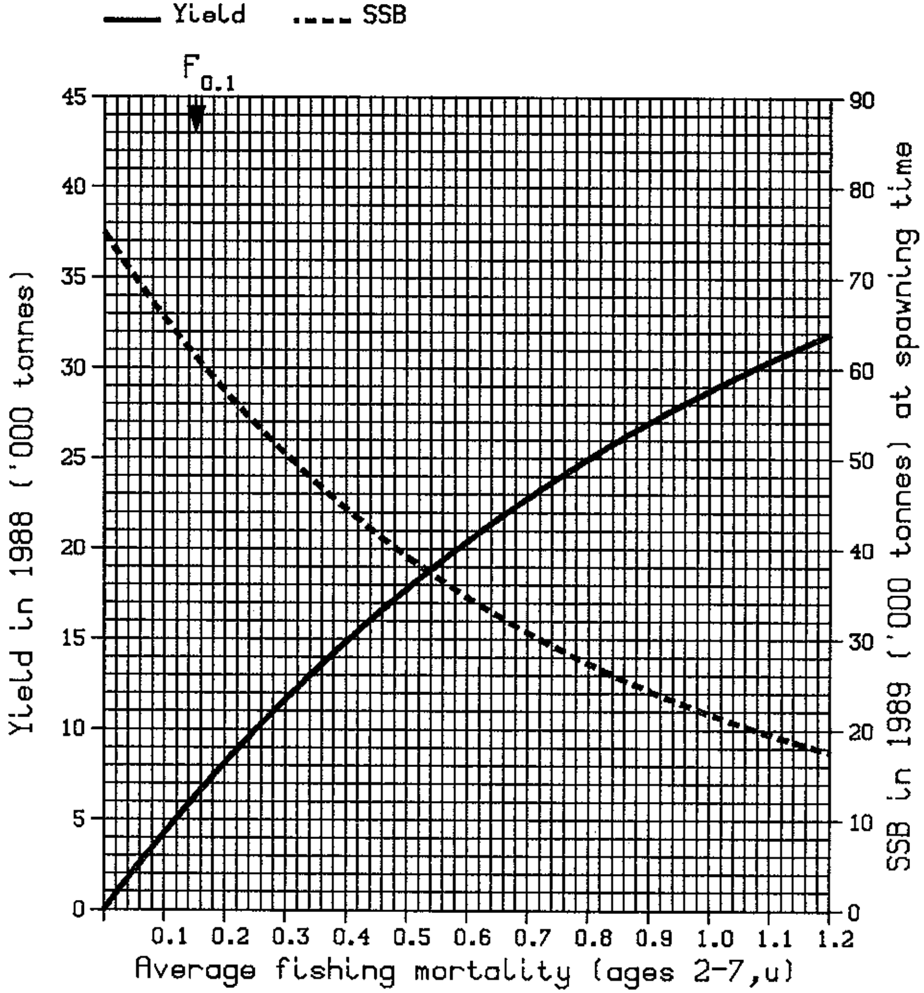
Figure 3.1.8 cont'd.

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass
assuming catch of 29,000 t in 1987

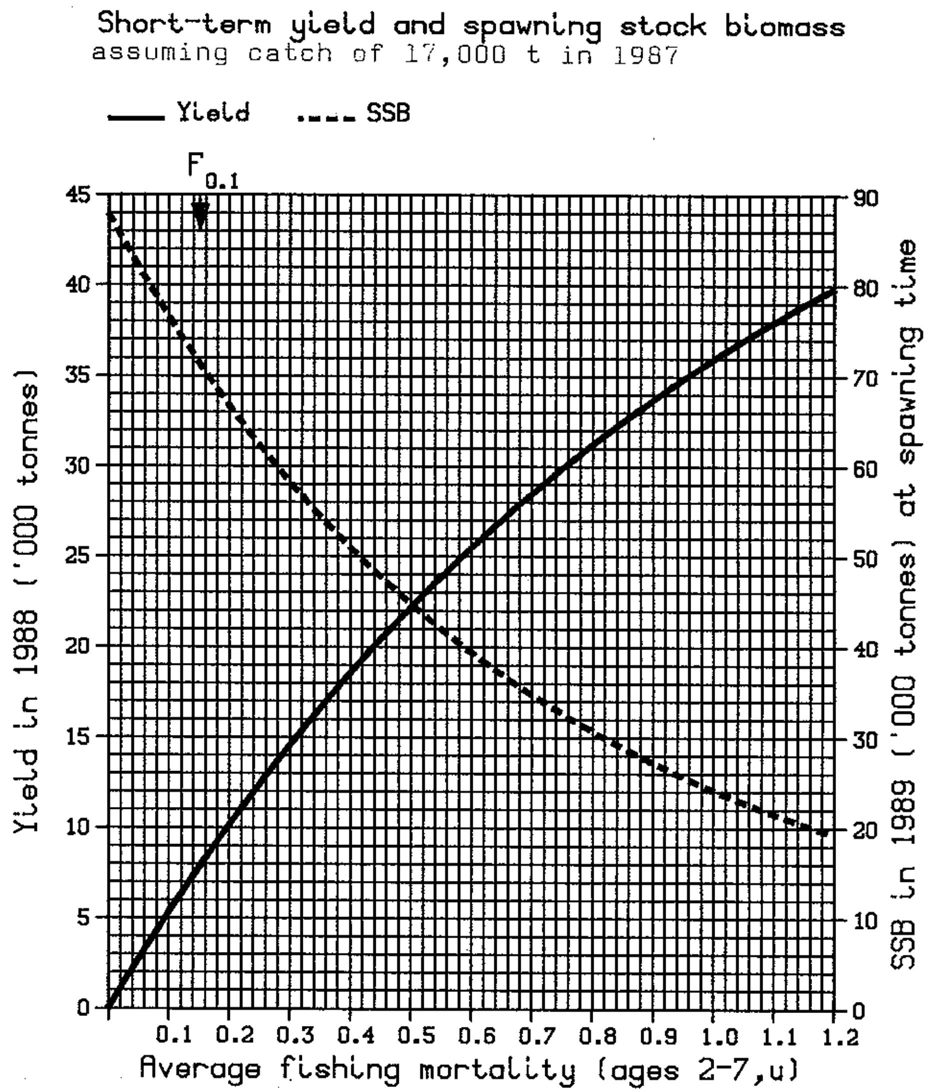


D

cont'd.

FISH STOCK SUMMARY
STOCK: Herring – VIaS and VIIb,c
14–04–1987

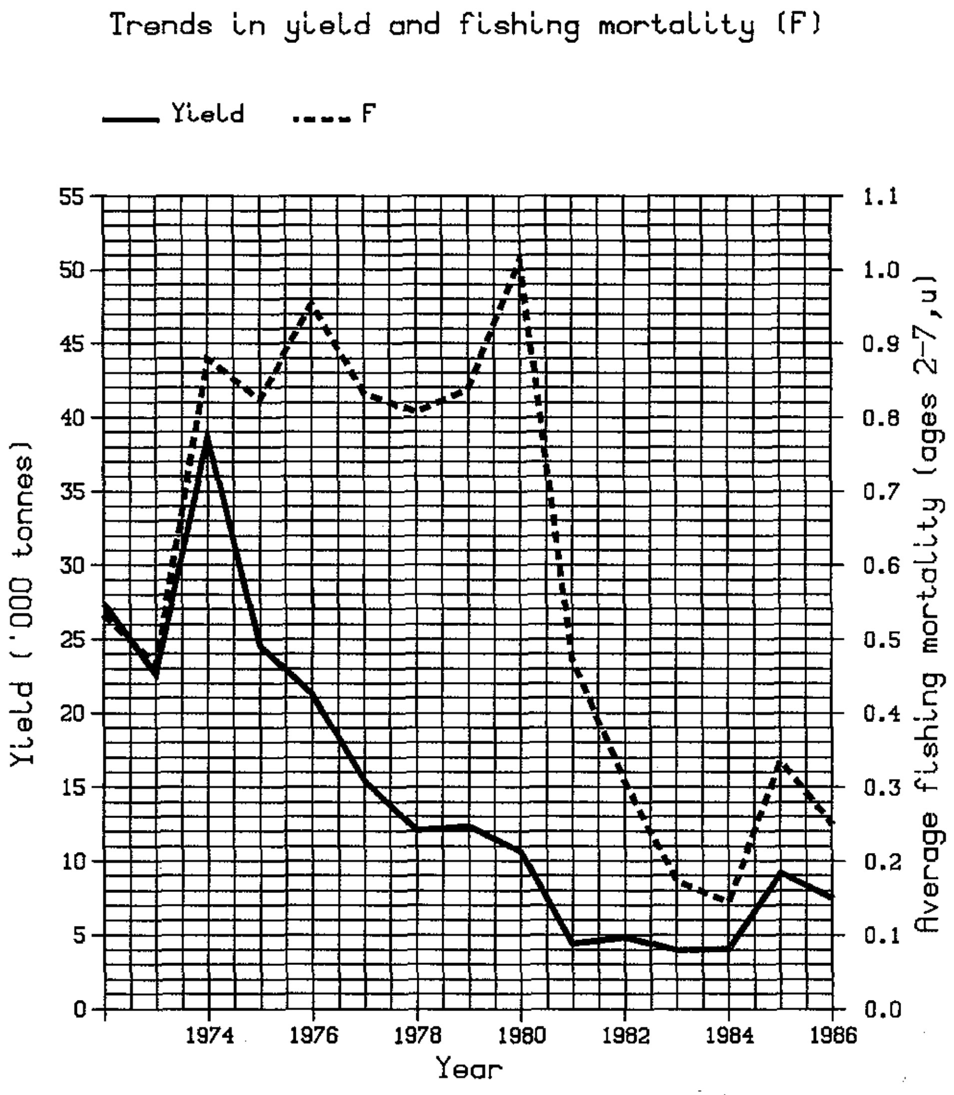
Figure 3.1.8 cont'd.



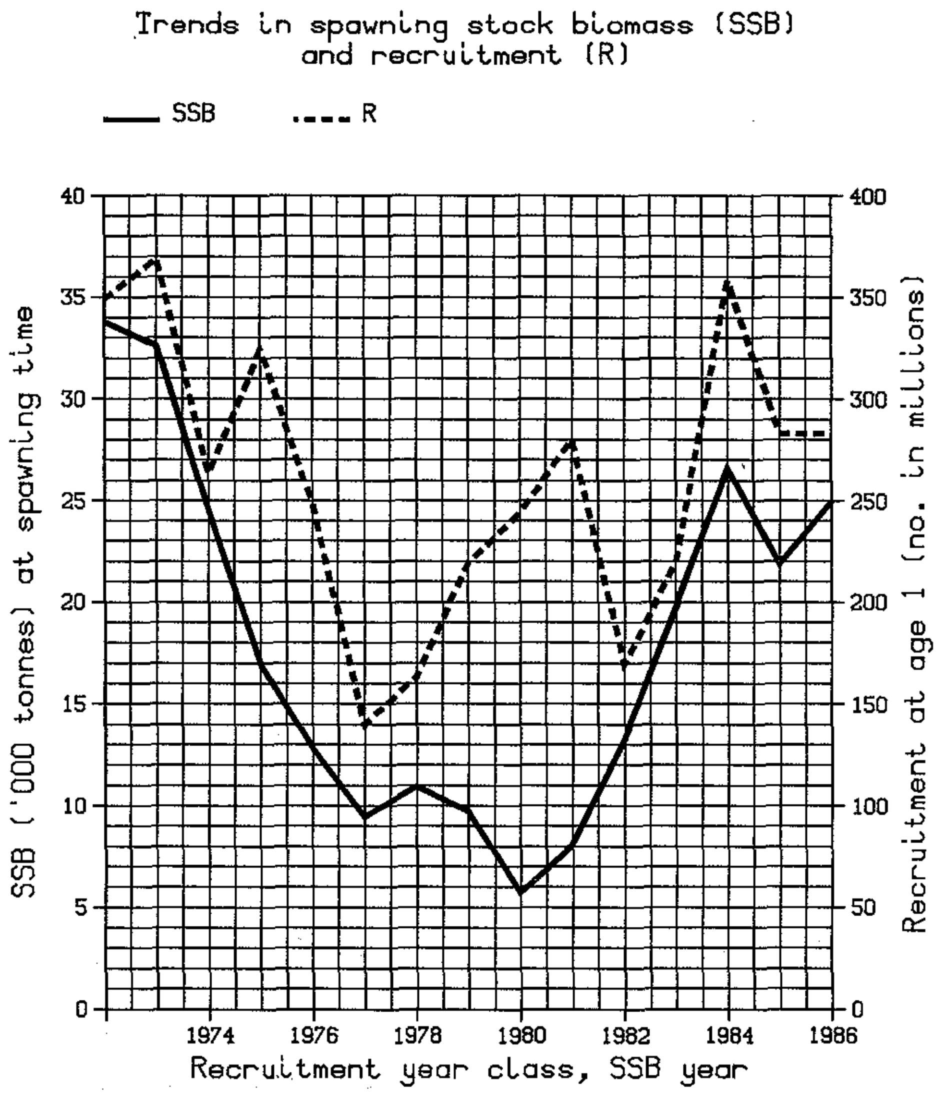
D

Figure 3.1.9

FISH STOCK SUMMARY
STOCK: Herring – Northern Irish Sea
14–04–1987



A



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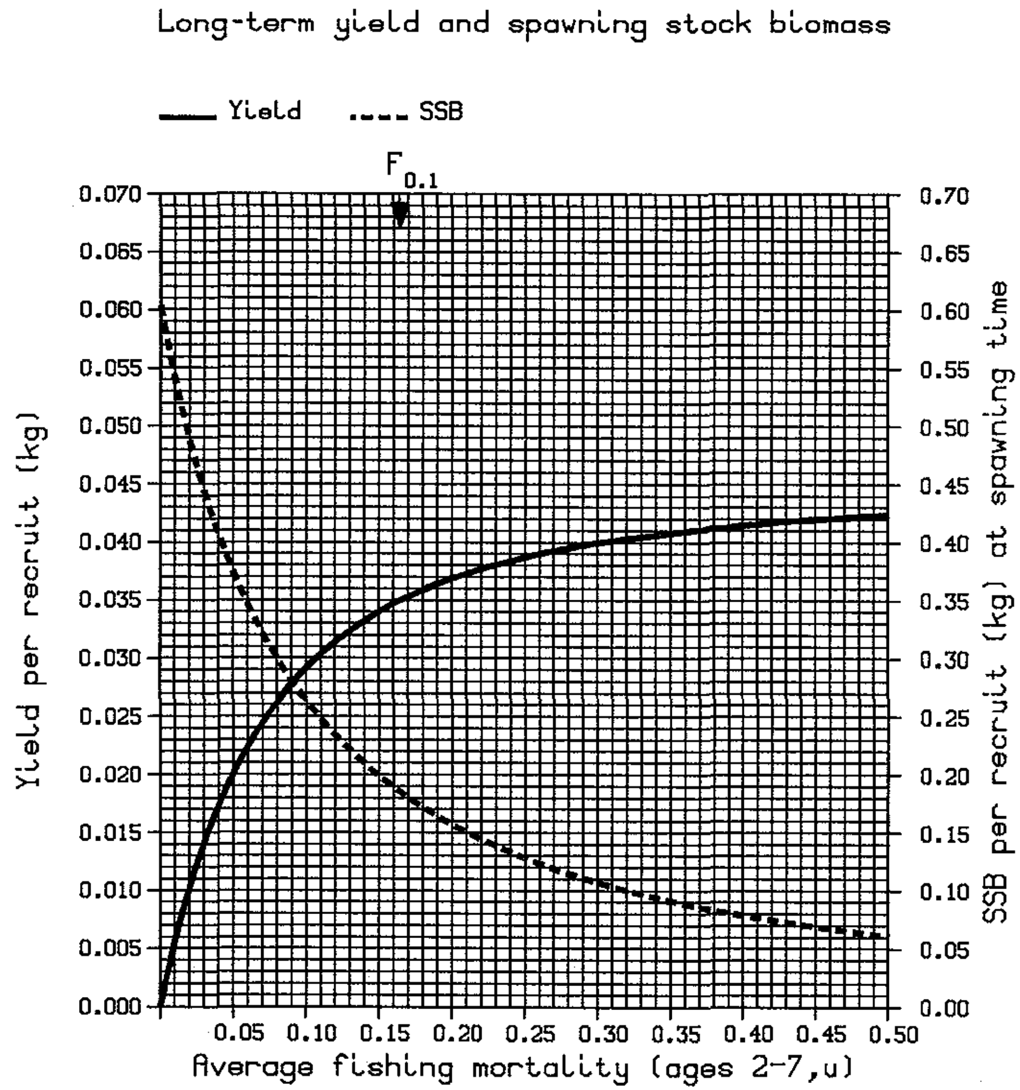
cont'd.

FISH STOCK SUMMARY
STOCK: Herring – Northern Irish Sea
14–04–1987

Figure 3.1.9 cont'd.



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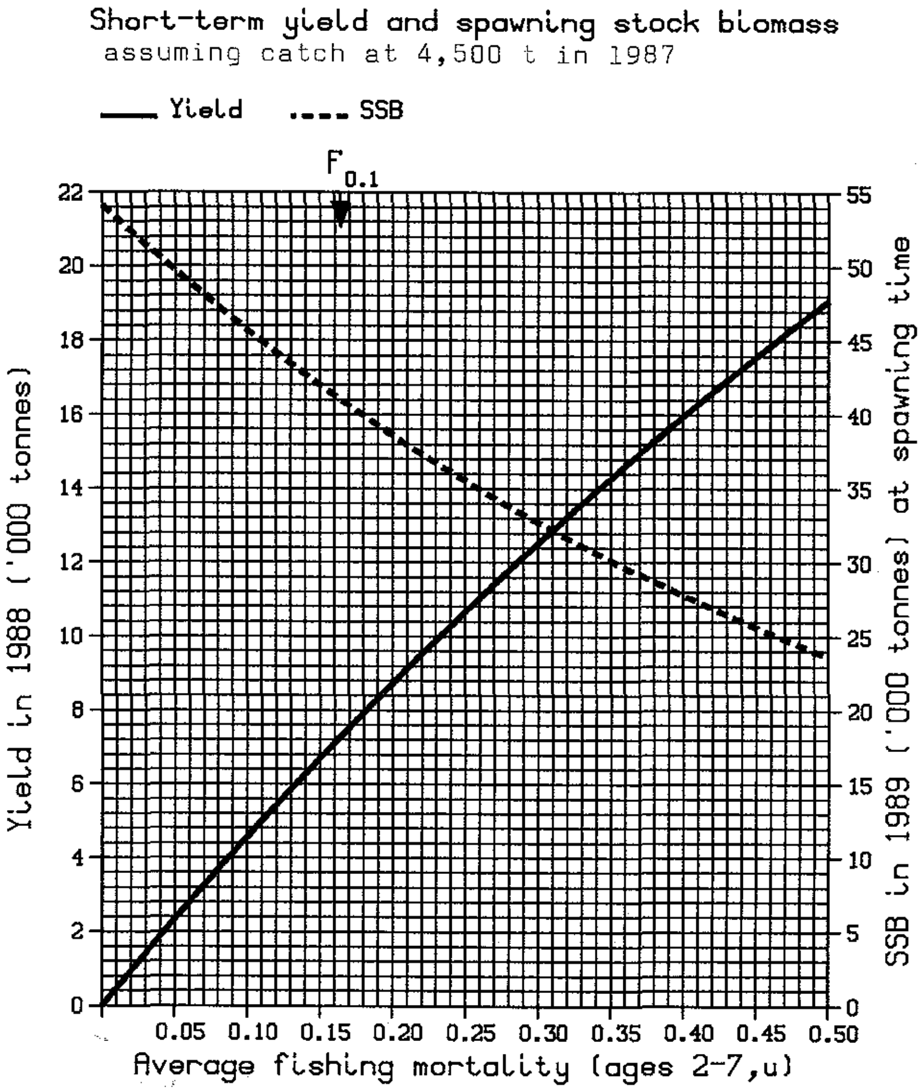


D

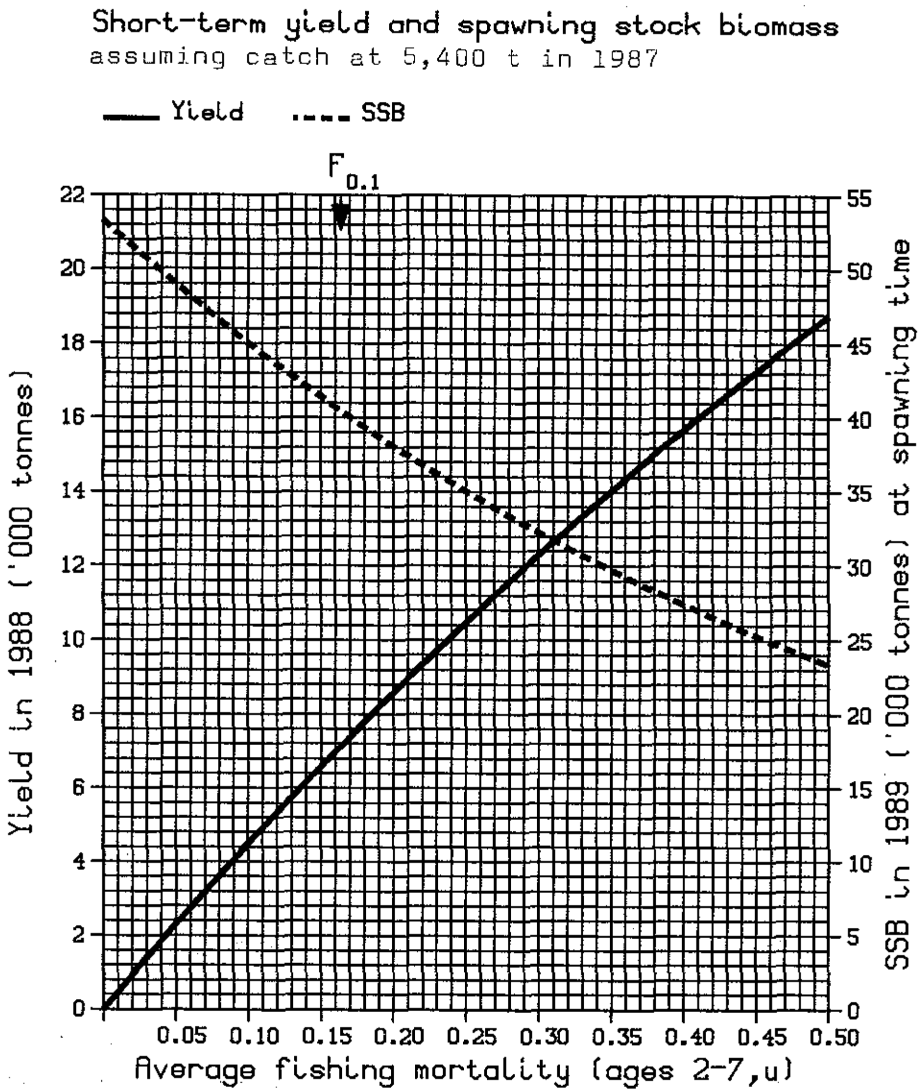
cont'd.

FISH STOCK SUMMARY

STOCK: Herring – Northern Irish Sea

14–04–1987

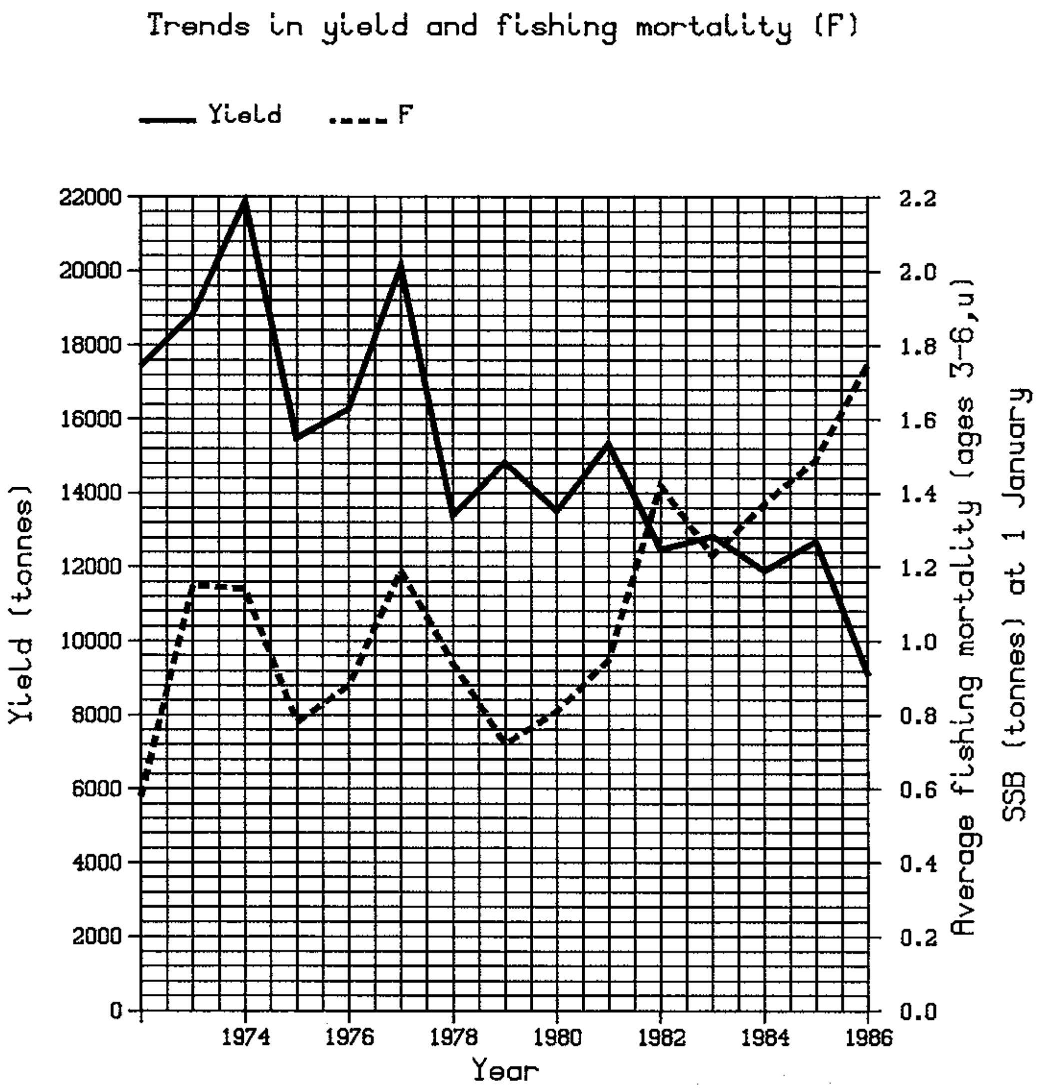
Figure 3.1.9 cont'd.



D

Figure 3.3.1

FISH STOCK SUMMARY
STOCK: Cod in the Kattegat
31–03–1987



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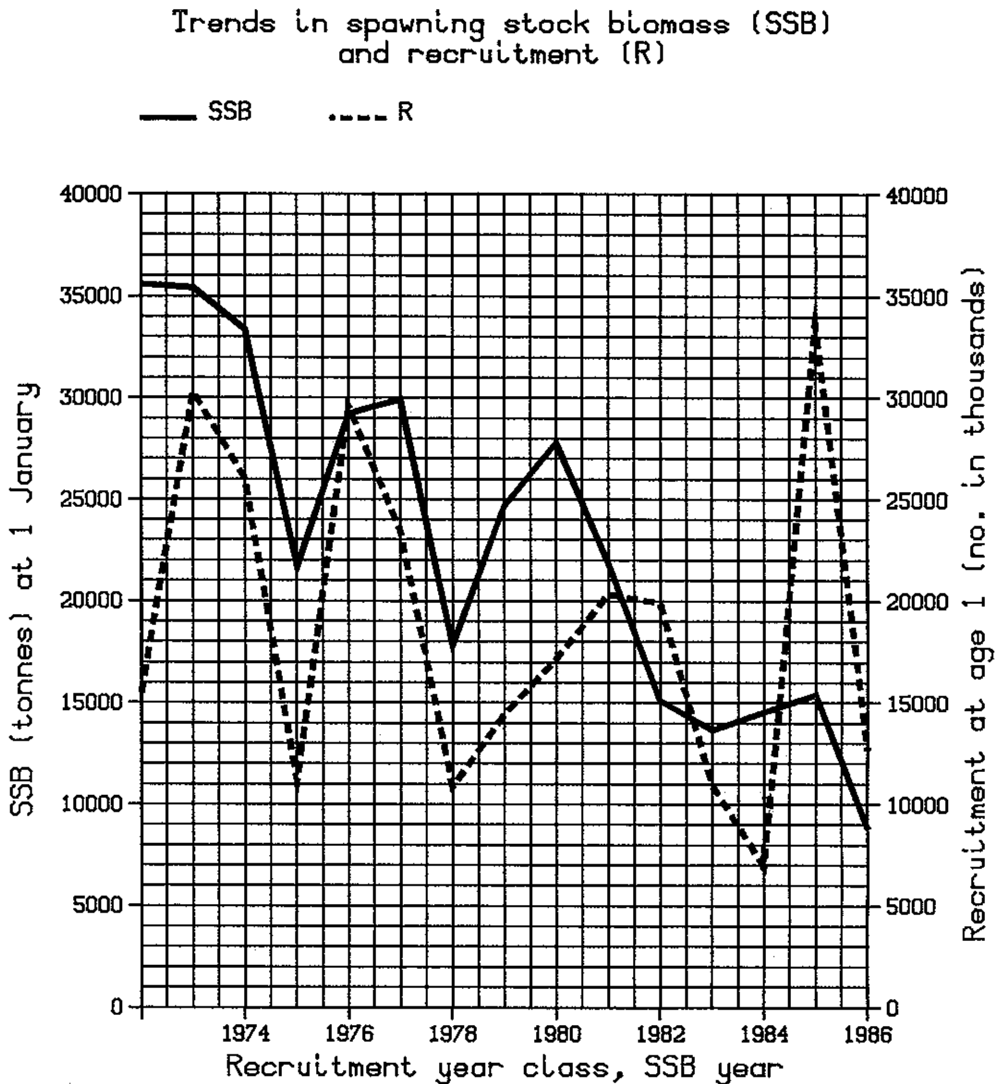
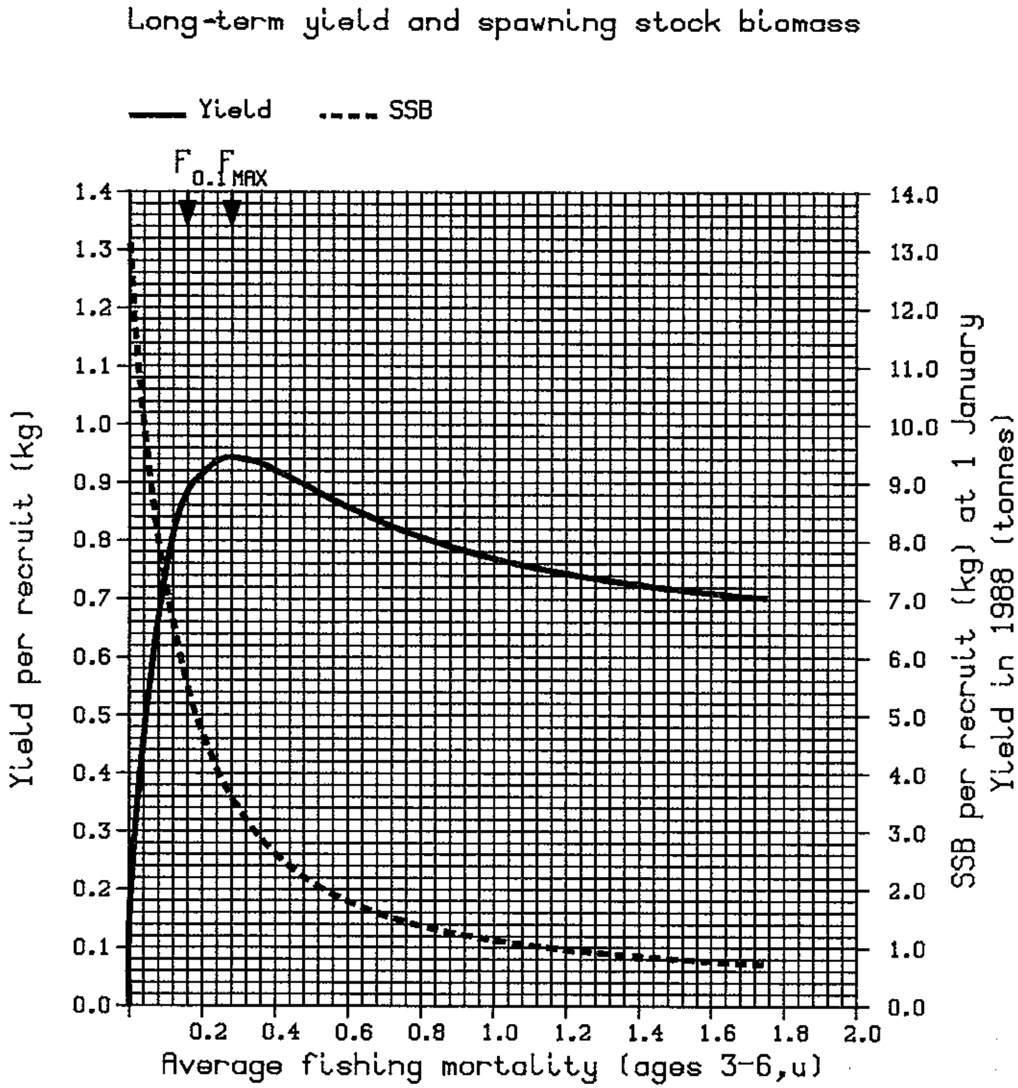


(cont'd)

B

Figure 3.3.1 (cont'd)

FISH STOCK SUMMARY
STOCK: Cod in the Kattegat
31–03–1987



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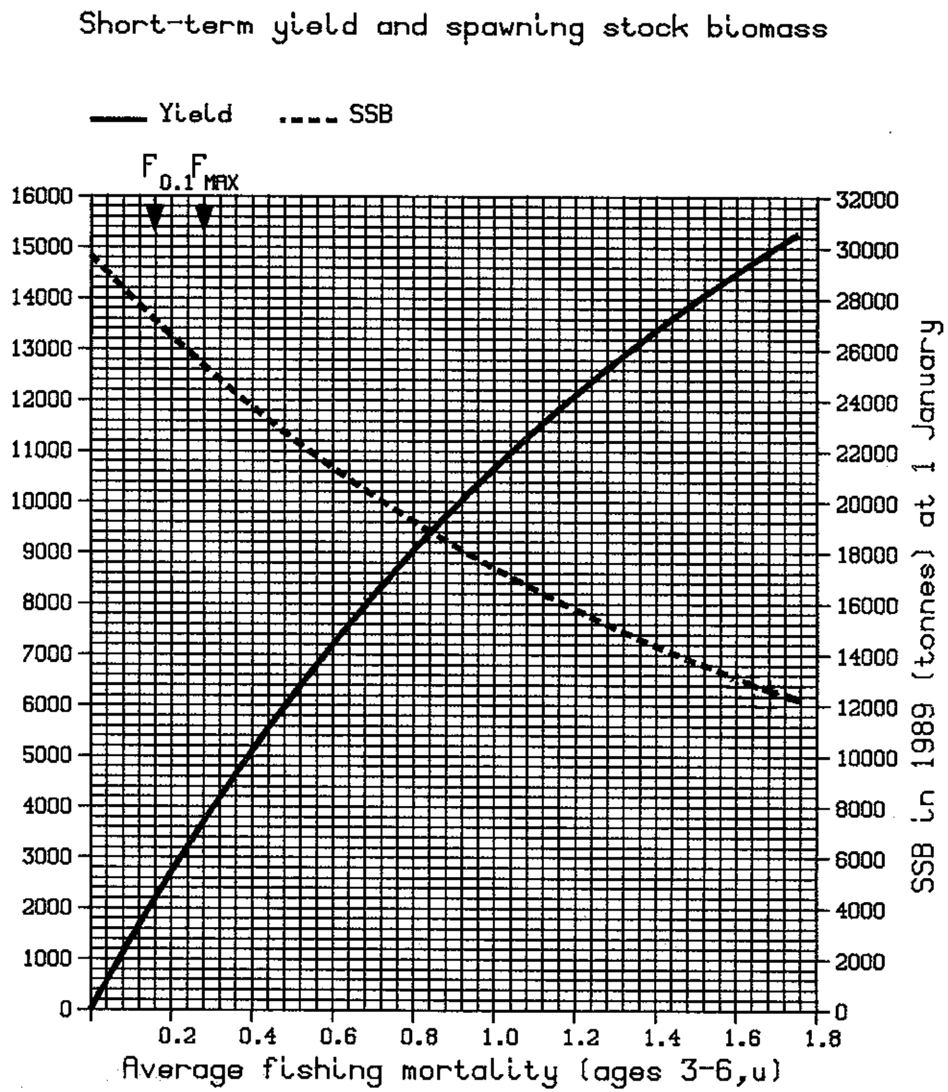
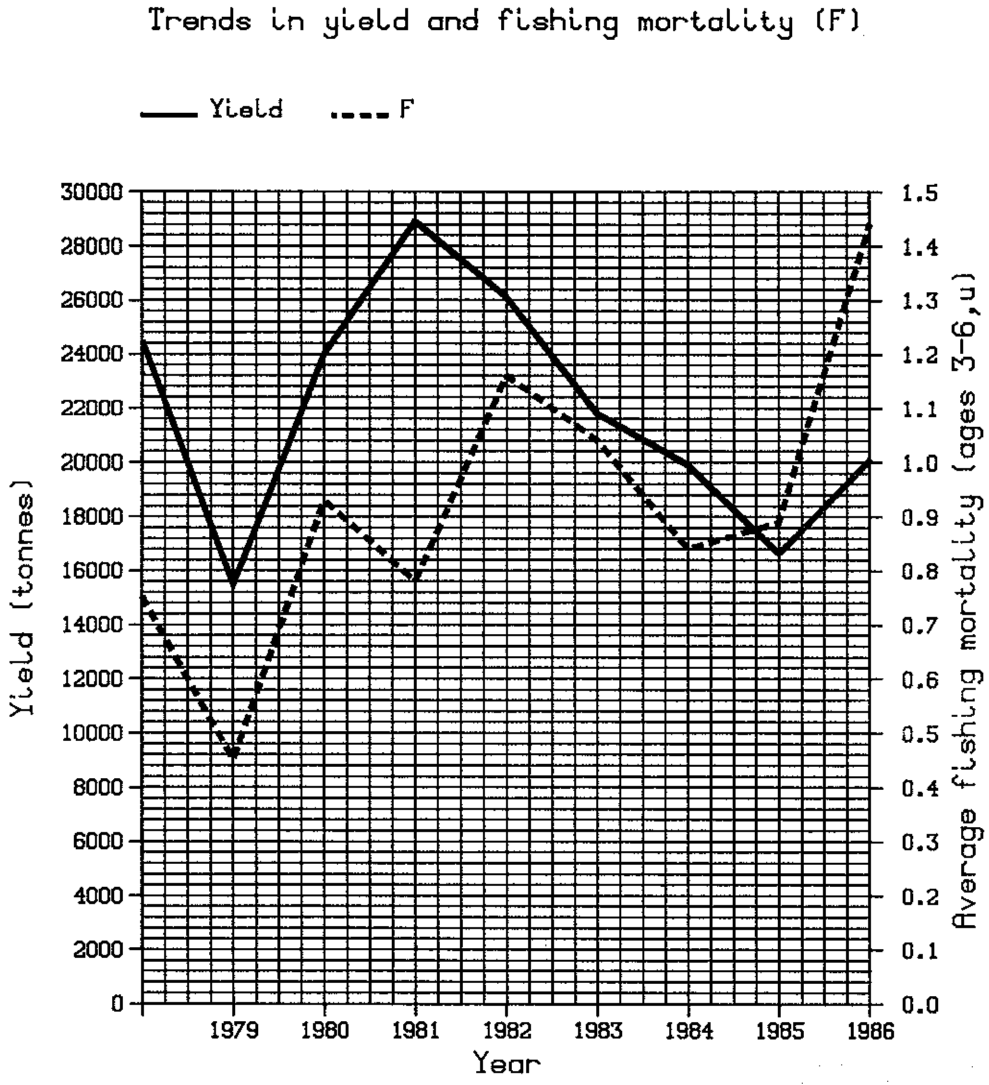


D

Figure 3.3.2

FISH STOCK SUMMARY
STOCK: Cod in the Skagerrak
01–04–1987



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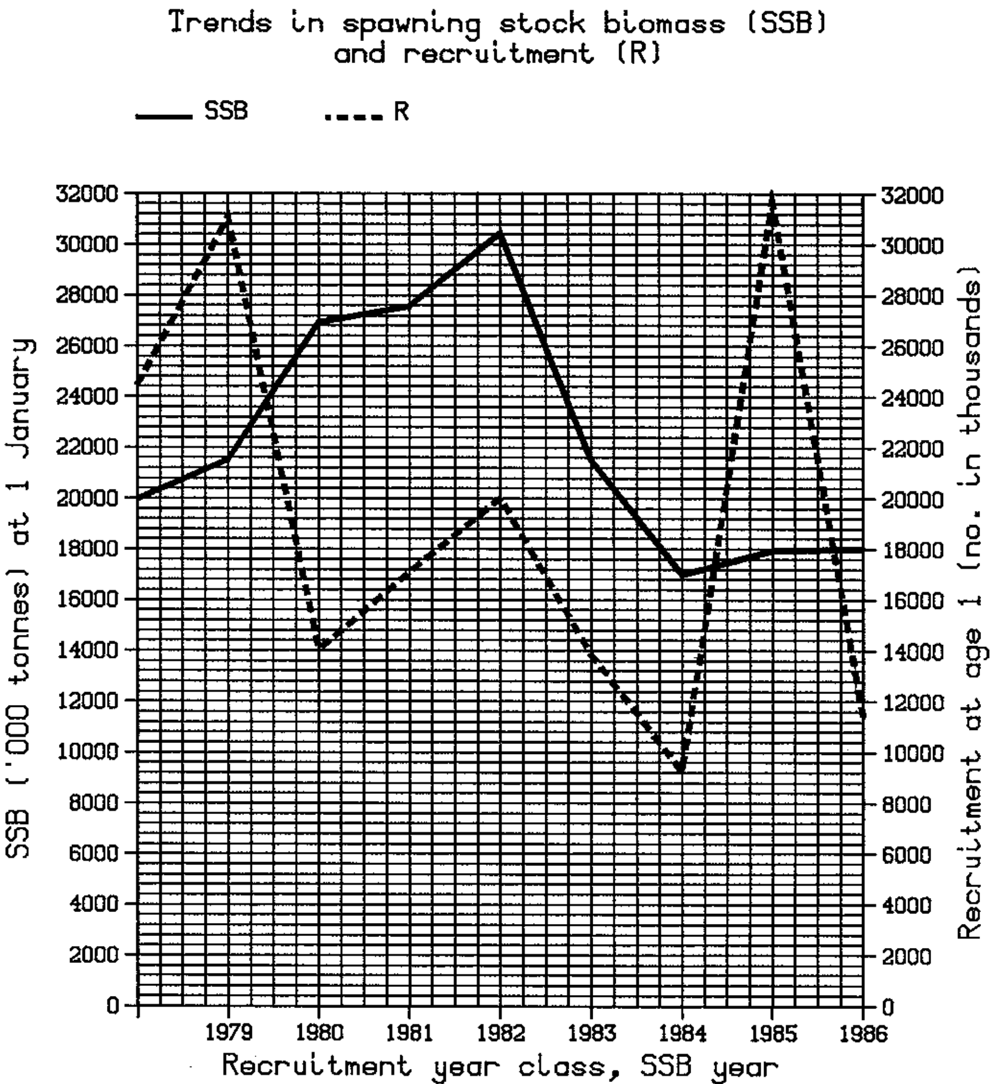


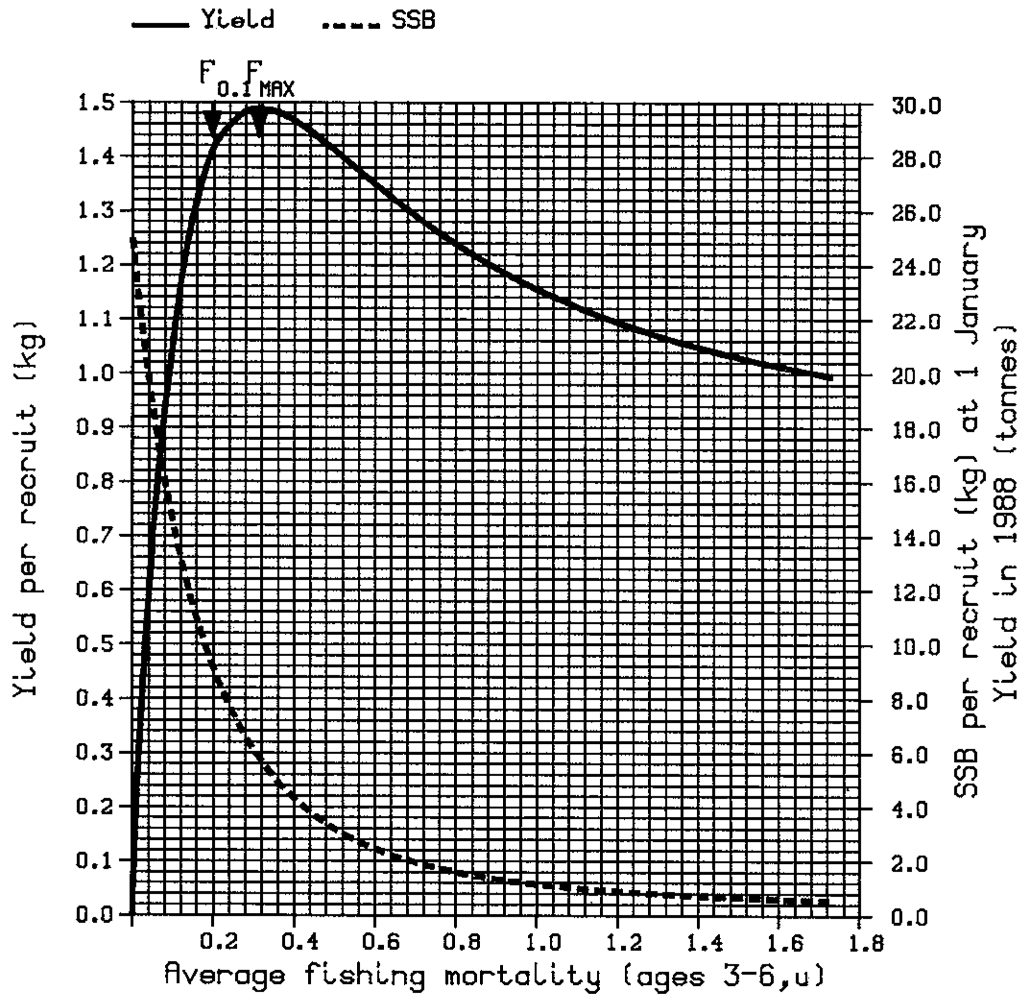
(cont'd)

B

Figure 3.3.2 (cont'd)

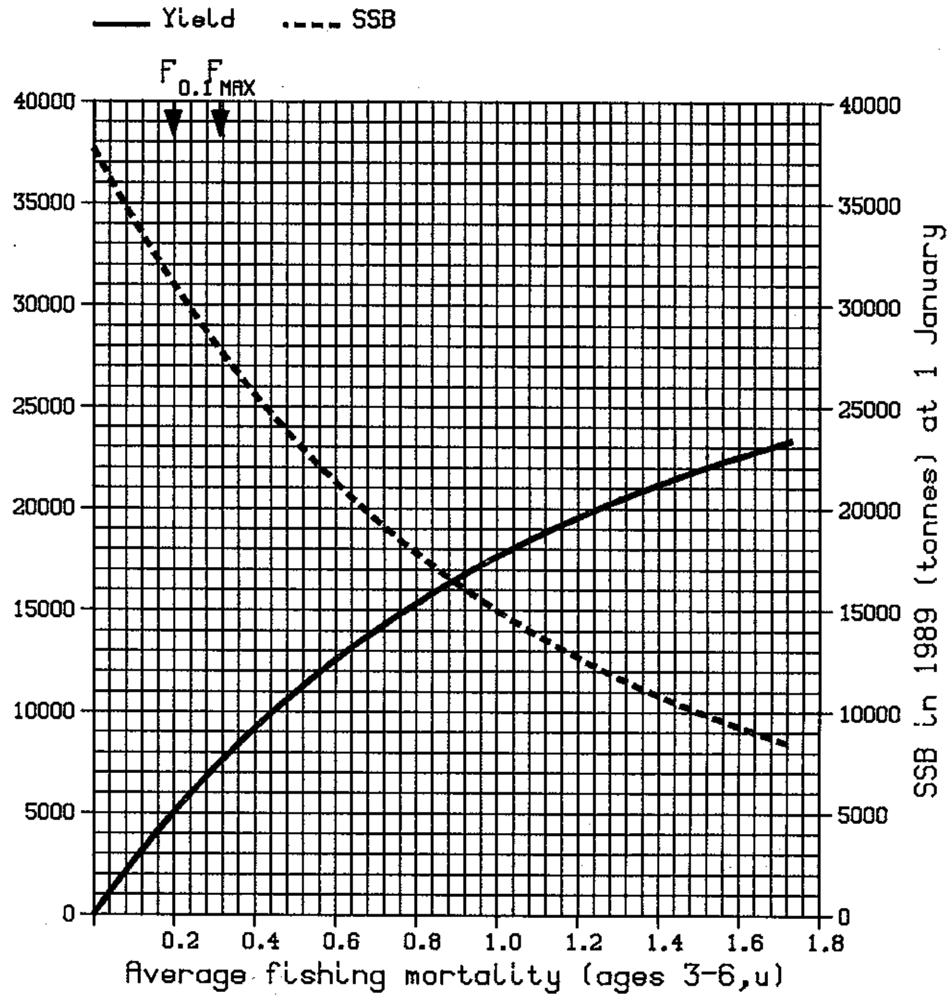
FISH STOCK SUMMARY
STOCK: Cod in the Skagerrak
01-04-1987

Long-term yield and spawning stock biomass



C

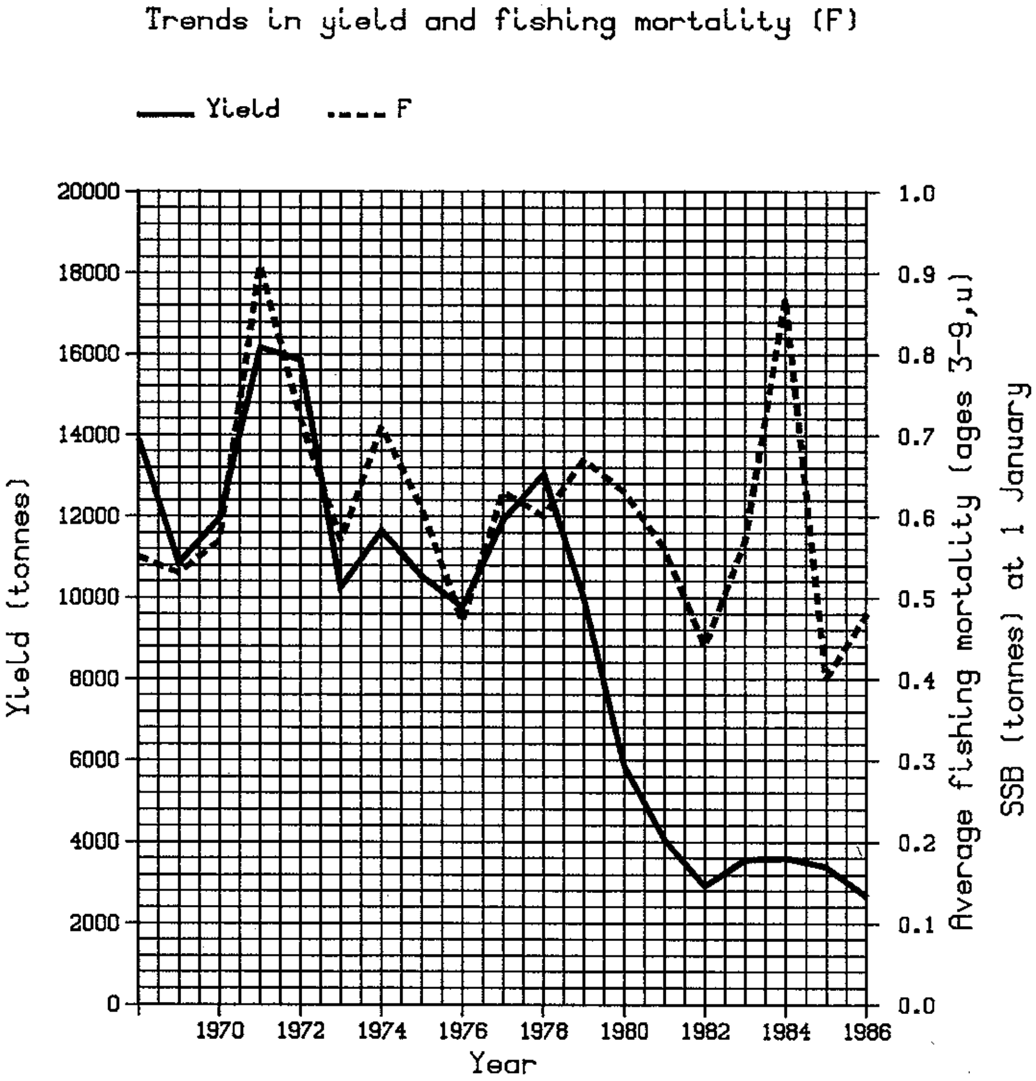
Short-term yield and spawning stock biomass



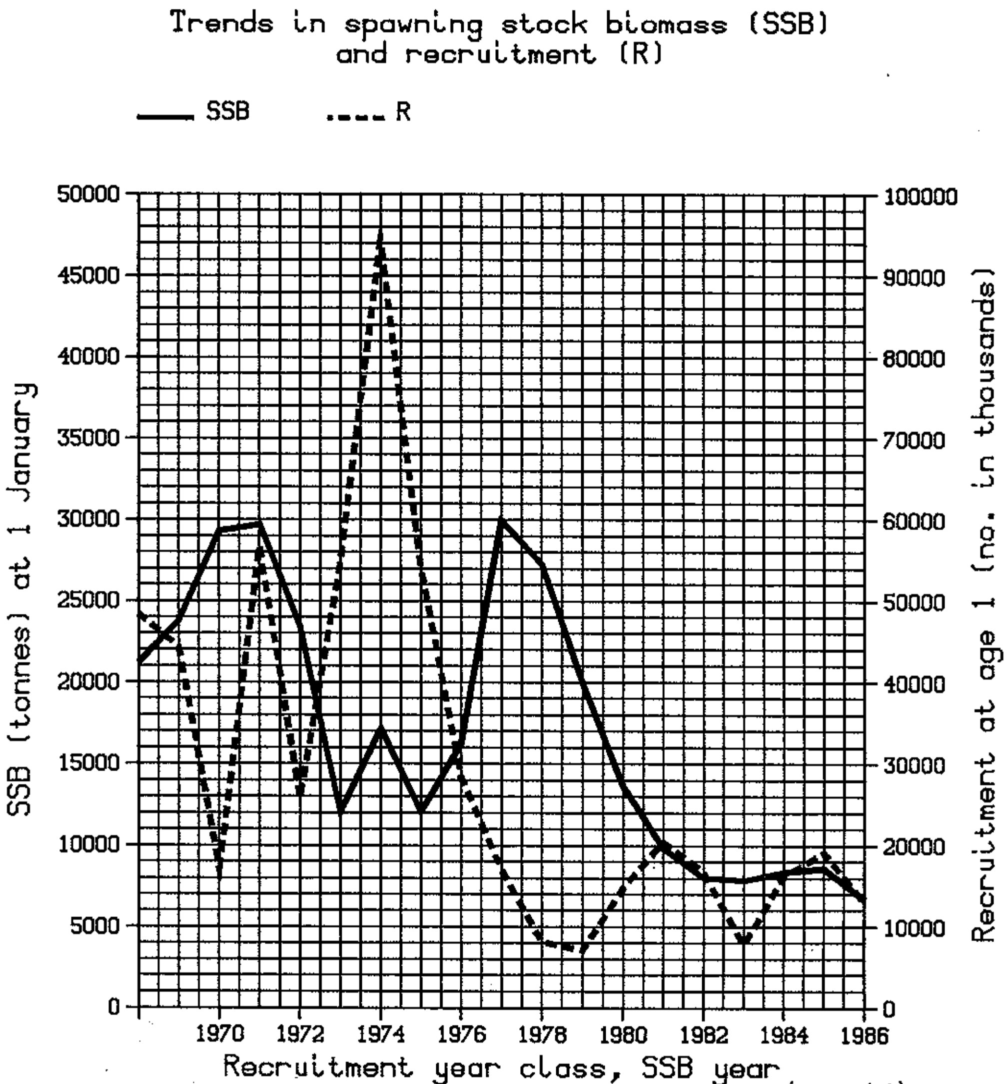
D

Figure 3.3.5

FISH STOCK SUMMARY
STOCK: Plaice in the Kattegat
31–03–1987



A

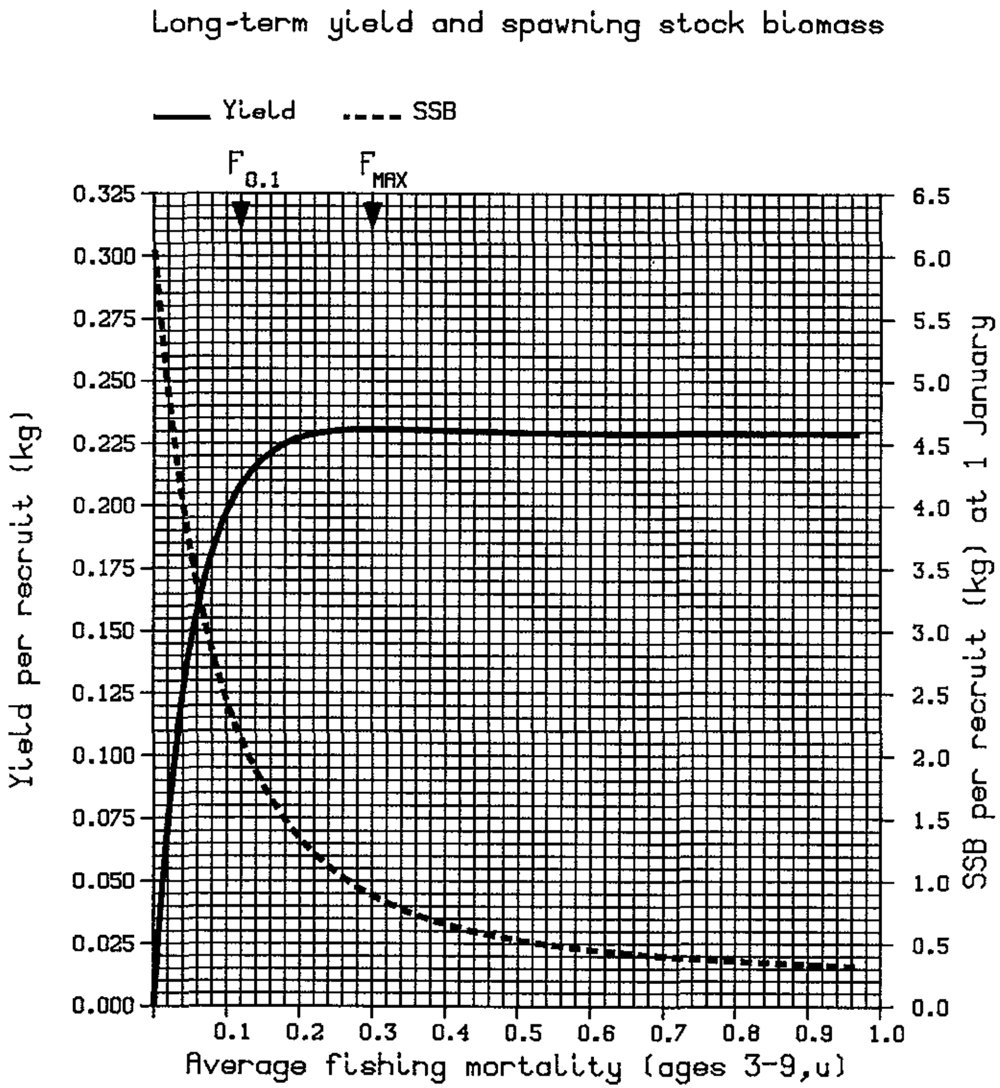


(cont'd)

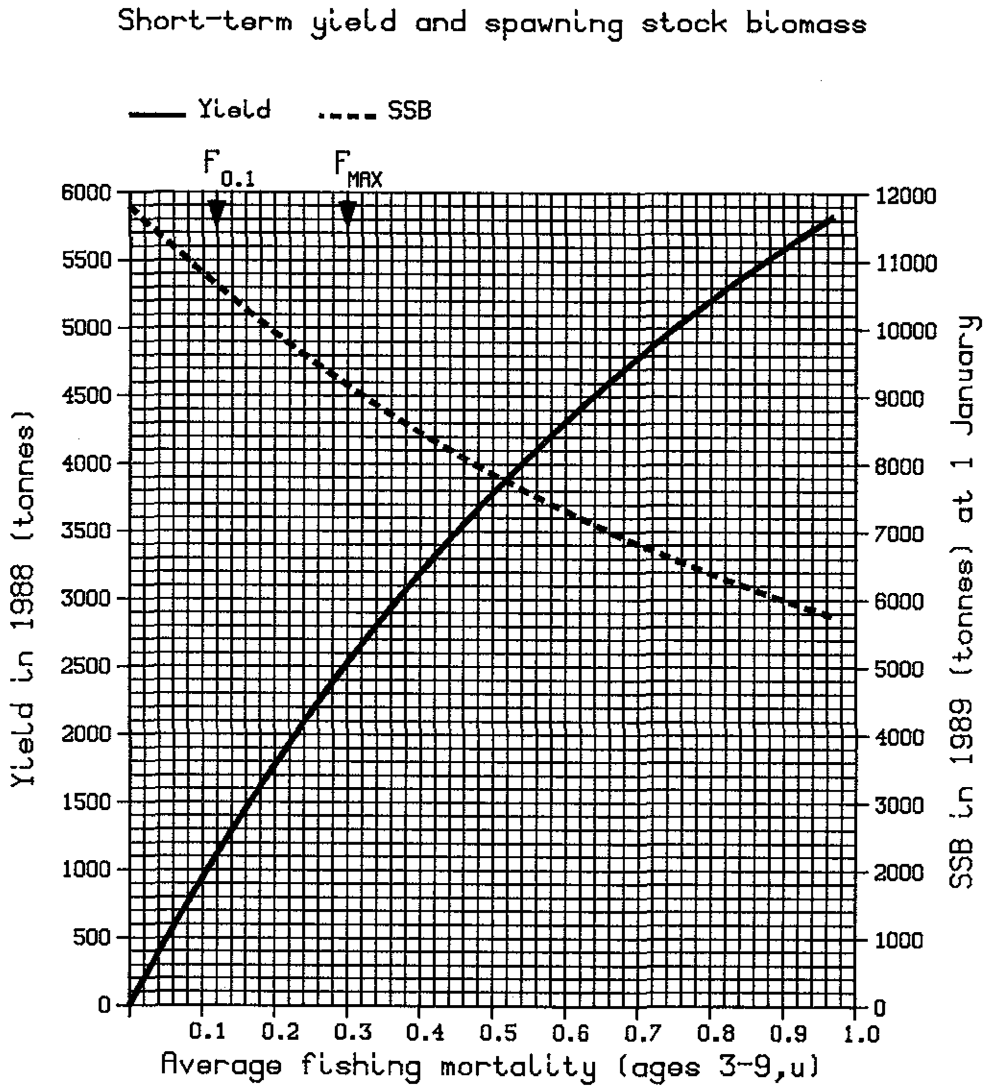
B

Figure 3.3.5 (cont'd)

FISH STOCK SUMMARY
STOCK: Plaice in the Kattegat
31–03–1987



C



D

Figure 3.3.8 Total landings in Division IIIa, and discarding rate (kg/hr) in the SW fishery in May-June. Source: 1951-1969 Bull.Stat.; 1970-1986 WG reports.

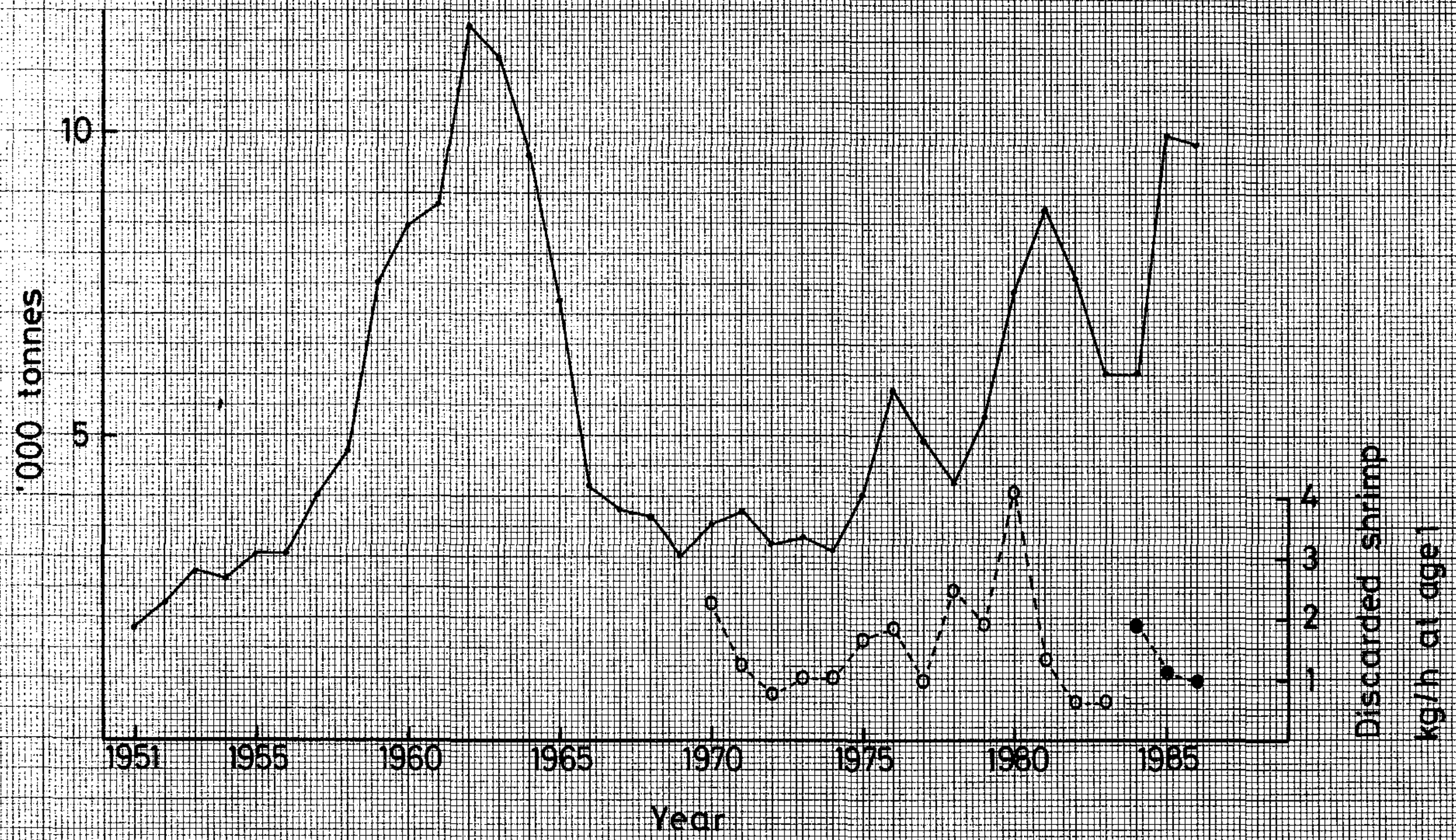


Figure 3.4.1.1 North Sea demersal fisheries.

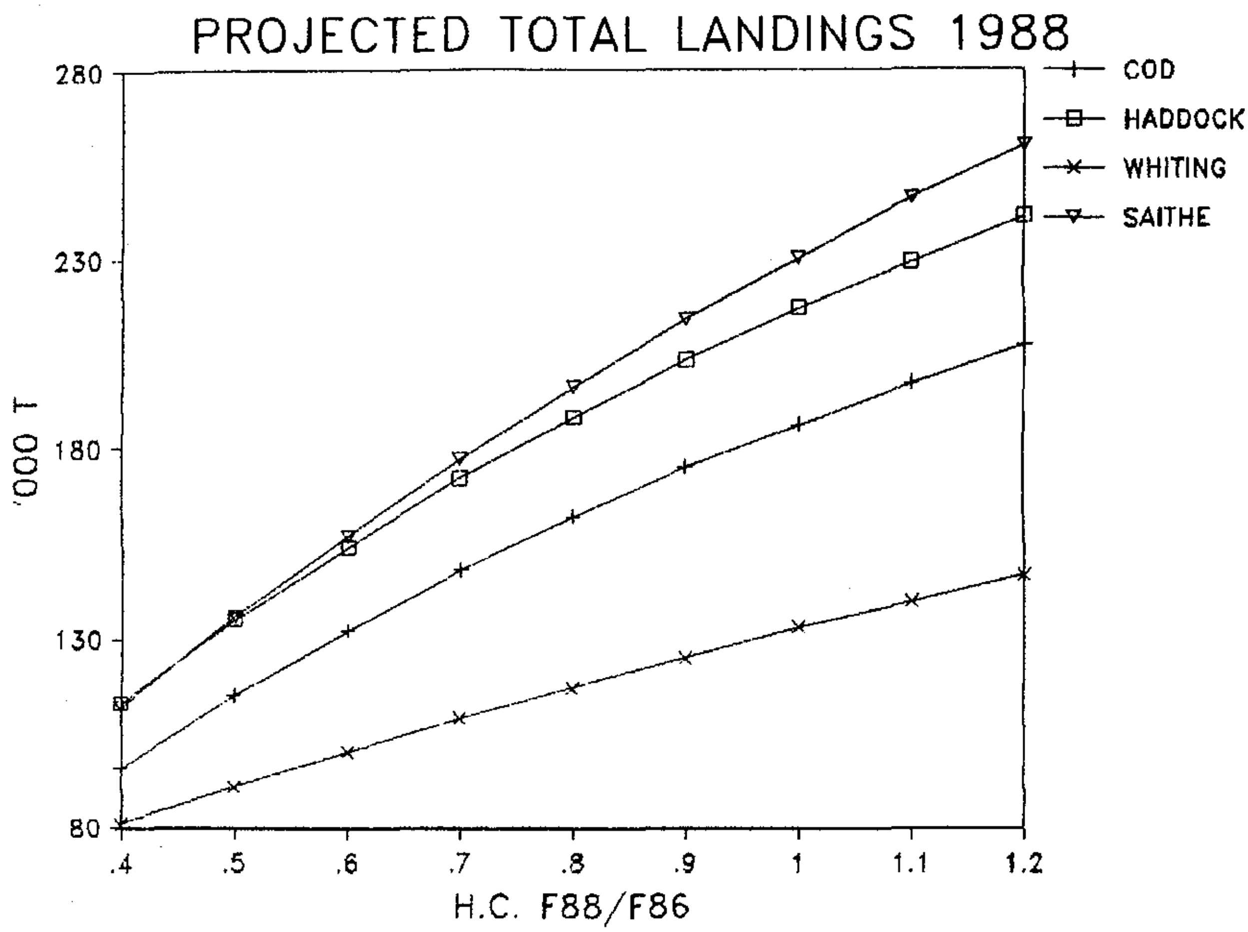
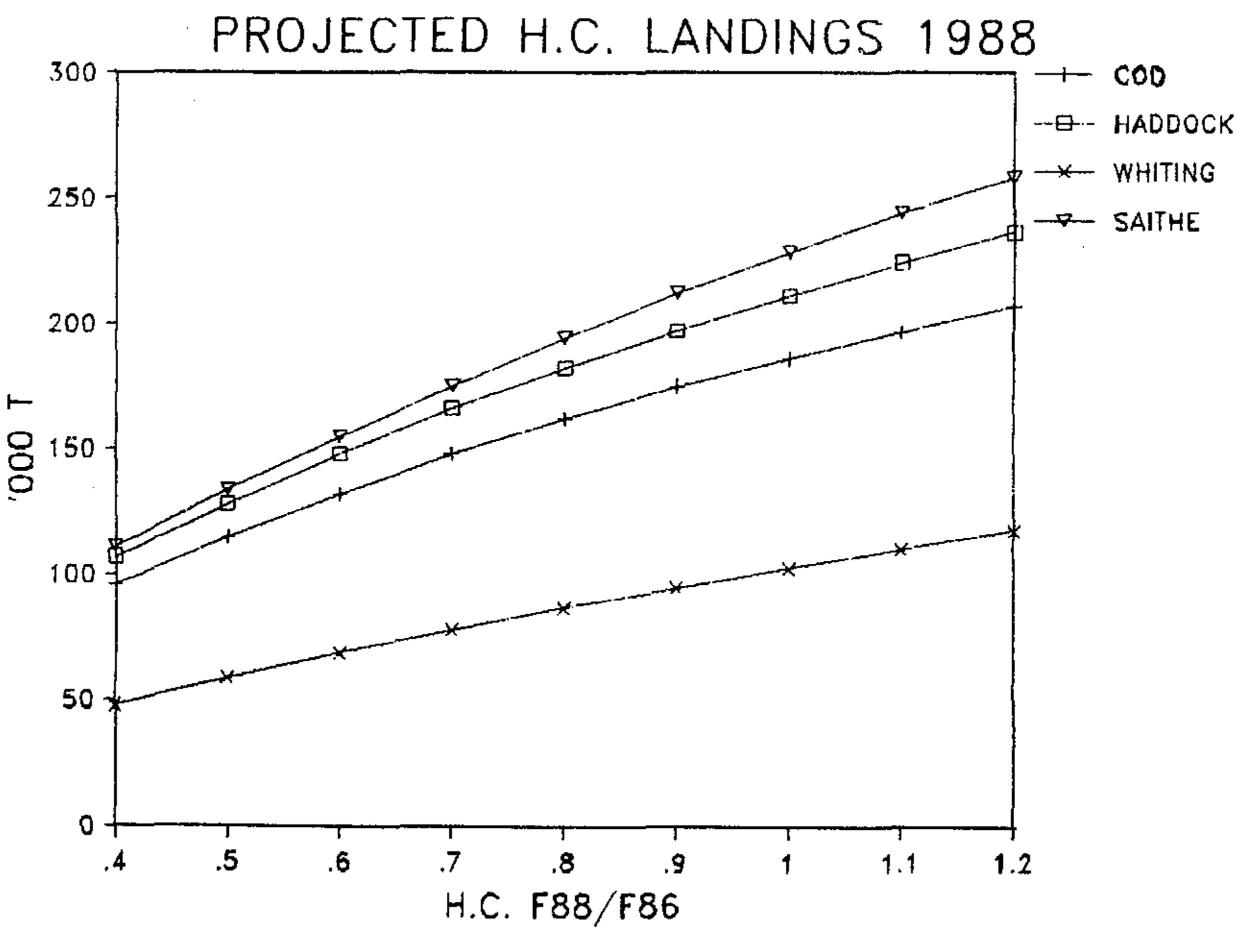


Figure 3.4.1.2 North Sea demersal fisheries.



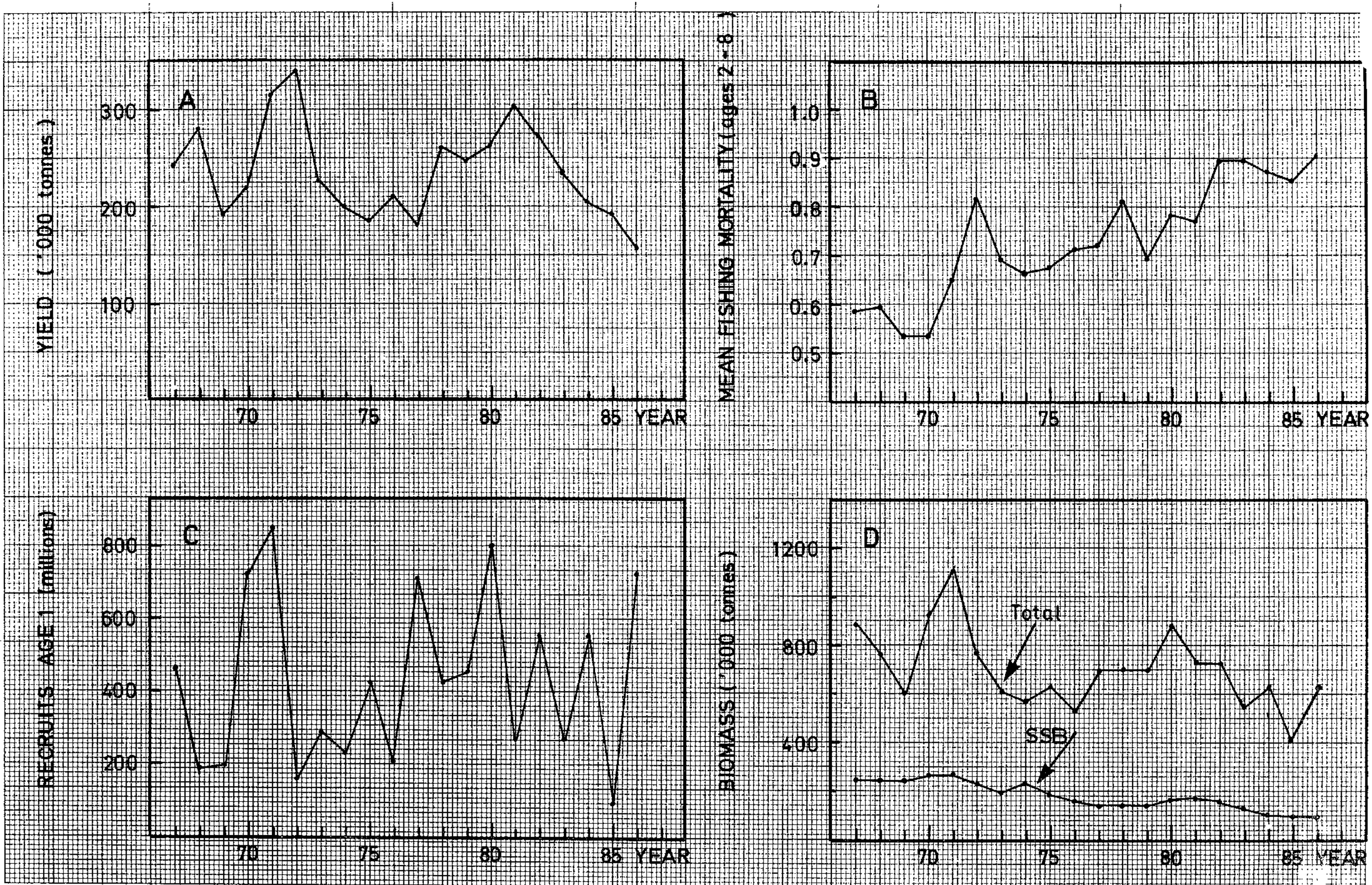
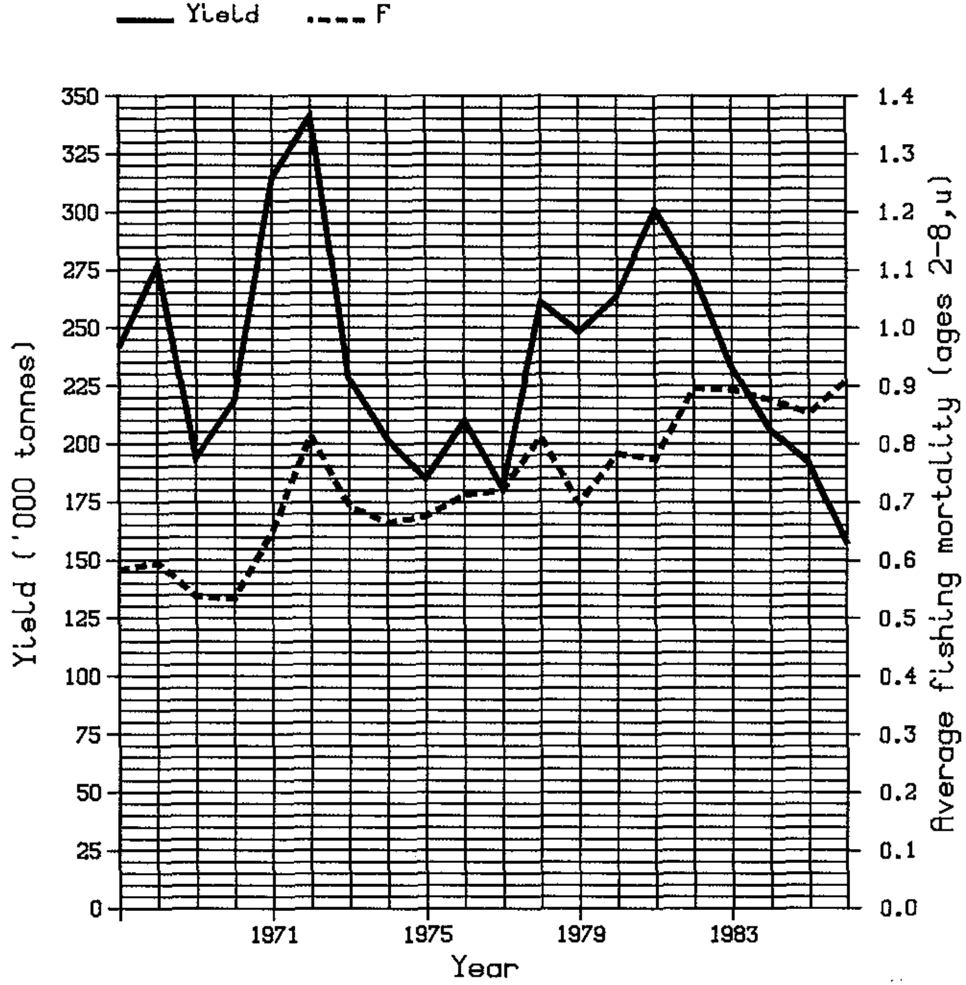


Figure 3.4.2.1 North Sea Cod.

Figure 3.4.2.2

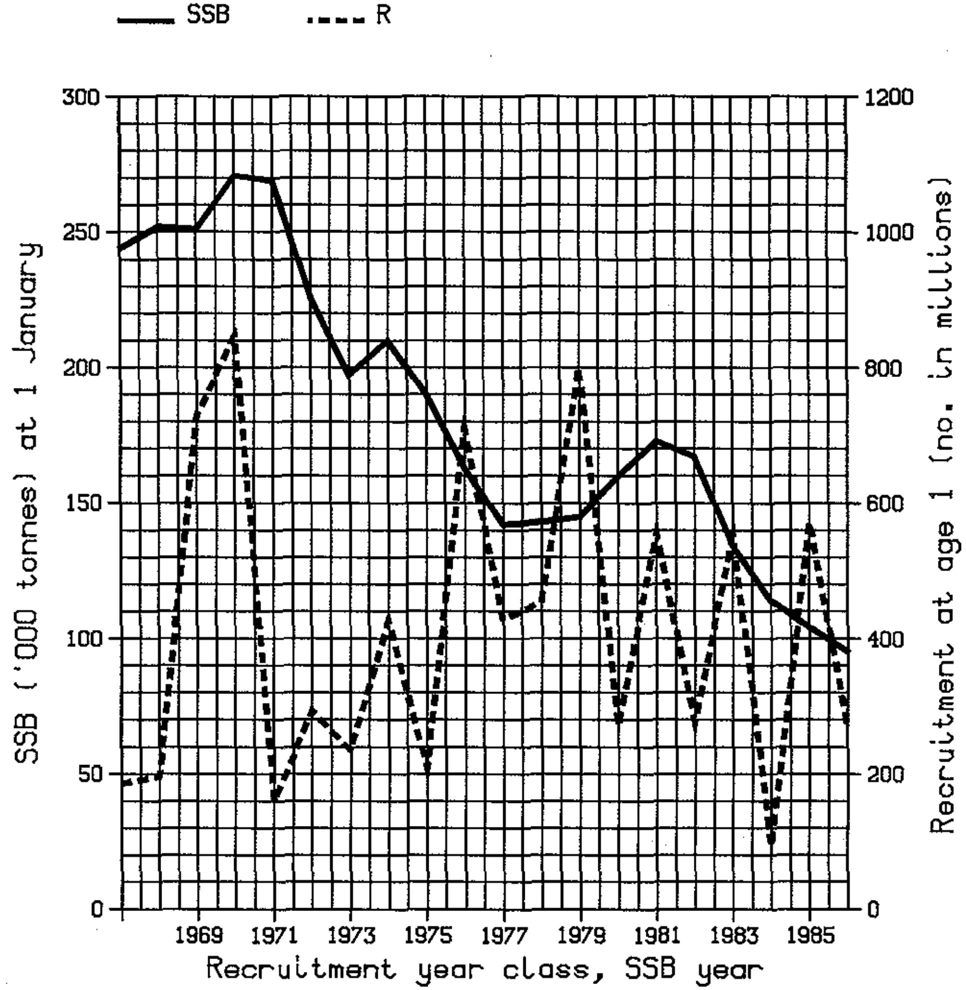
FISH STOCK SUMMARY
STOCK: Cod – North Sea
03-11-1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



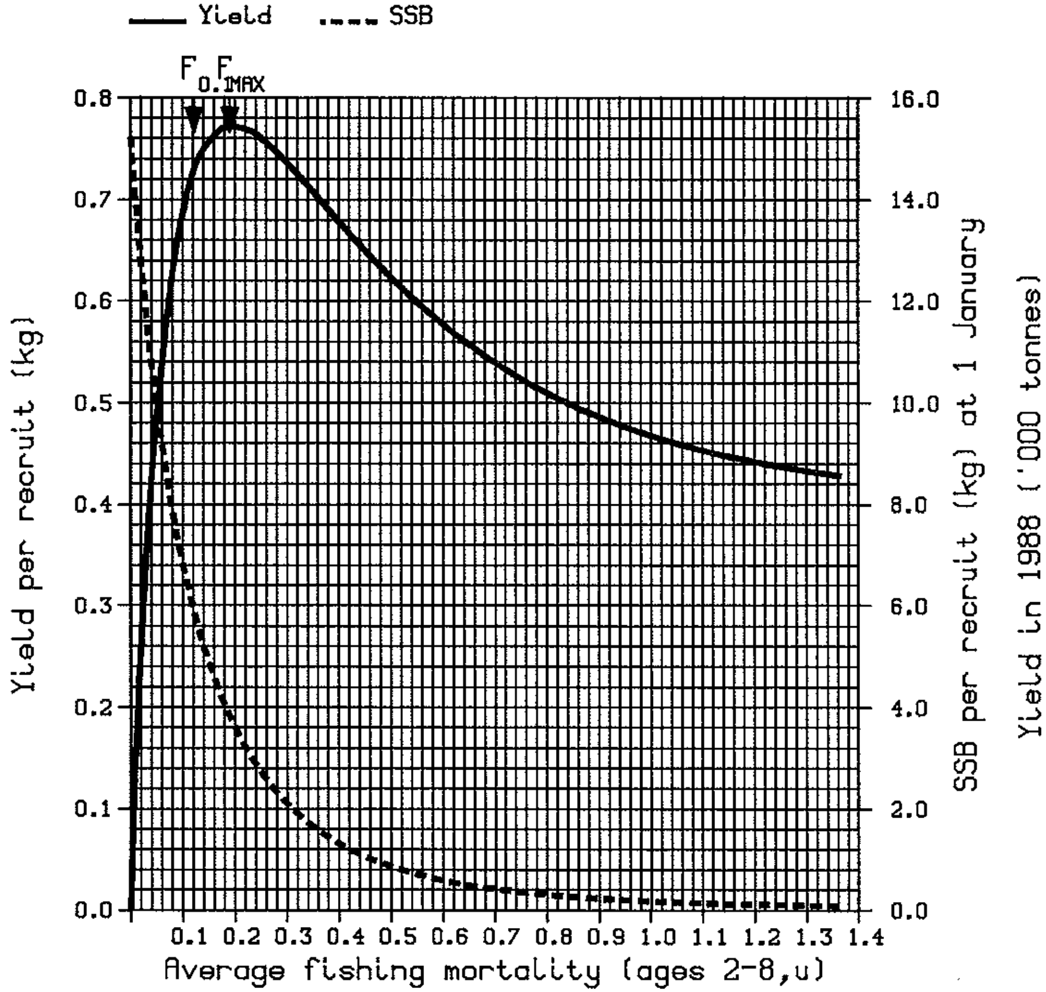
B

ctd.

Figure 3.4.2.2 (ctd.)

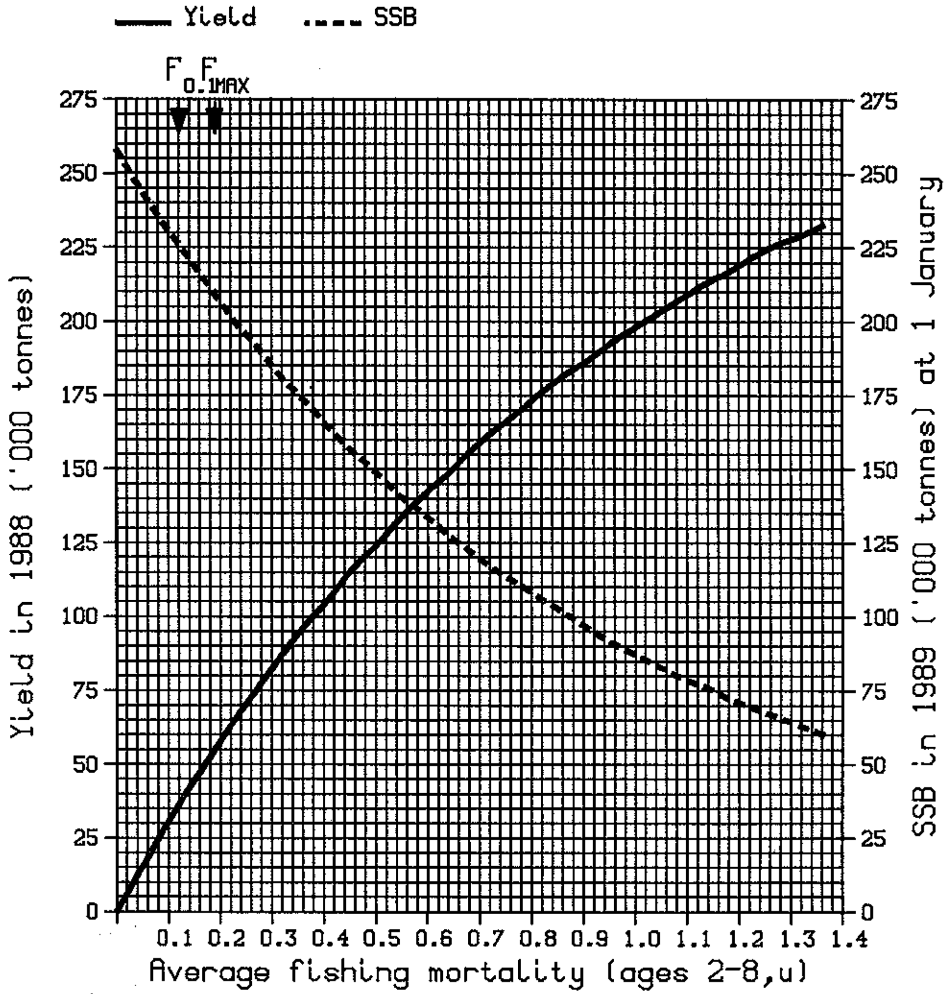
FISH STOCK SUMMARY
STOCK: Cod – North Sea
03–11–1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

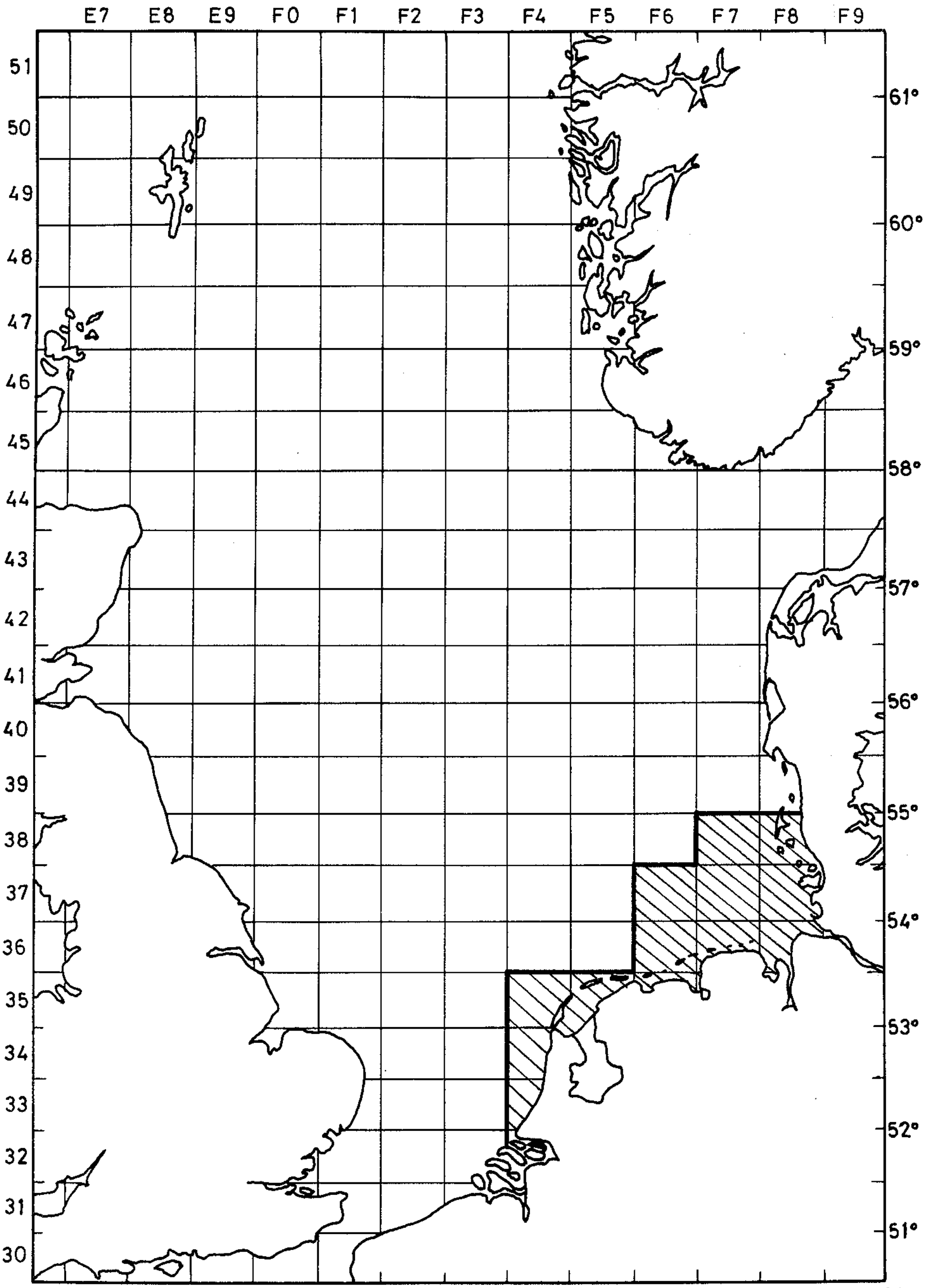


Figure 3.4.2.3 . Cod box (hatched area) in effect in 1987.

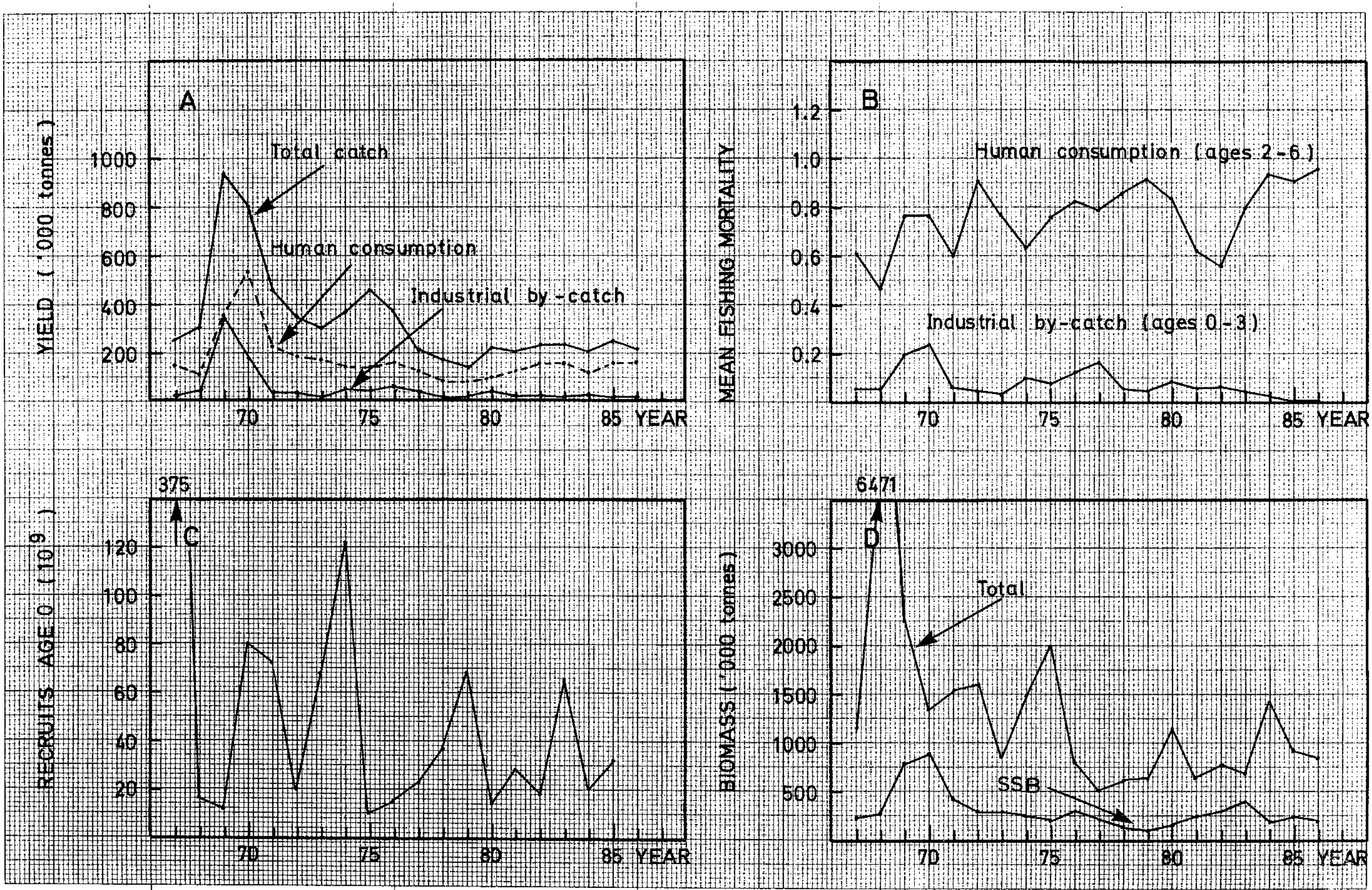


Figure 3.4.3.1 North Sea Haddock.

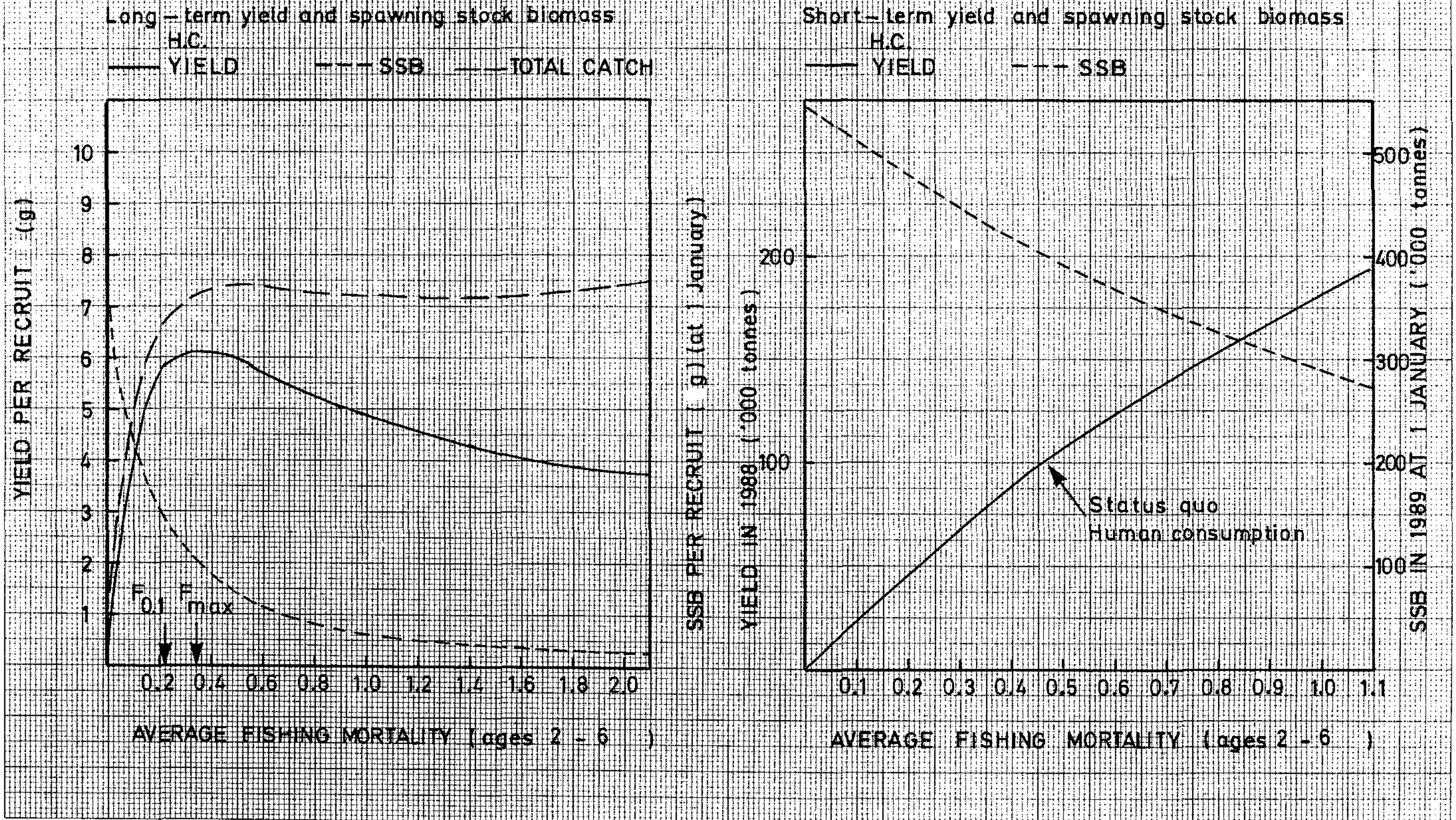


Figure 3.4.3.2 North Sea Haddock.

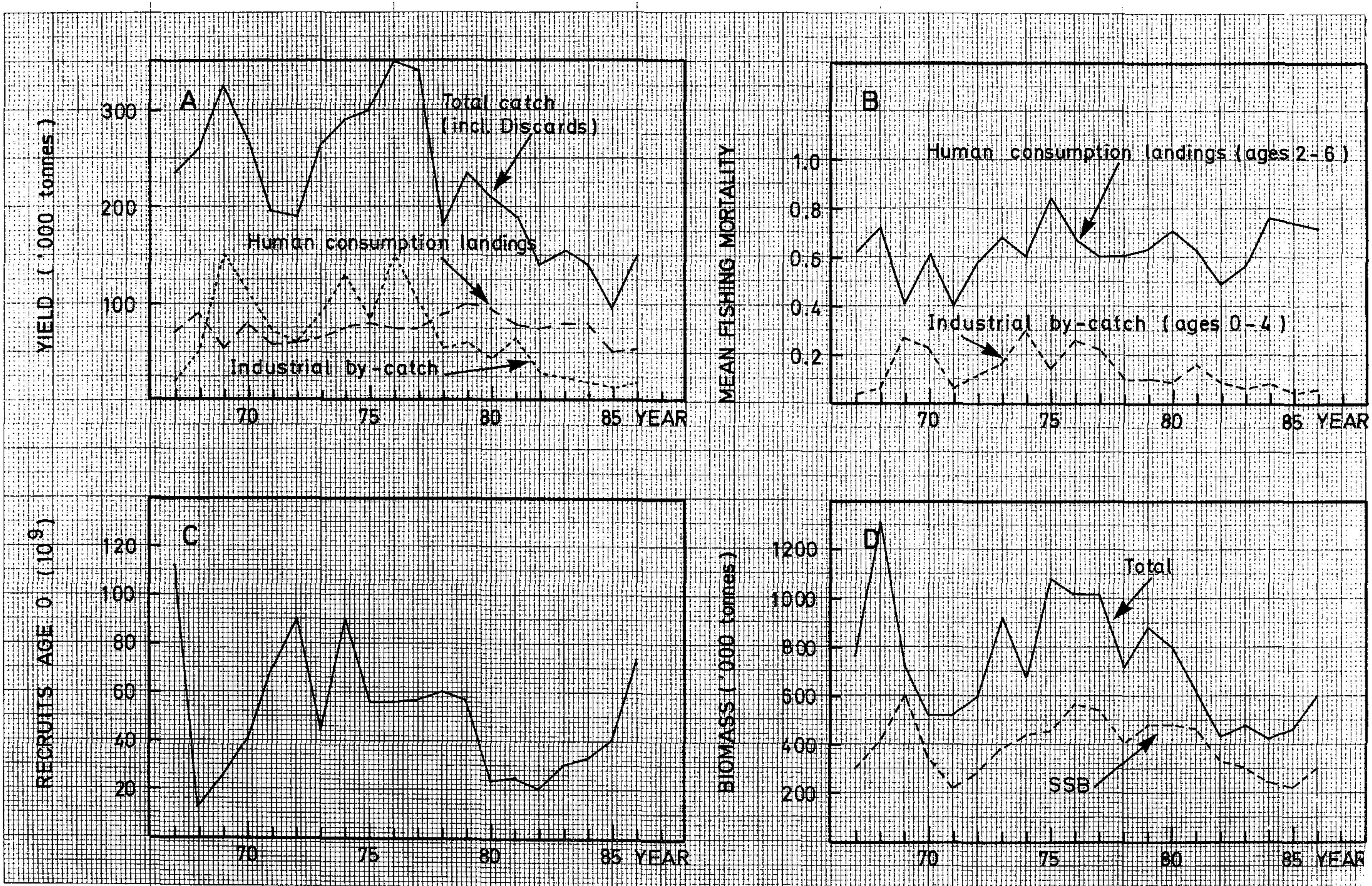


Figure 3.4.4.1 North Sea Whiting.

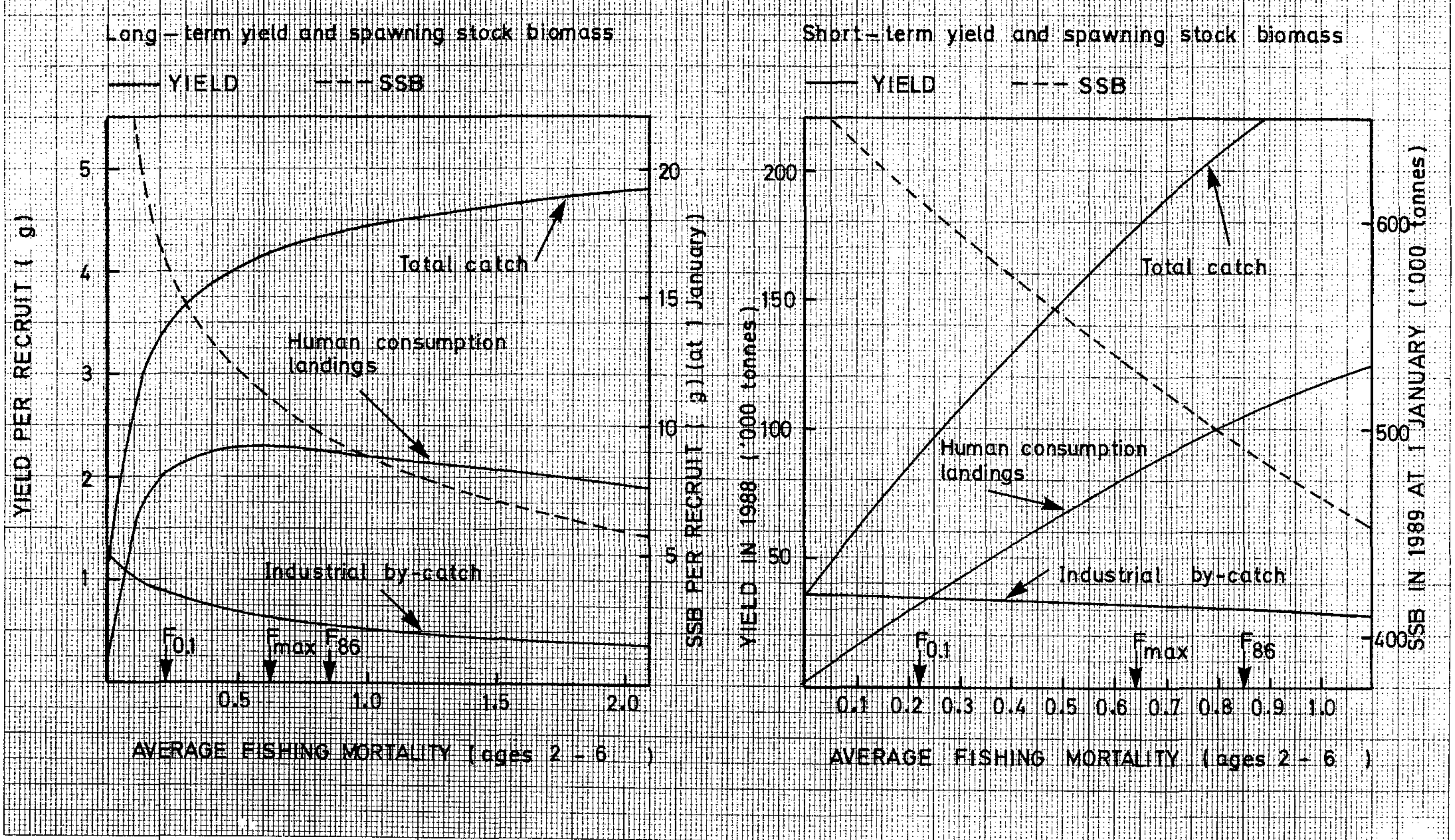


Figure 3.4.4.2 North Sea Whiting

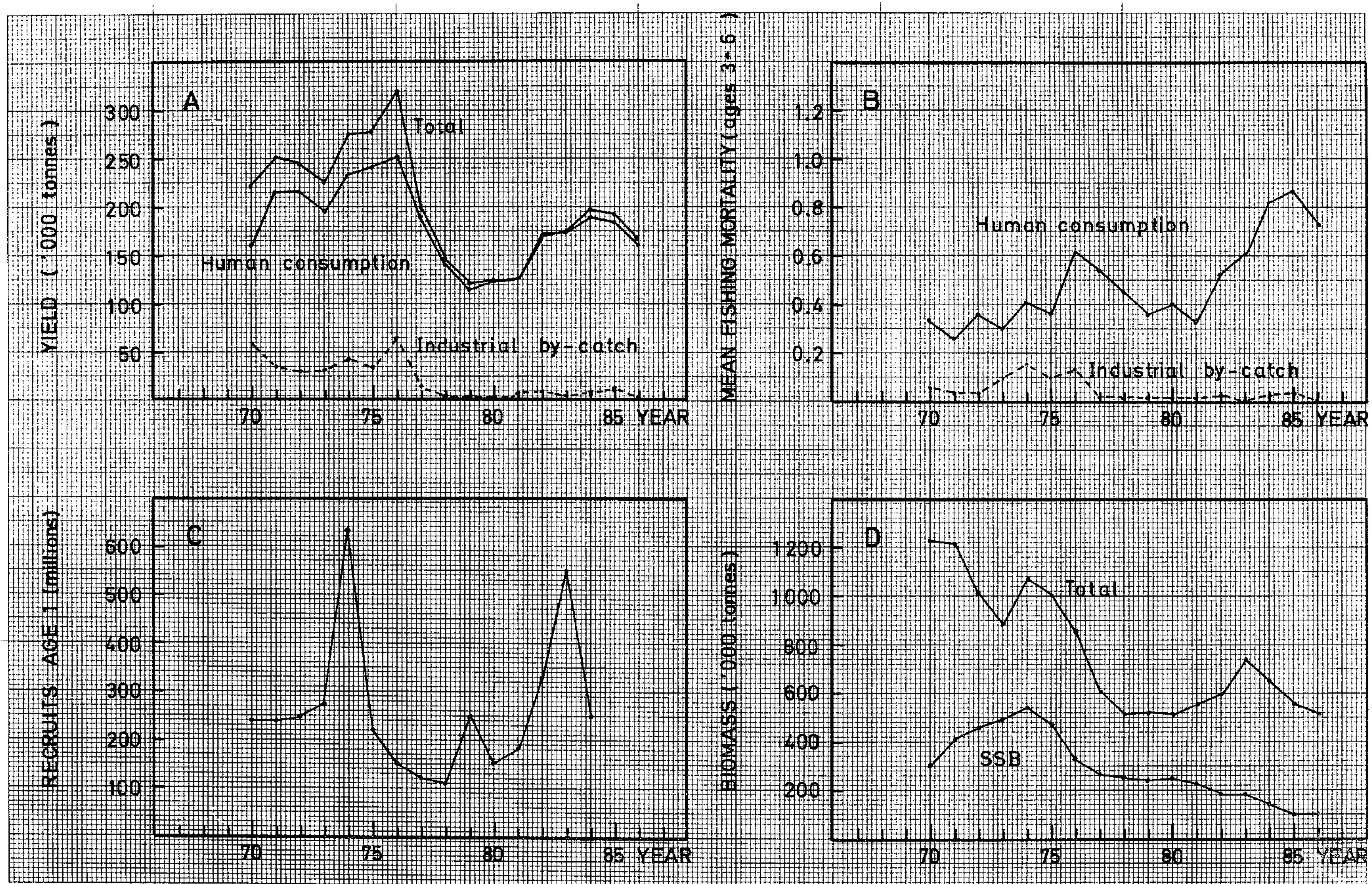


Figure 3.4.5.1 North Sea Saithe.

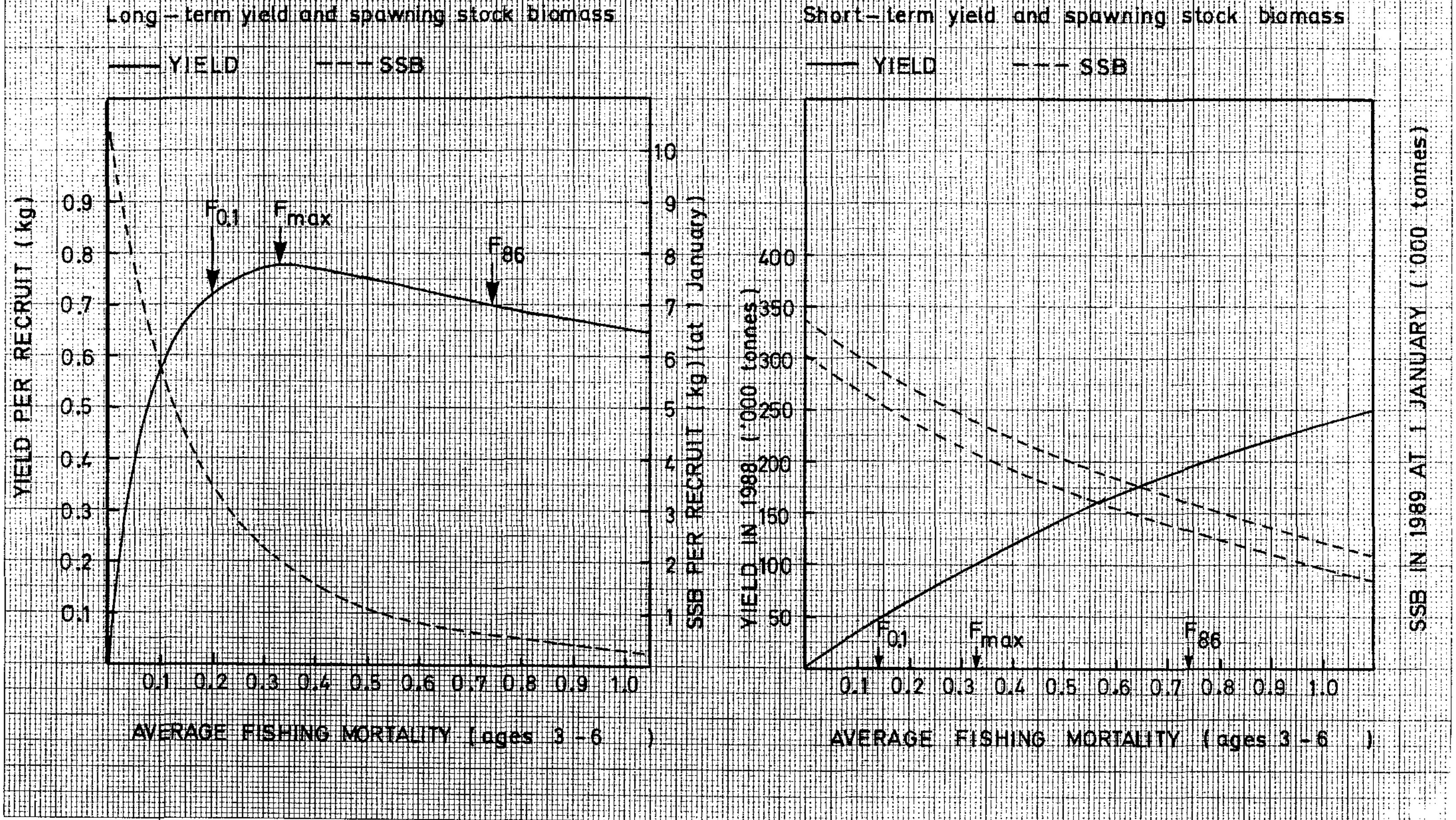


Figure 3.4.5.2 North Sea Saithe.

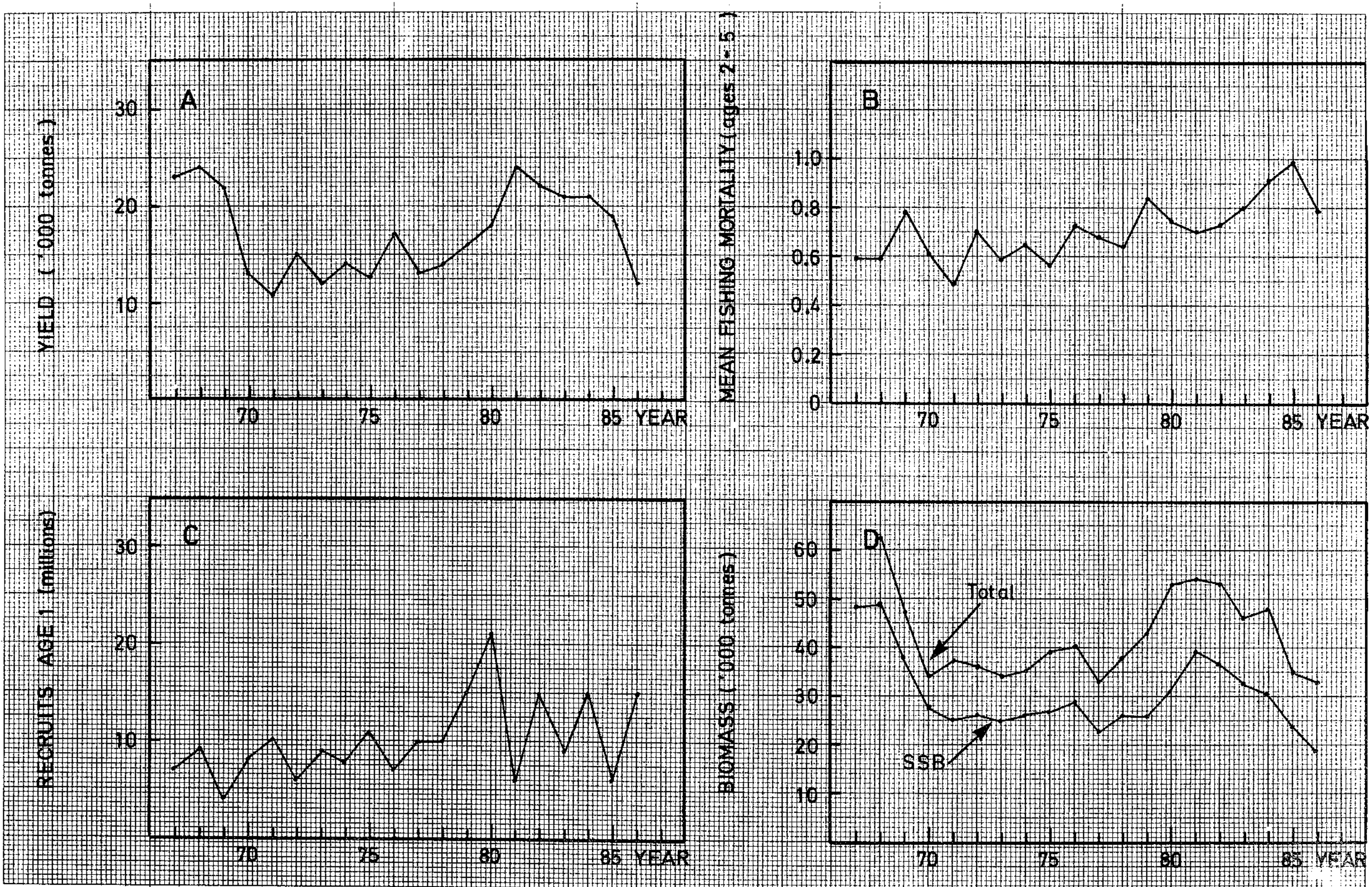


Figure 3.5.2.1 Cod in Division VIa (West of Scotland).

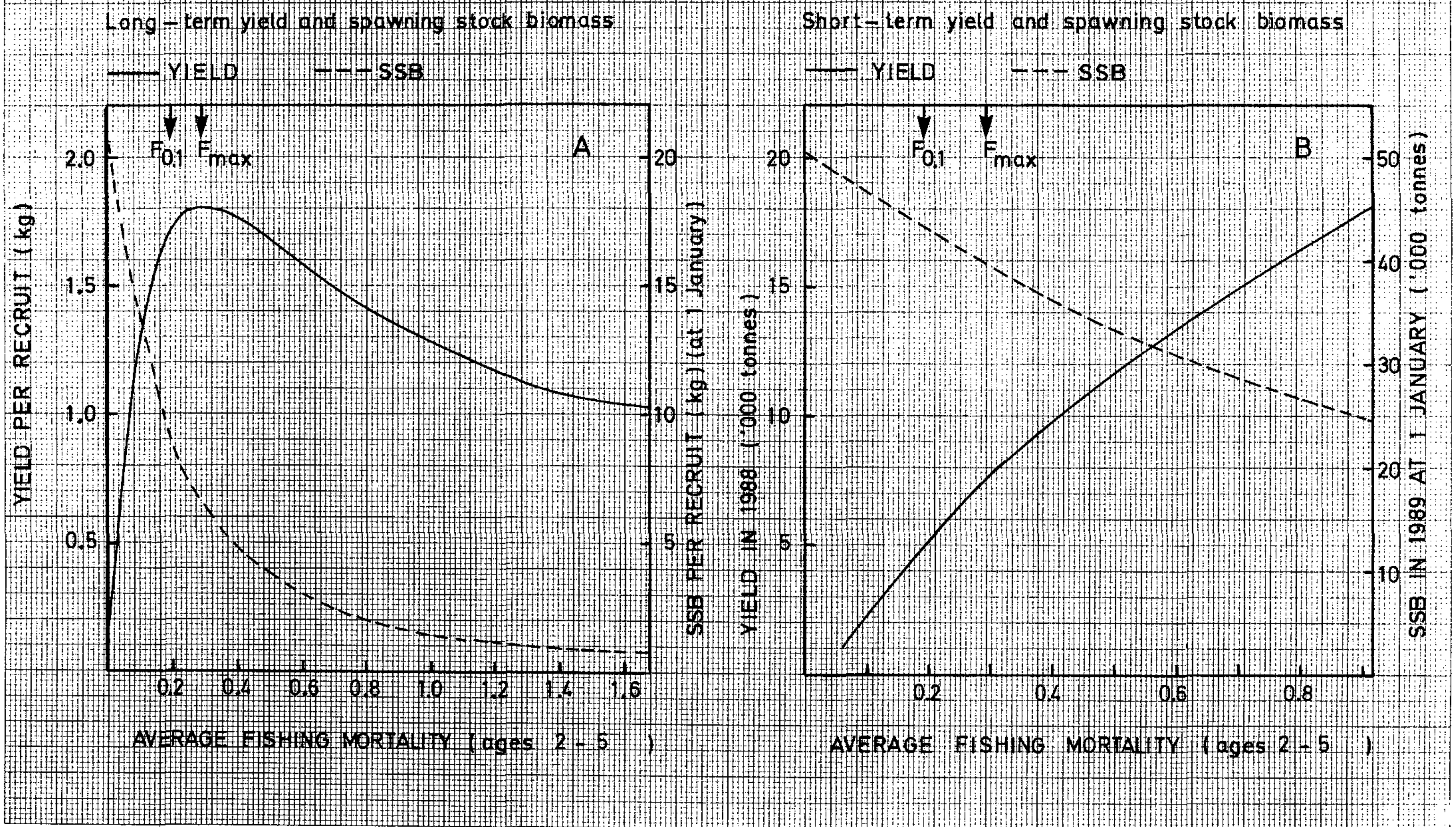


Figure 3.5.2.2 Cod in Division VIa (West of Scotland).

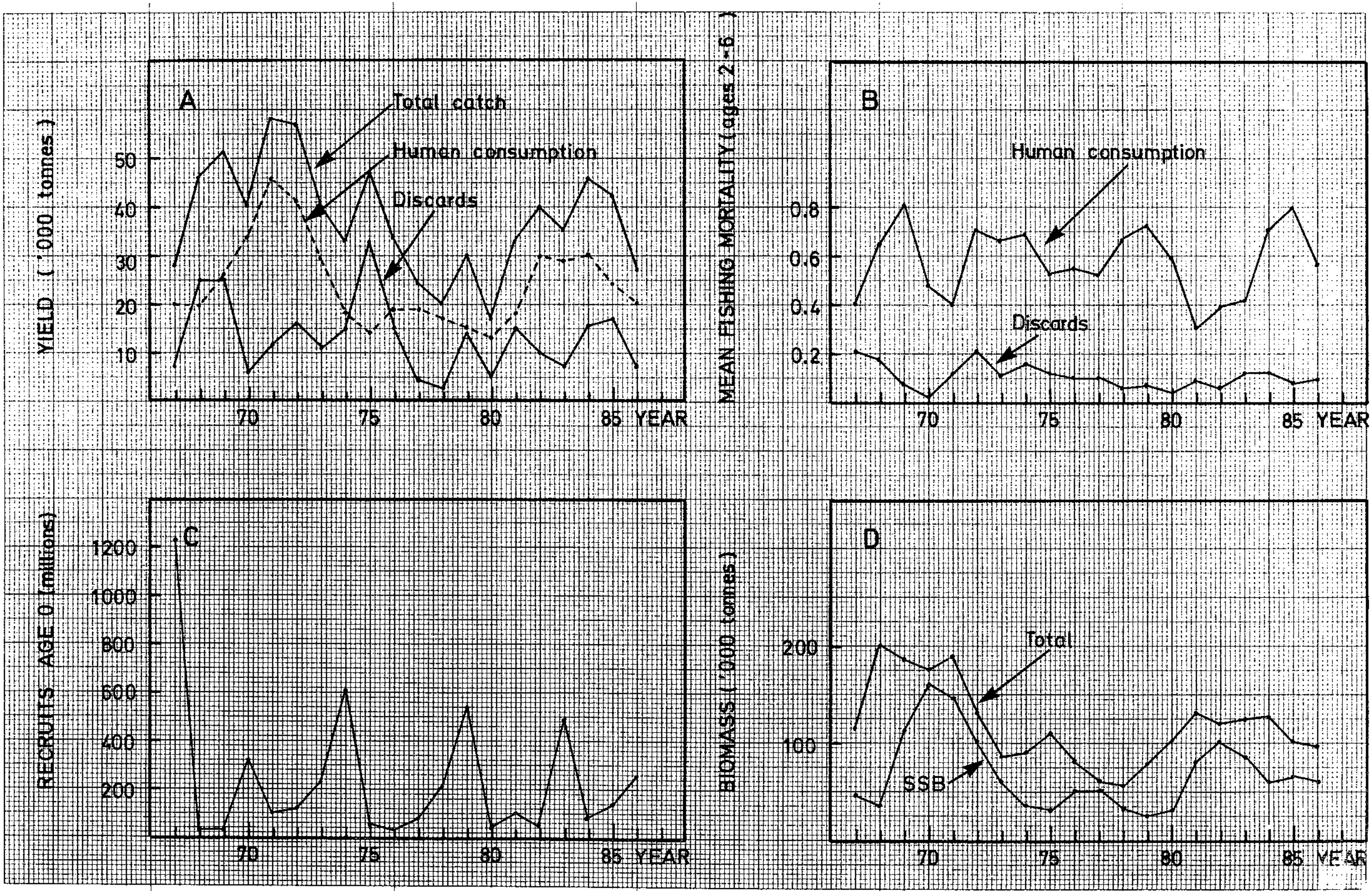


Figure 3.5.4.1 Haddock in Division VIa.

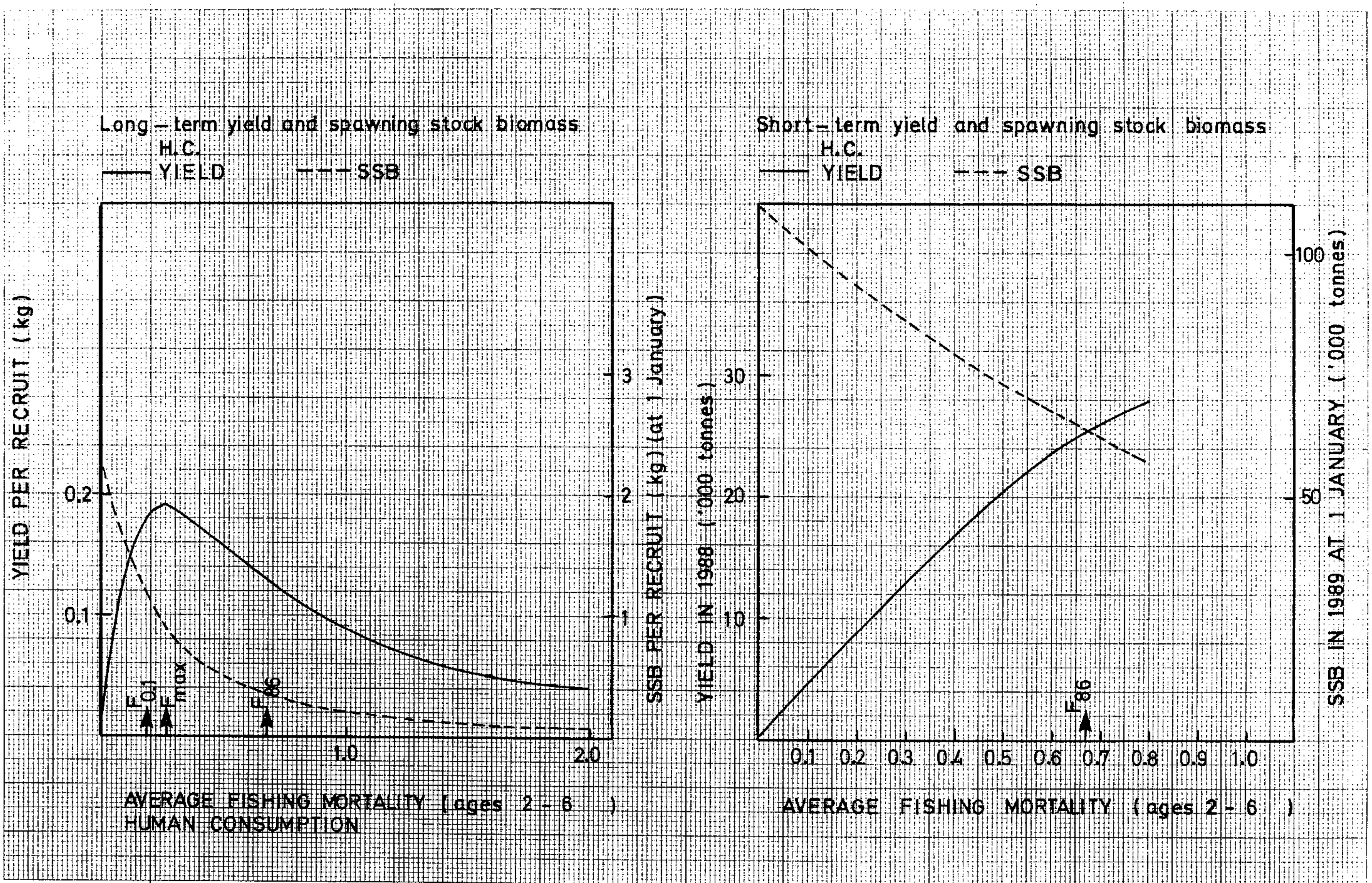


Figure 3.5.4.2 Haddock in Division VIa.

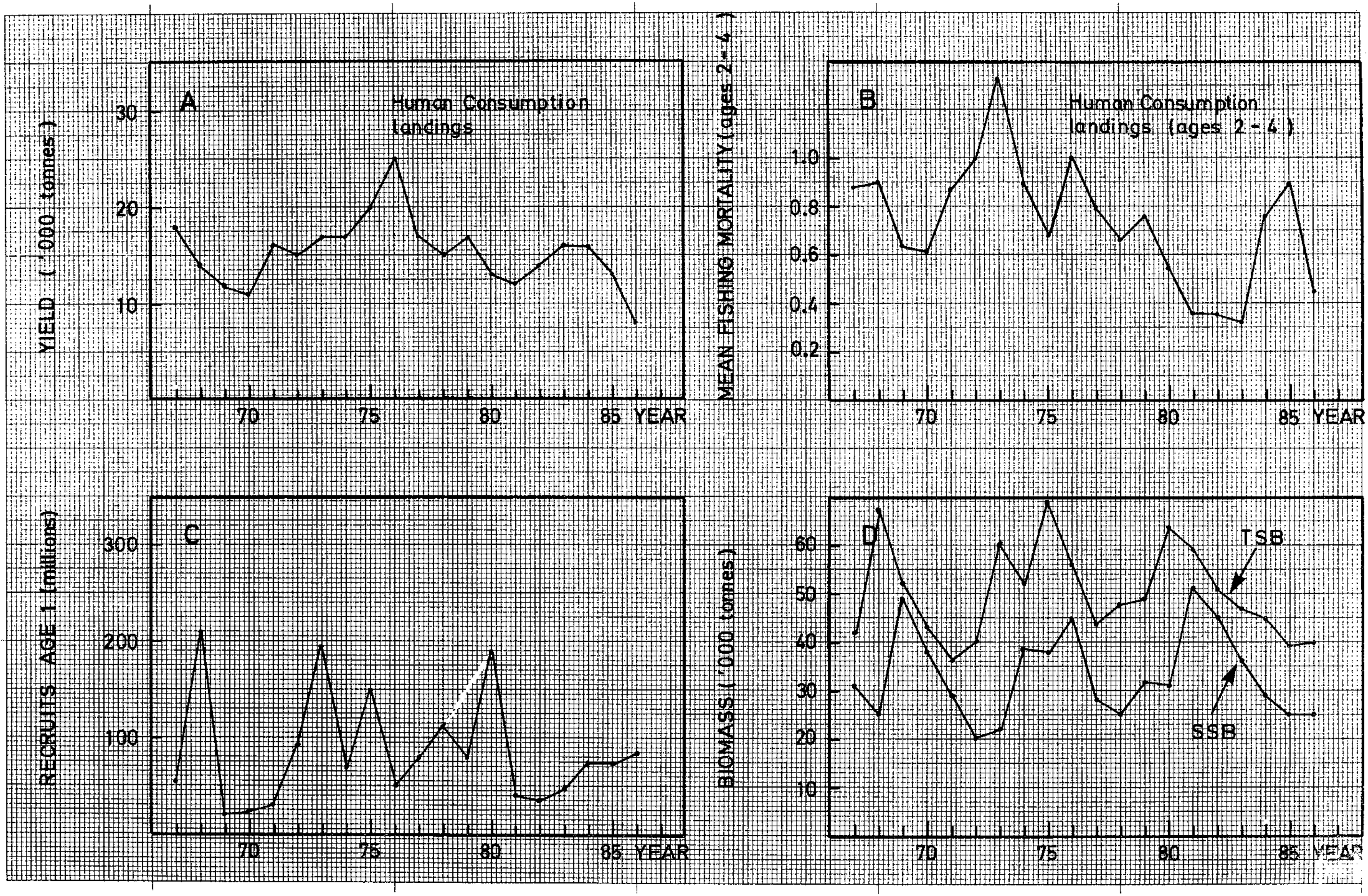


Figure 3.5.6.1 Whiting in Division VIa (West of Scotland).

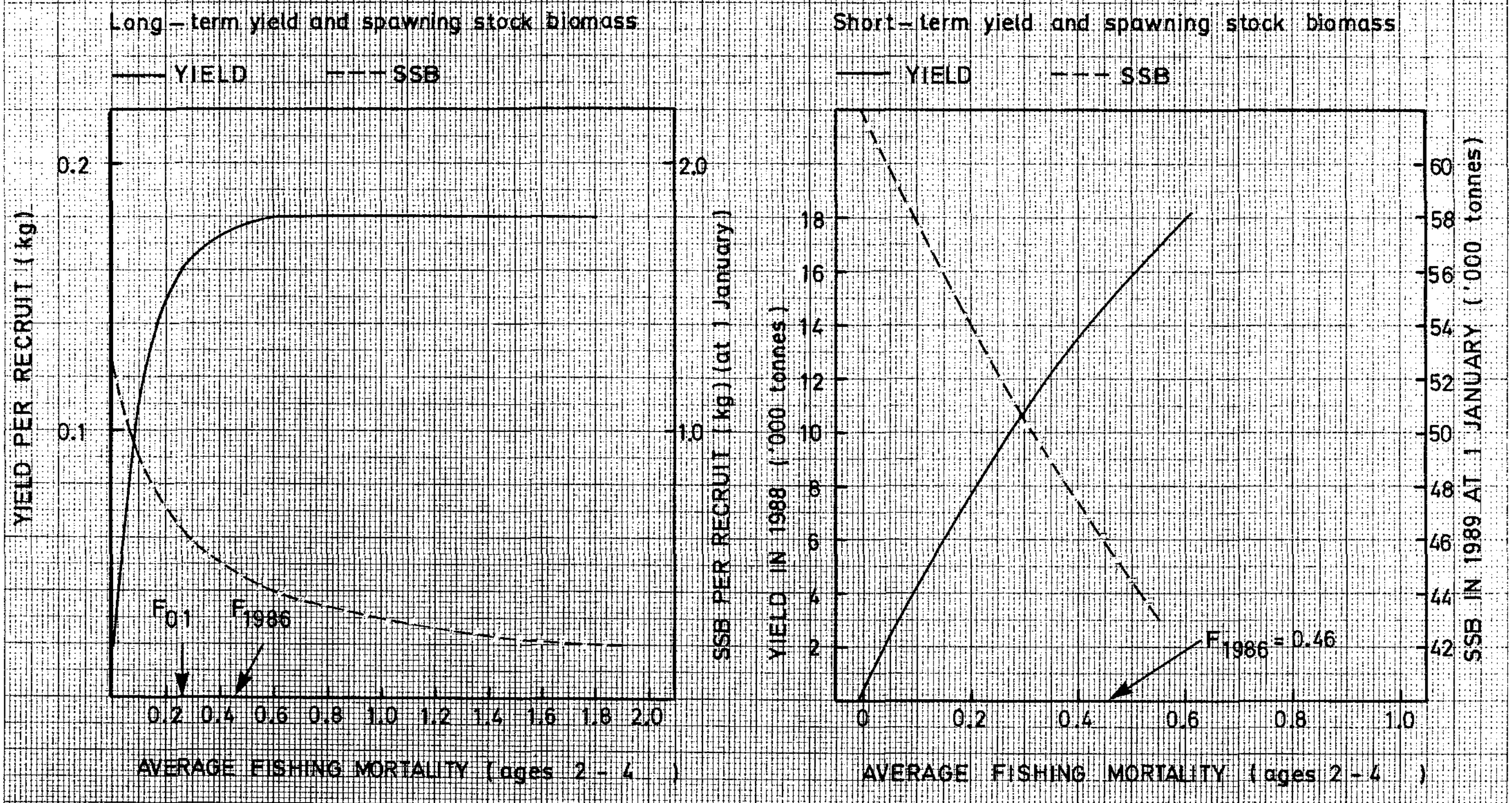


Figure 3.5.6.2 Whiting in Division VIa.

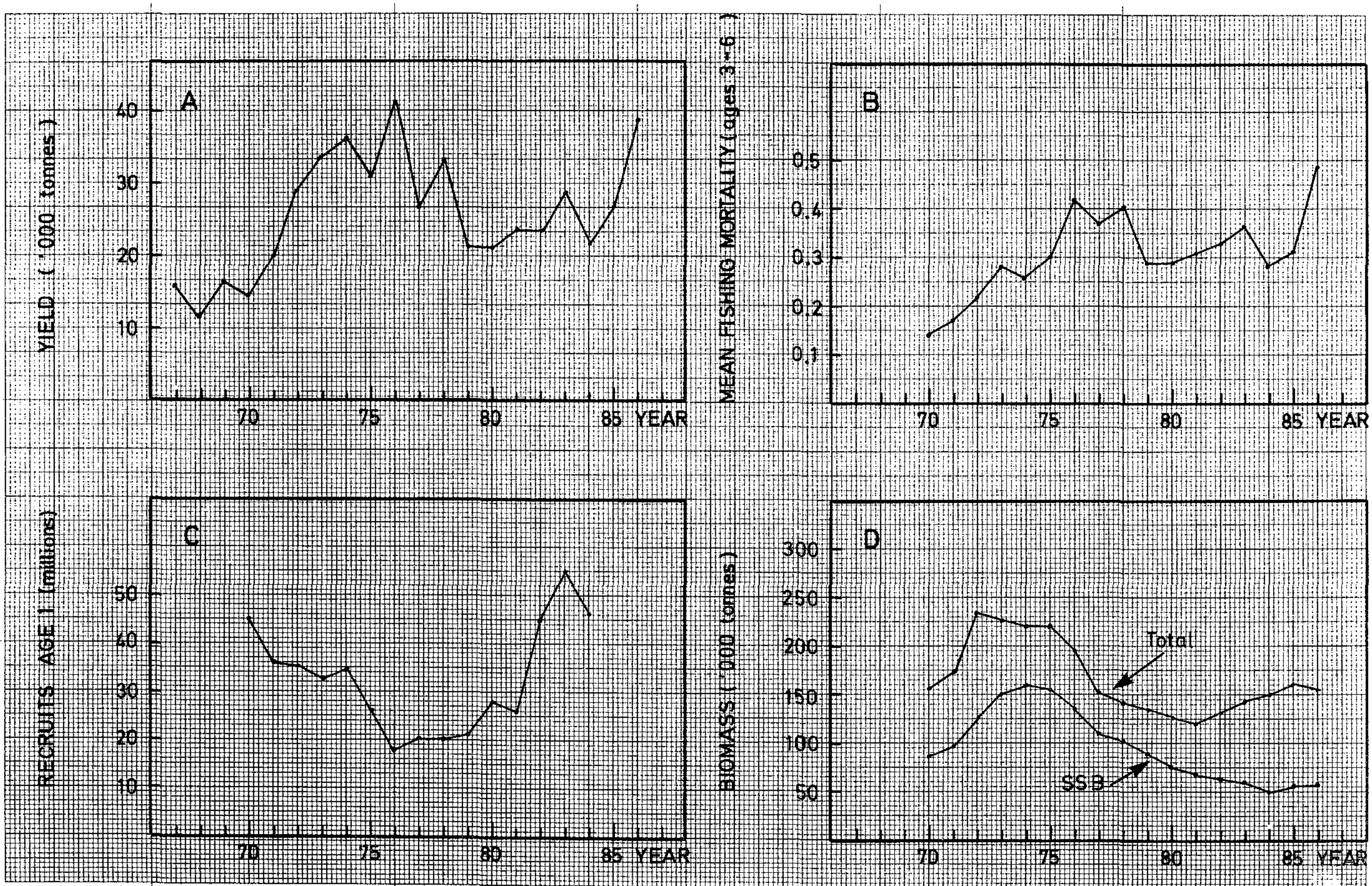


Figure 3.5.8.1 Saithe in Sub-area VI.

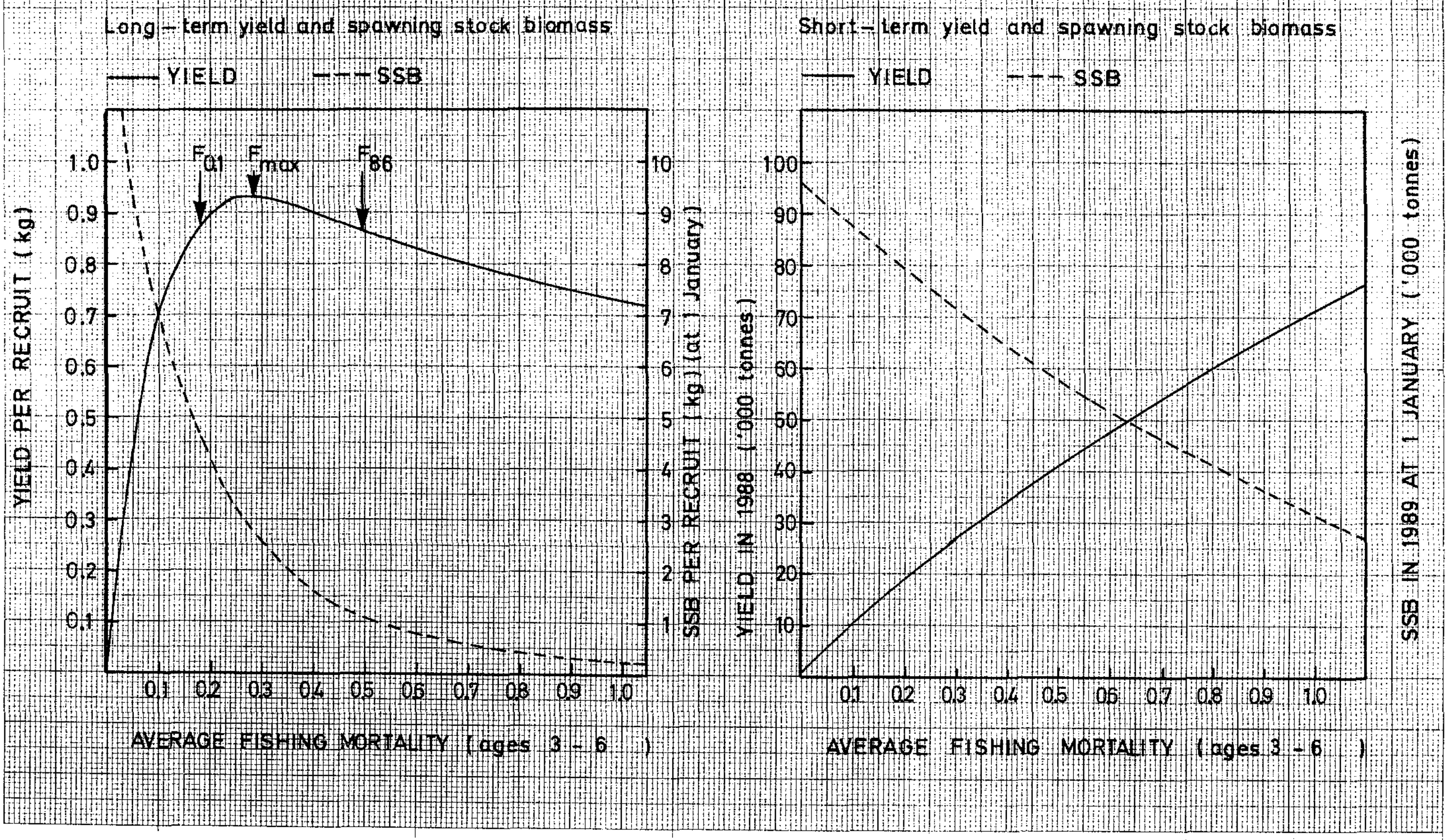
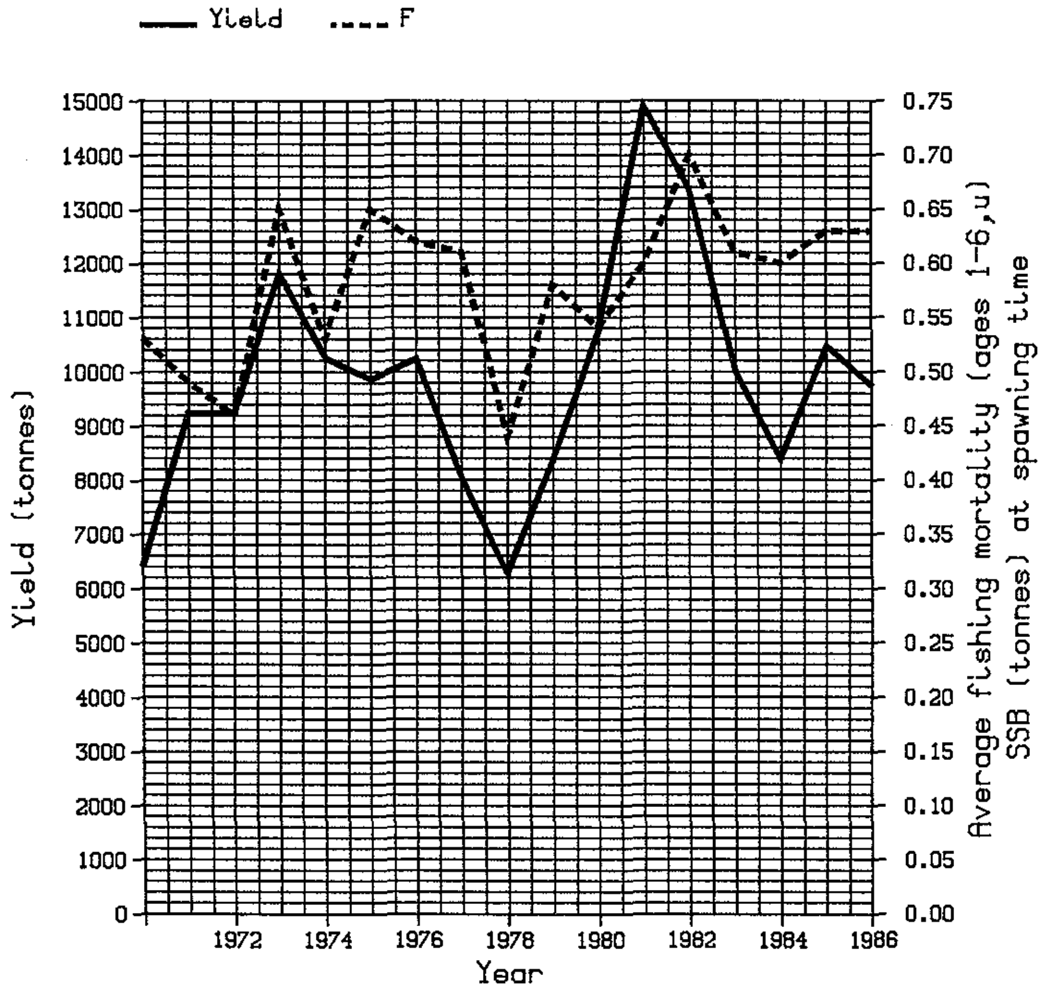


Figure 3.5.8.2 Saithe in Sub-area VI.

FISH STOCK SUMMARY
STOCK: Irish Sea Cod
11–03–1987

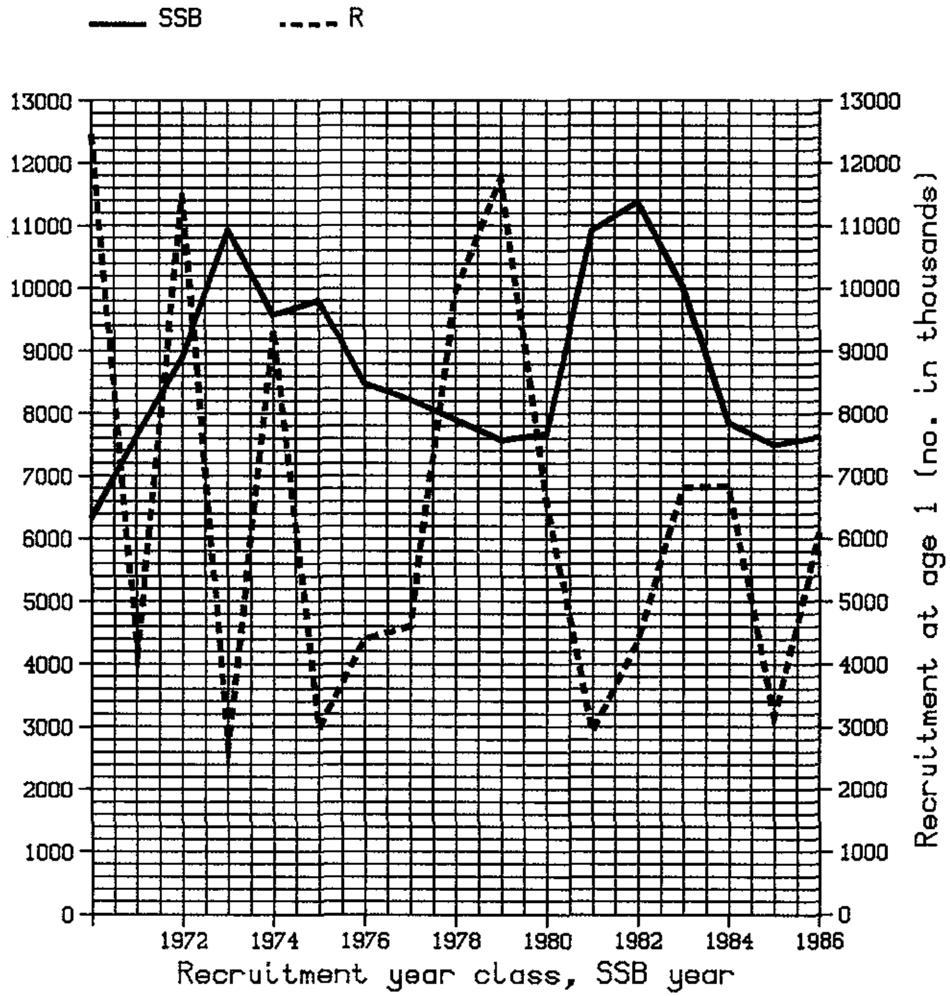
Figure 3.6.1.1

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



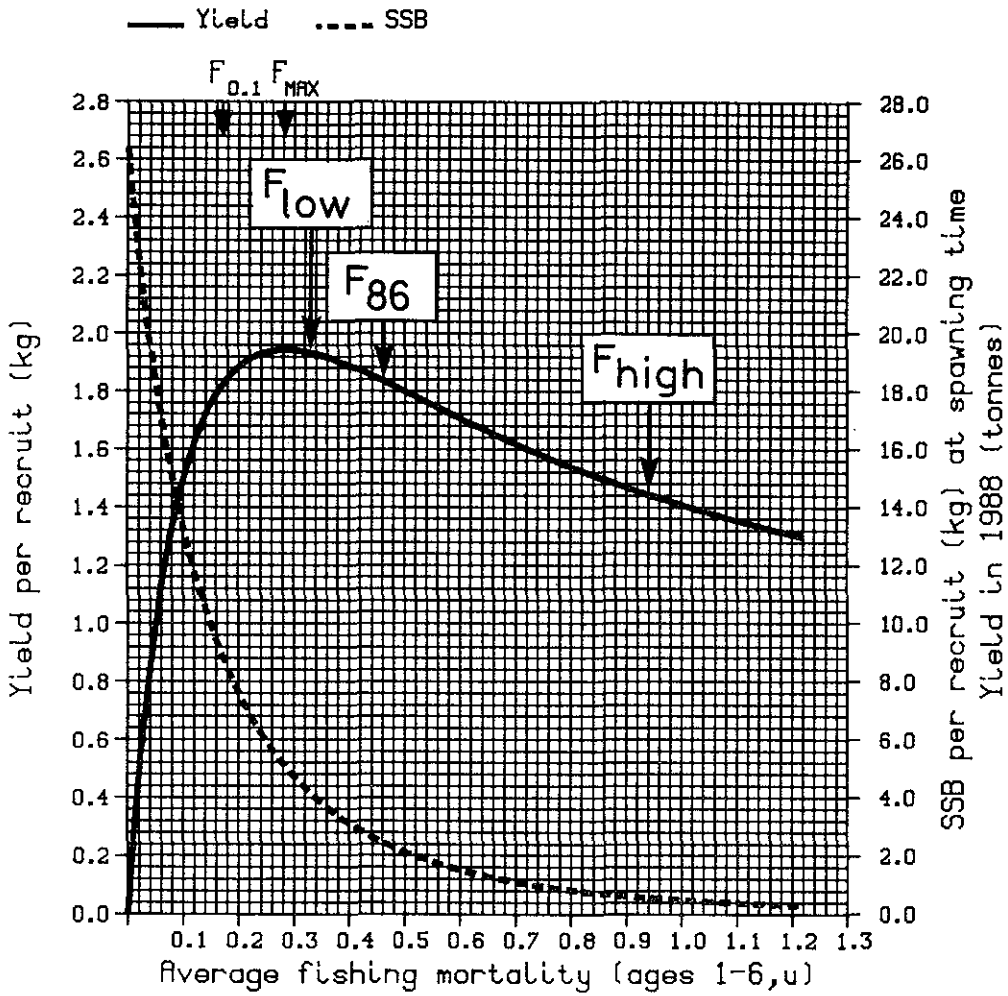
B

Cont'd

FISH STOCK SUMMARY
STOCK: Irish Sea Cod
11–03–1987

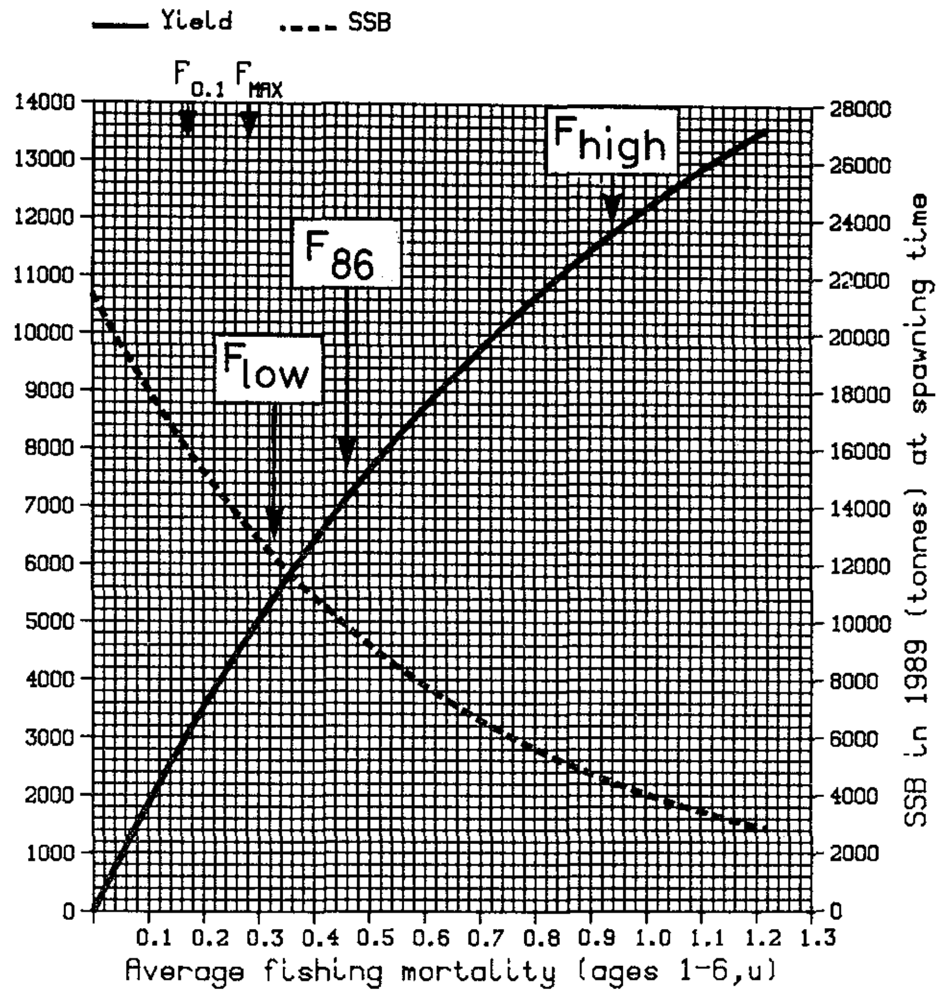
Figure 3.6.1.1 (cont'd)

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass

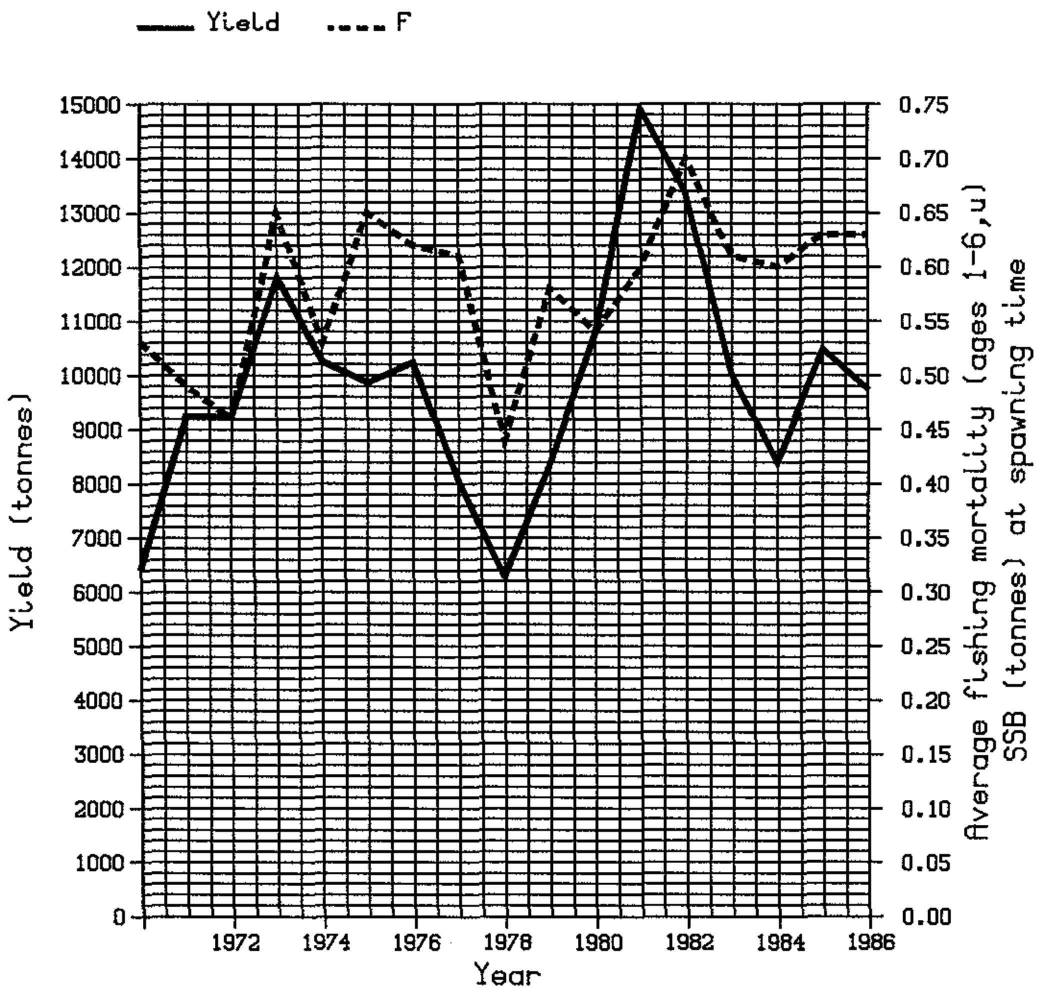


D

Figure 3.6.1.2

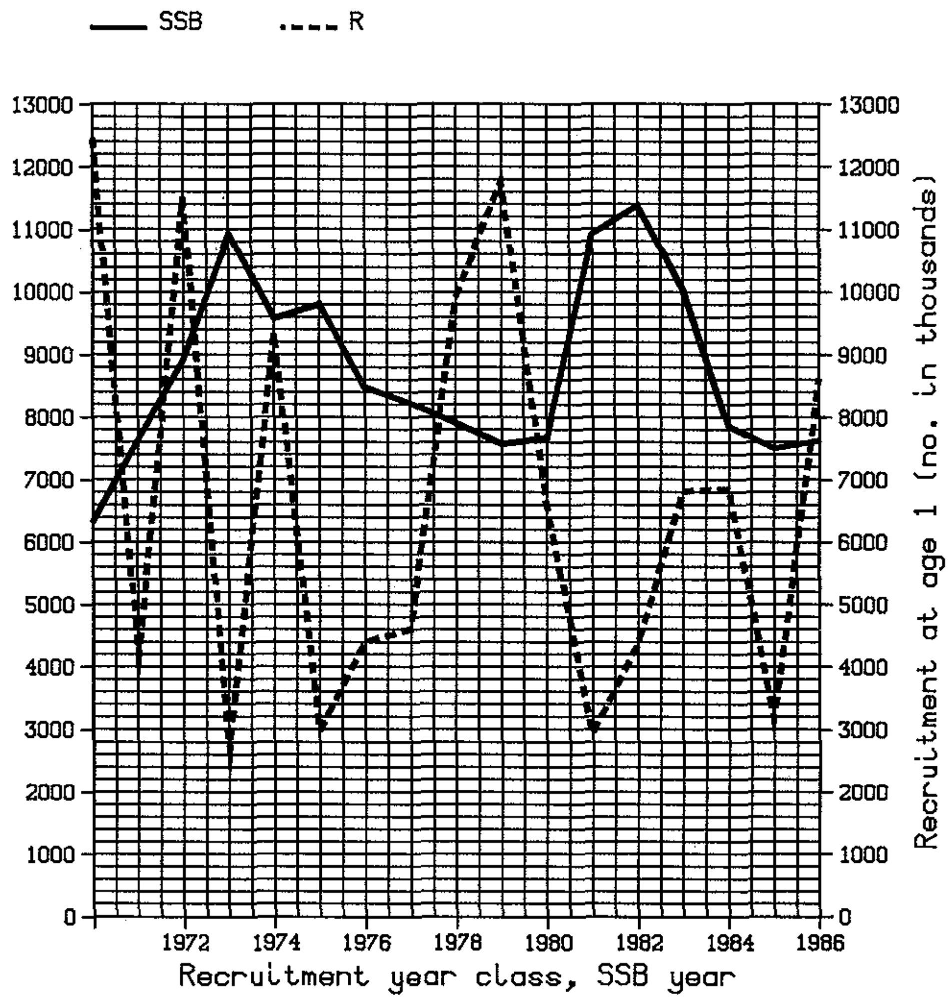
FISH STOCK SUMMARY
STOCK: Irish Sea Cod
04–11–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)

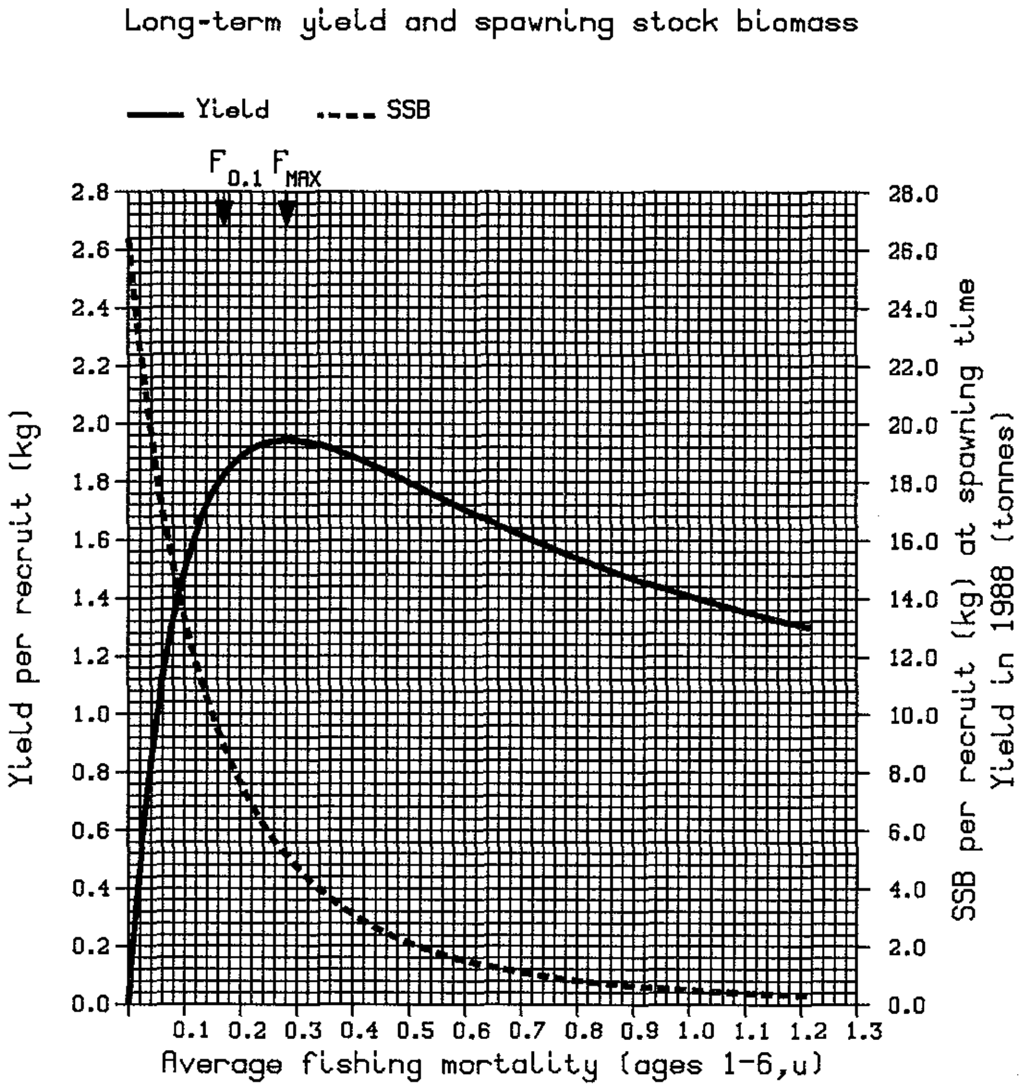


B

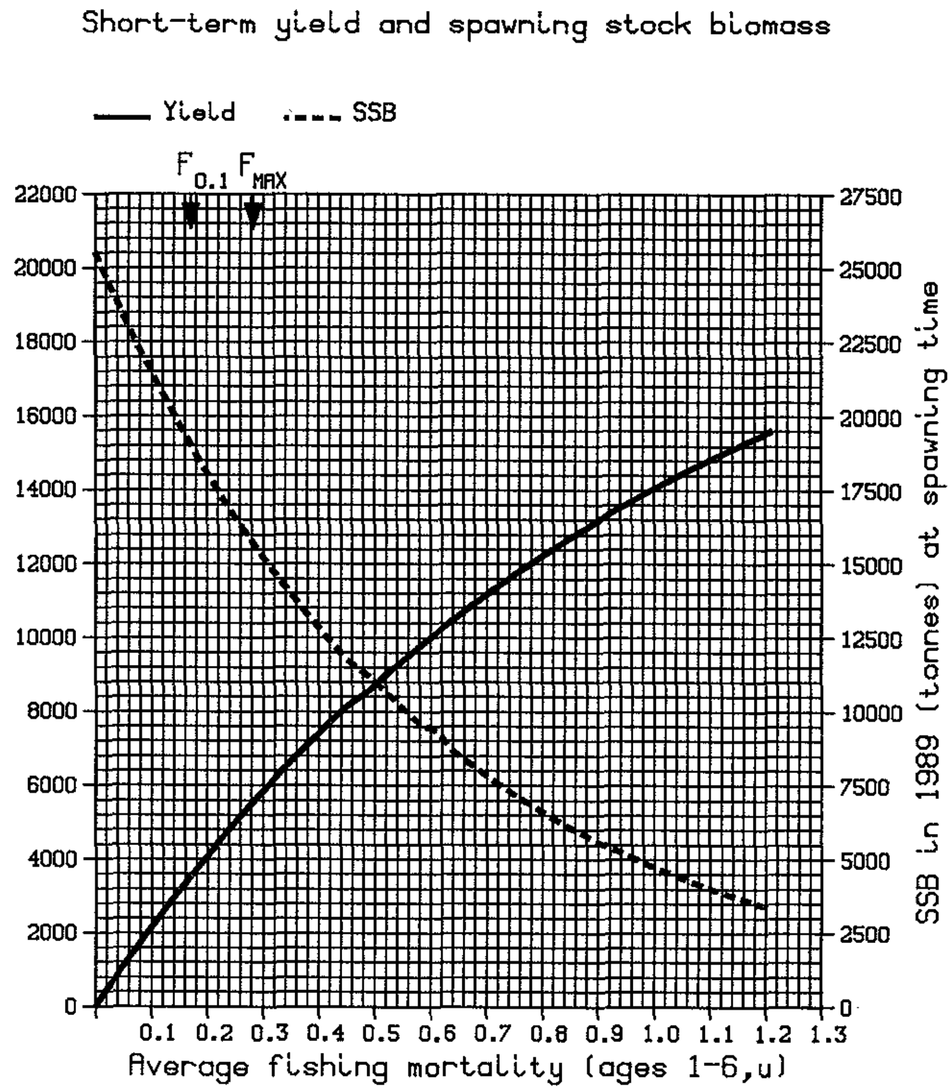
(cont'd)

Figure 3.6.1.2 (cont'd)

FISH STOCK SUMMARY
STOCK: Irish Sea Cod
04–11–1987



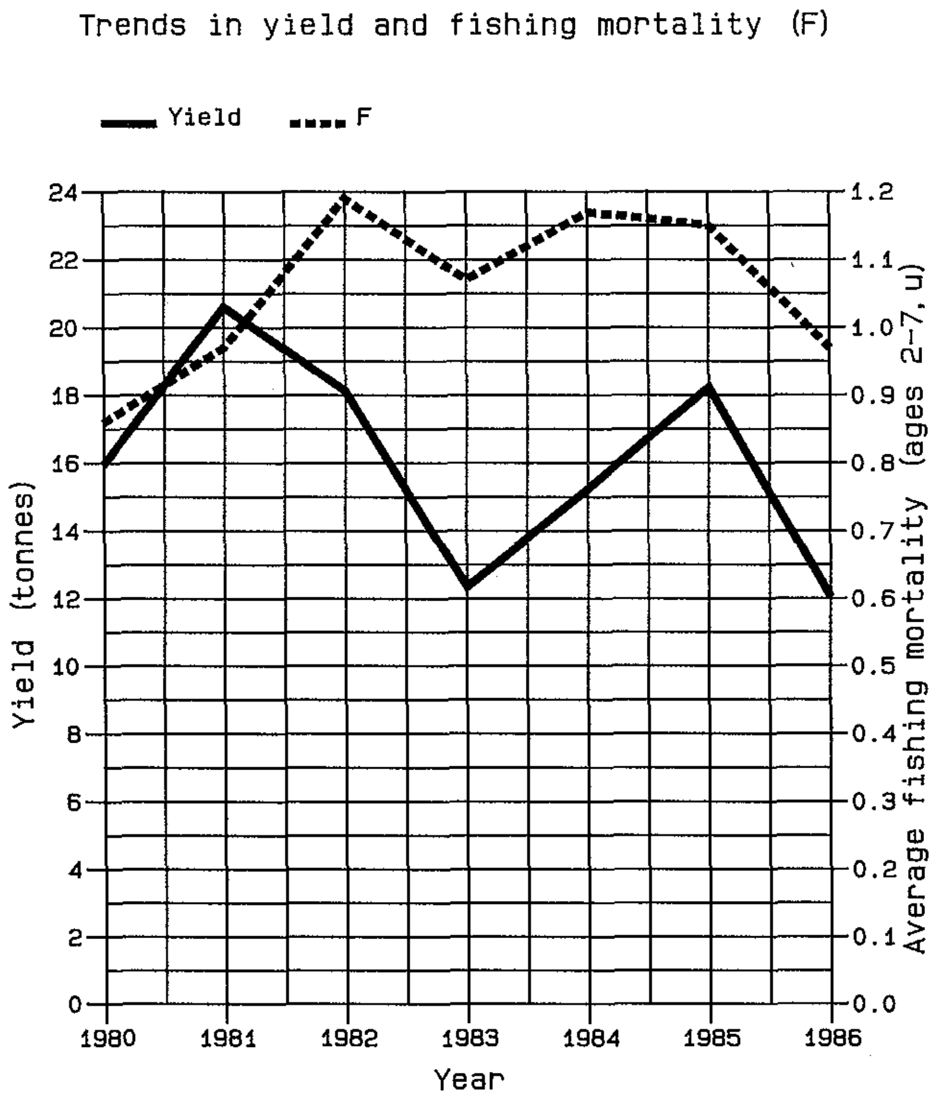
C



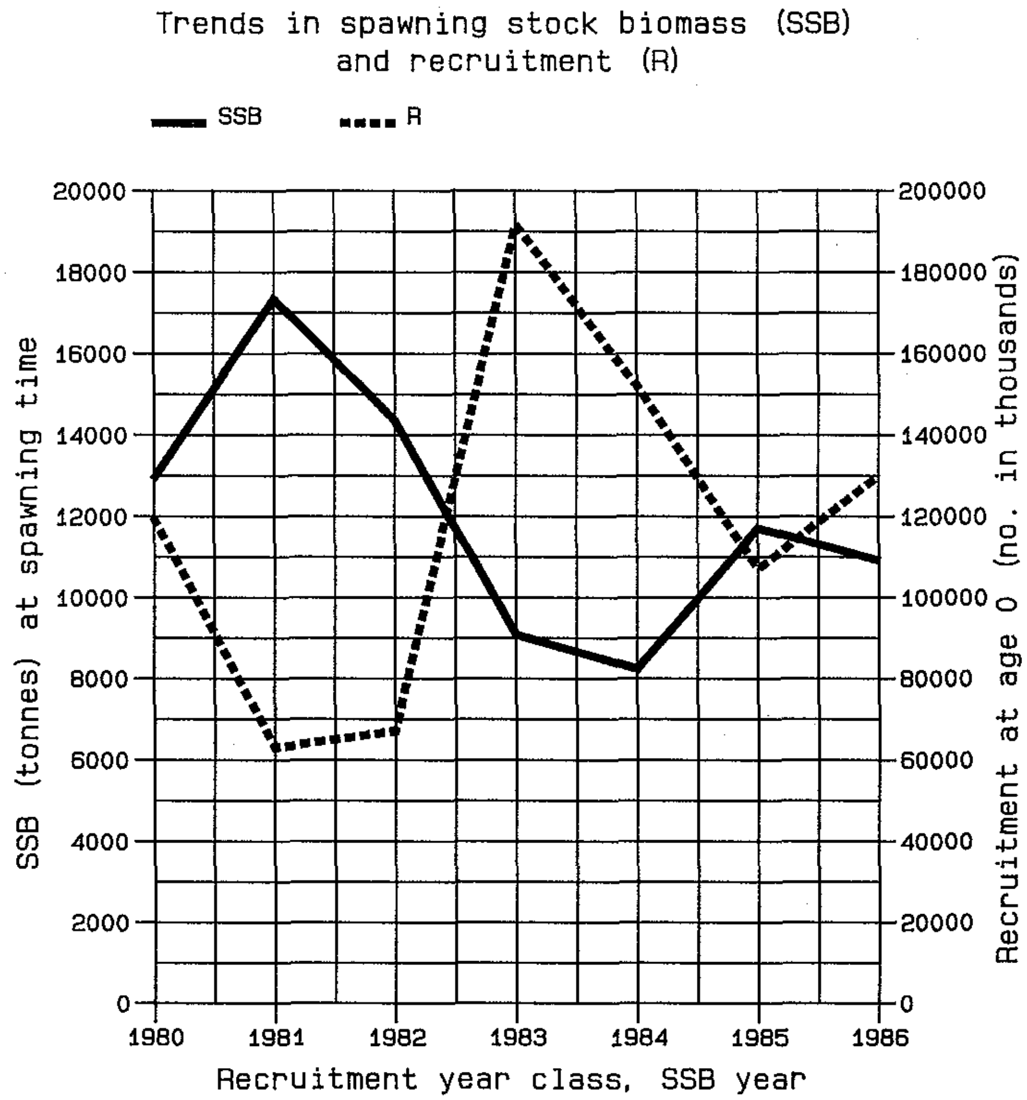
D

Figure 3.6.2

FISH STOCK SUMMARY
STOCK: Irish Sea Whiting
12-03-1987



A

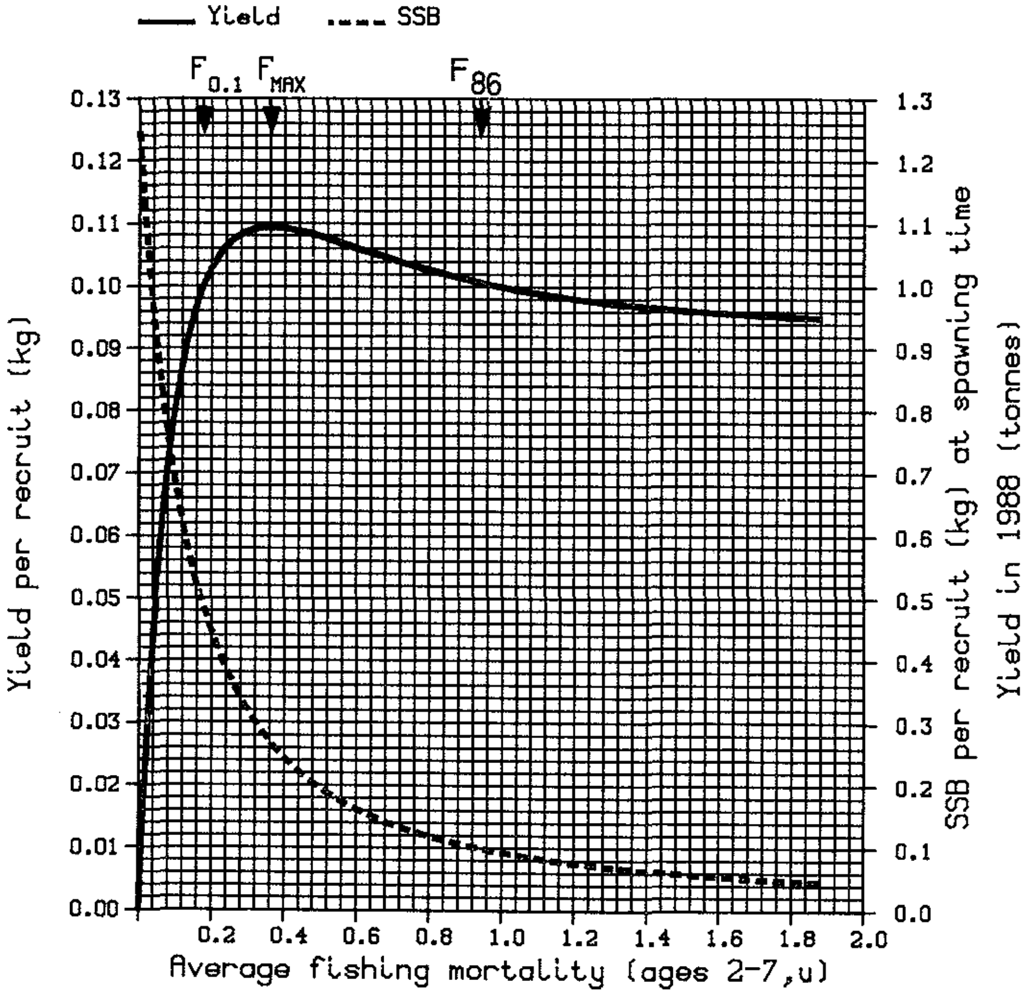


B

FISH STOCK SUMMARY
STOCK: Irish Sea Whiting
12–03–1987

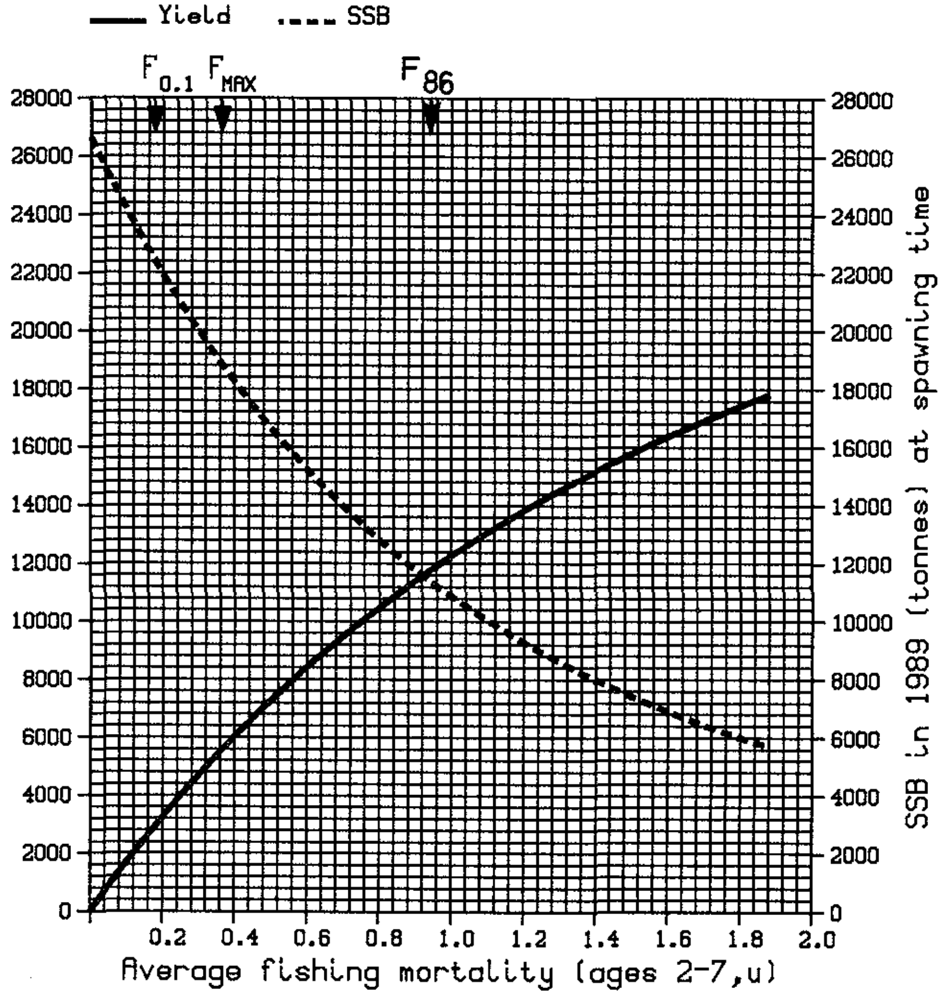
Figure 3.6.2 (cont'd)

Long-term yield and spawning stock biomass



C

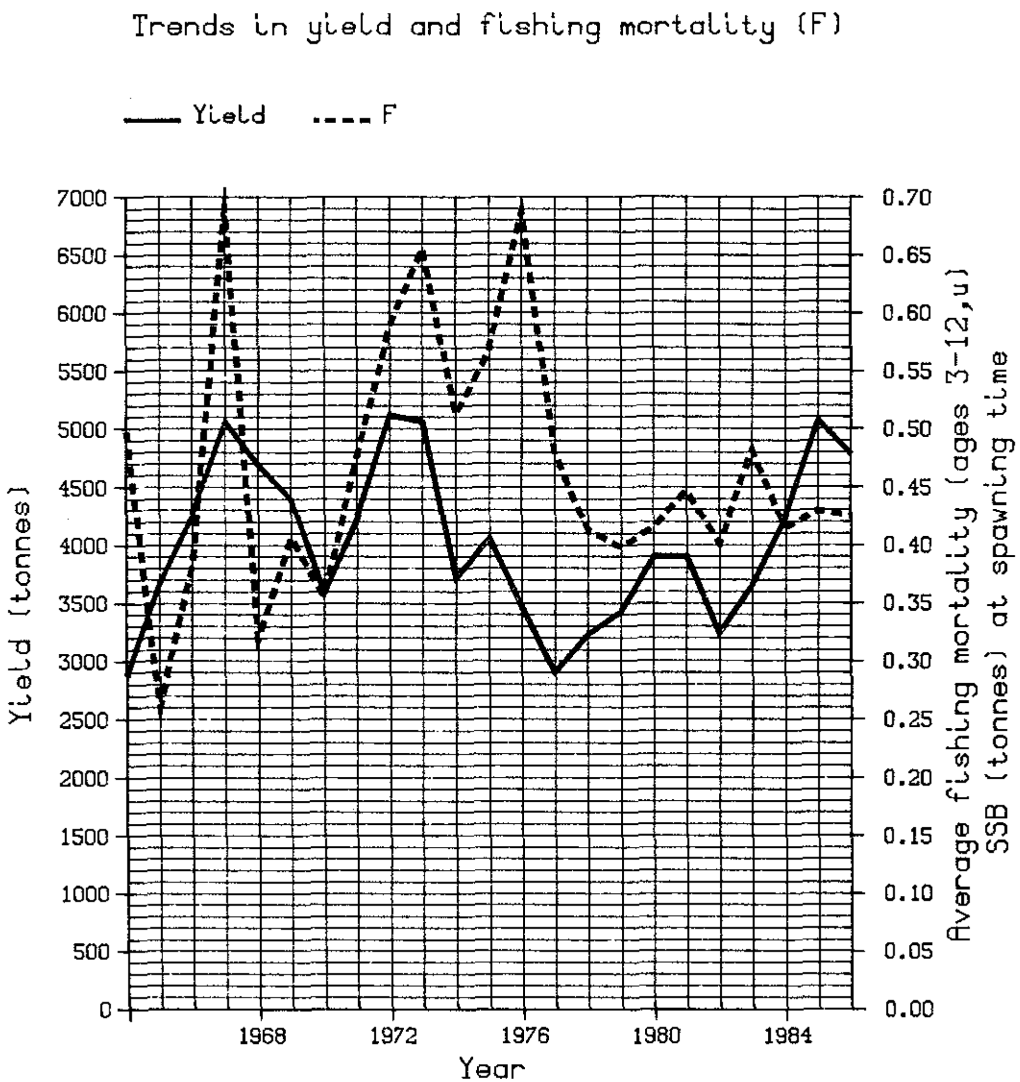
Short-term yield and spawning stock biomass



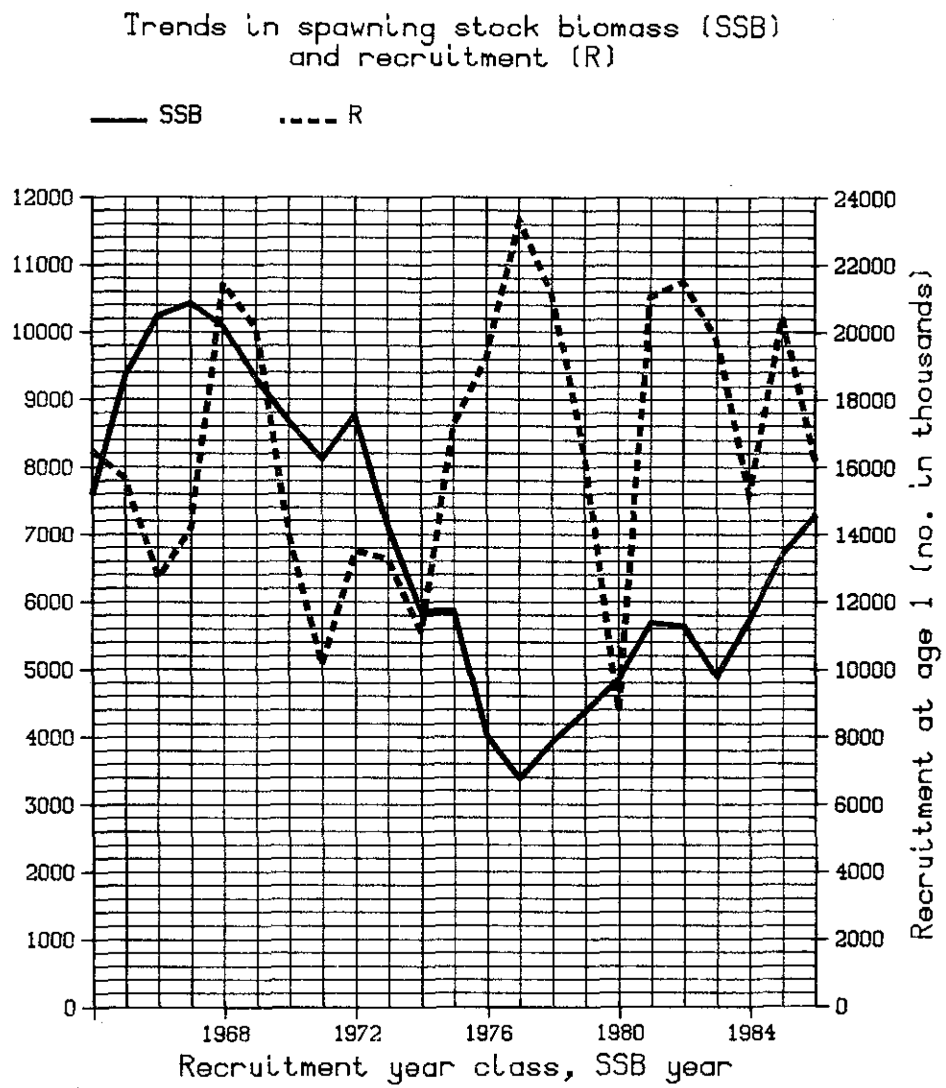
D

FISH STOCK SUMMARY
STOCK: Irish Sea Plaice (M/F), (Area VIIA)
12-03-1987

Figure 3.6.3



A



B

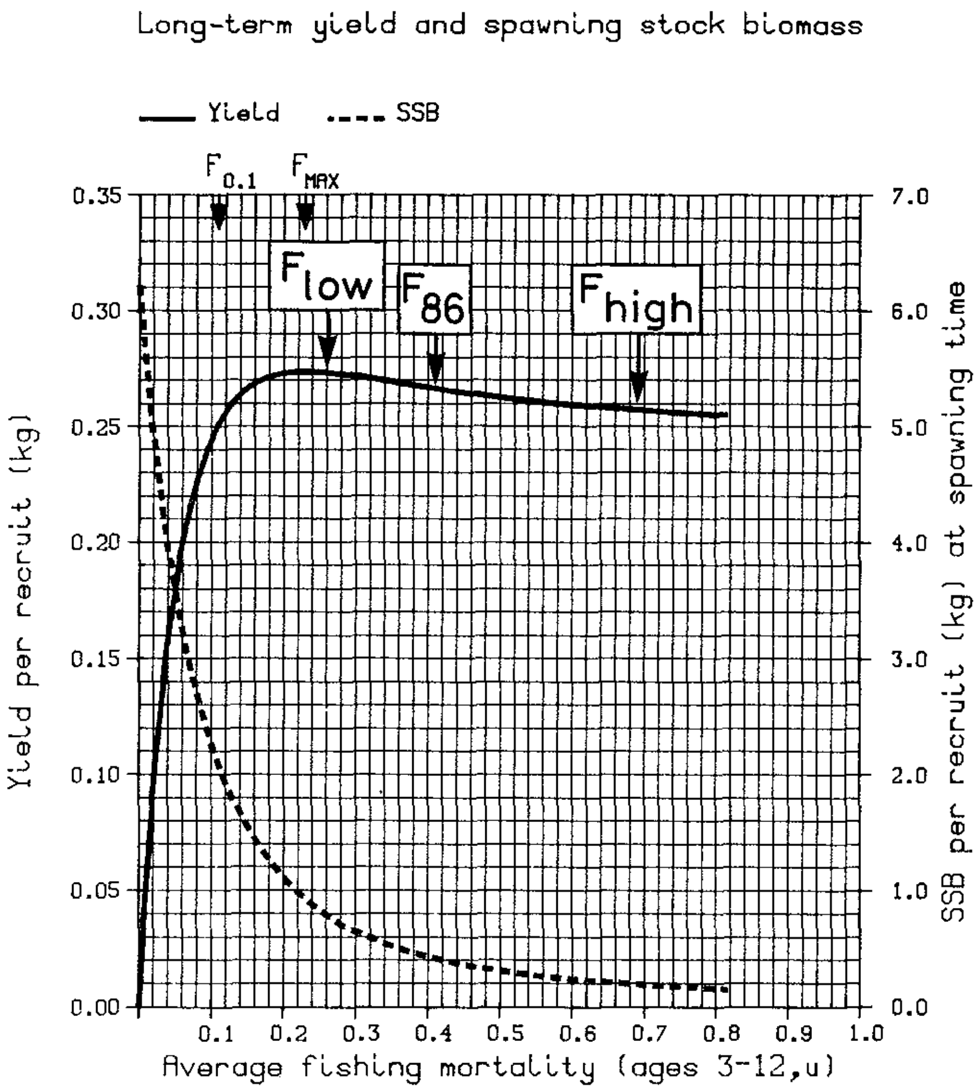
Cont'd

FISH STOCK SUMMARY

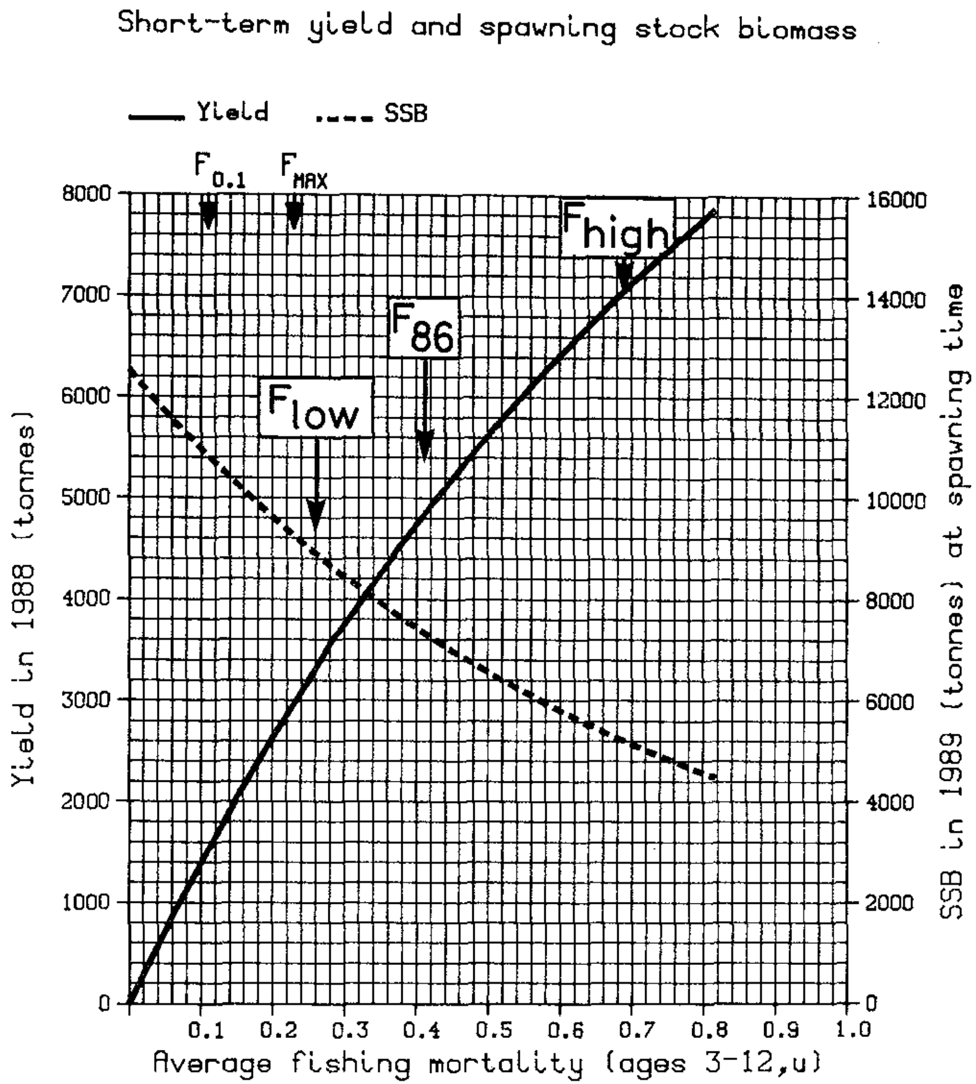
STOCK: Irish Sea Plaice (M/F), (Area VIIA)

12-03-1987

Figure 3.6.3 (cont'd)



C

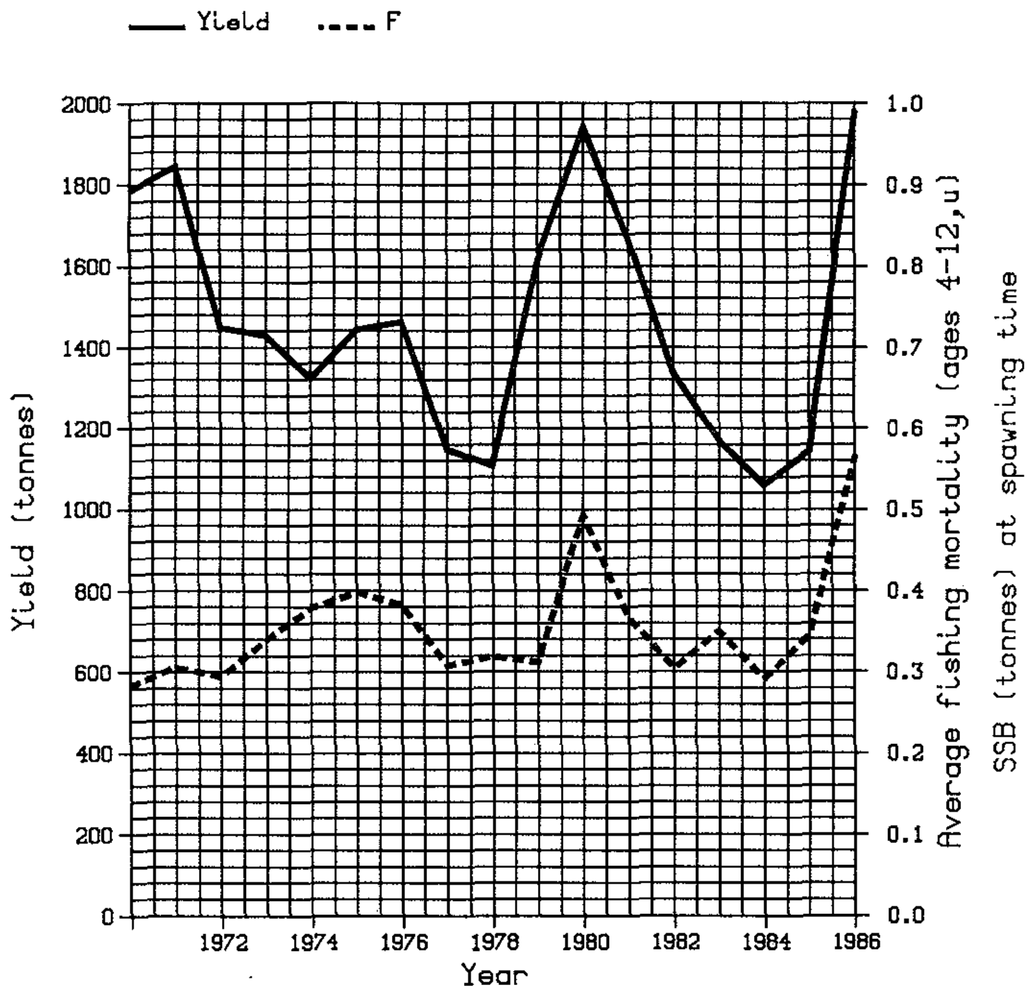


D

FISH STOCK SUMMARY
STOCK: Irish Sea Sole (M/F) (VIIA)
12-03-1987

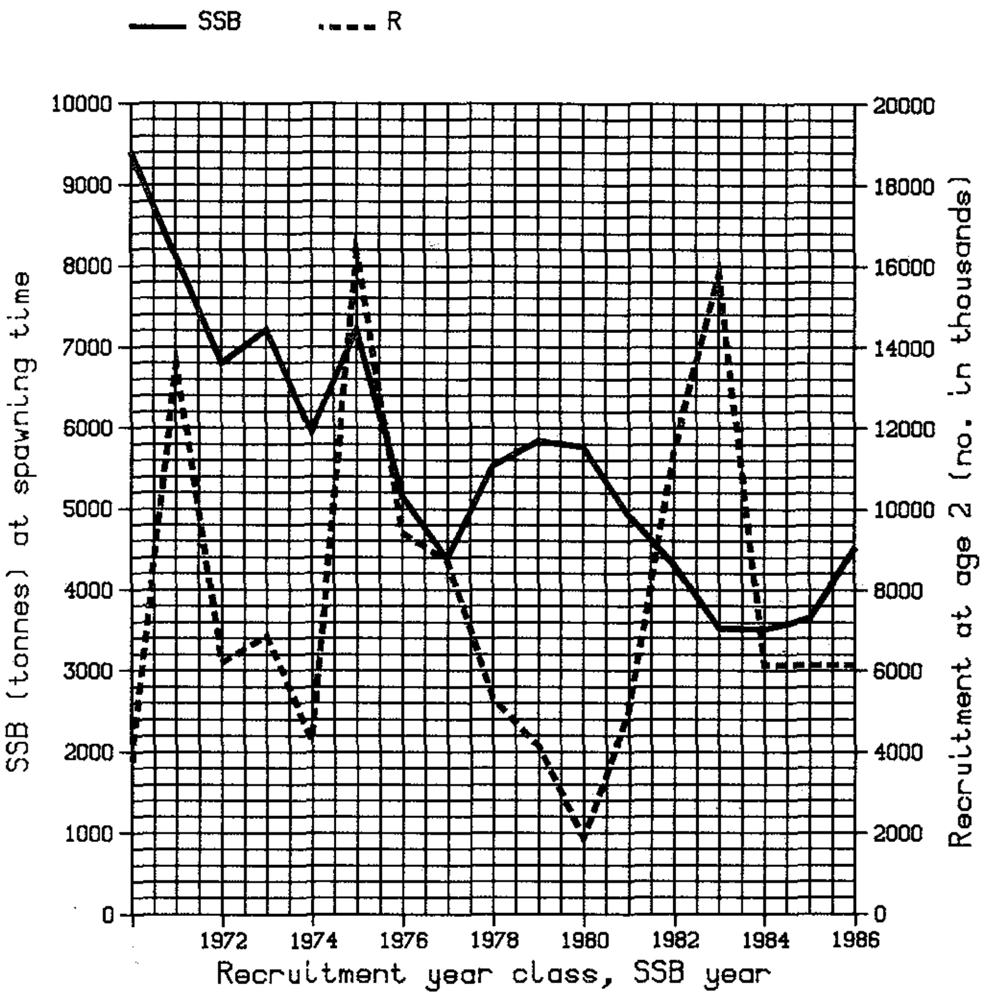
Figure 3.6.4.1

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)

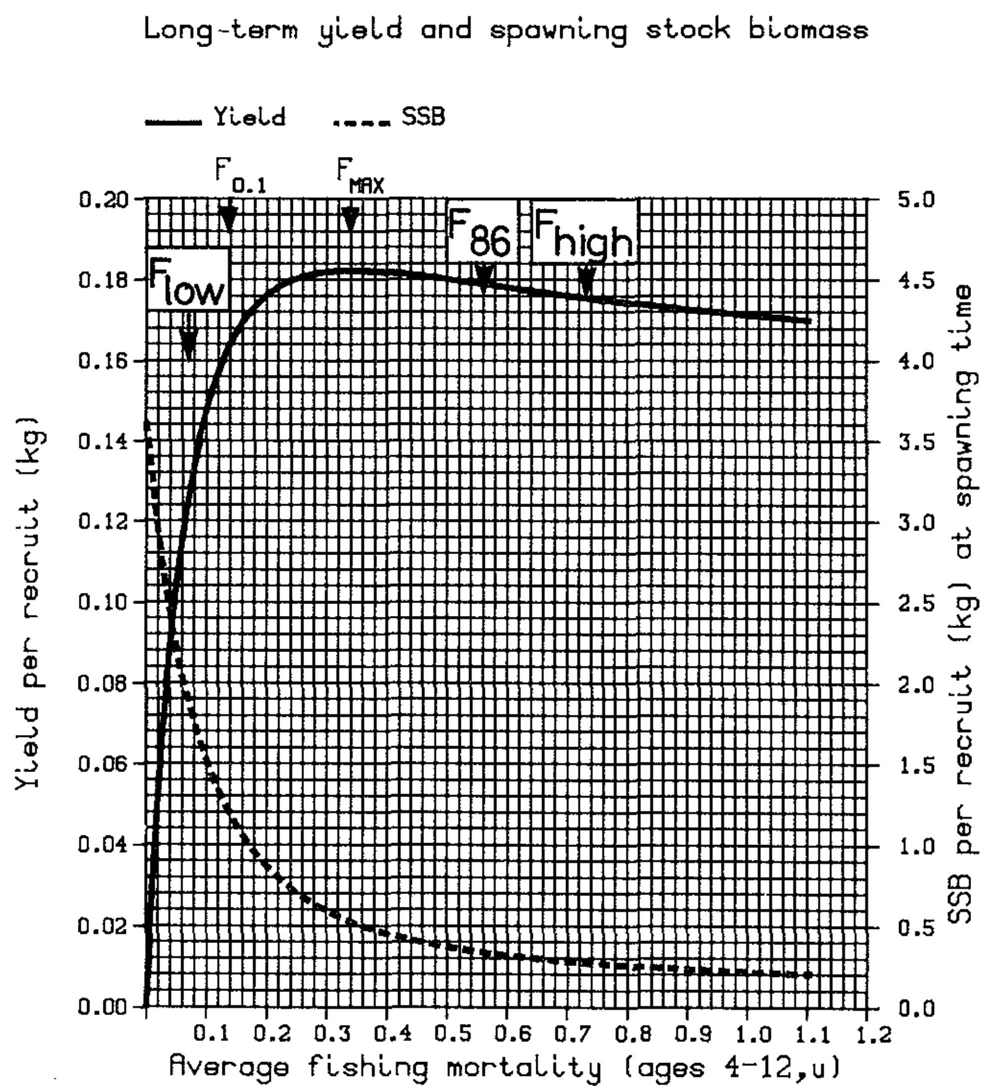


B

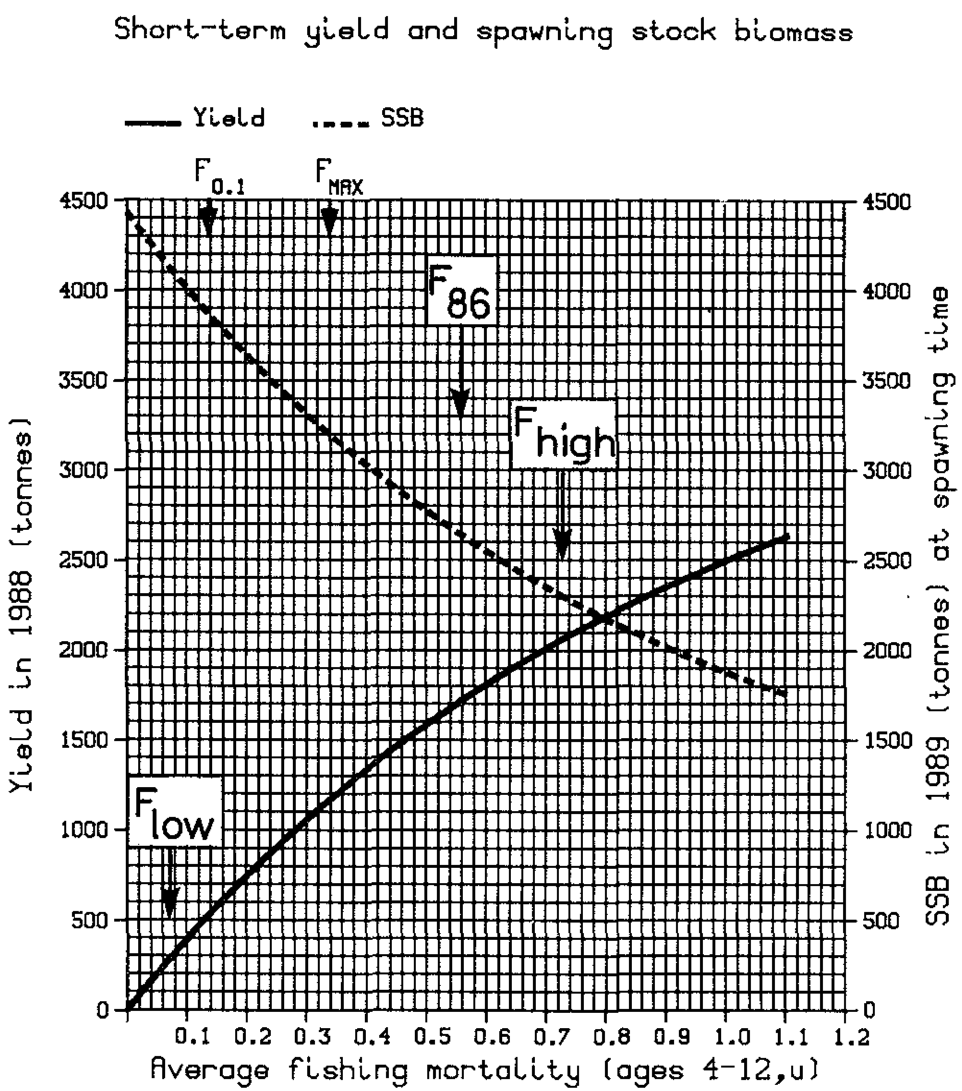
Cont'd

FISH STOCK SUMMARY
STOCK: Irish Sea Sole (M/F) (VIIA)
12-03-1987

Figure 3.6.4.1 (cont'd)



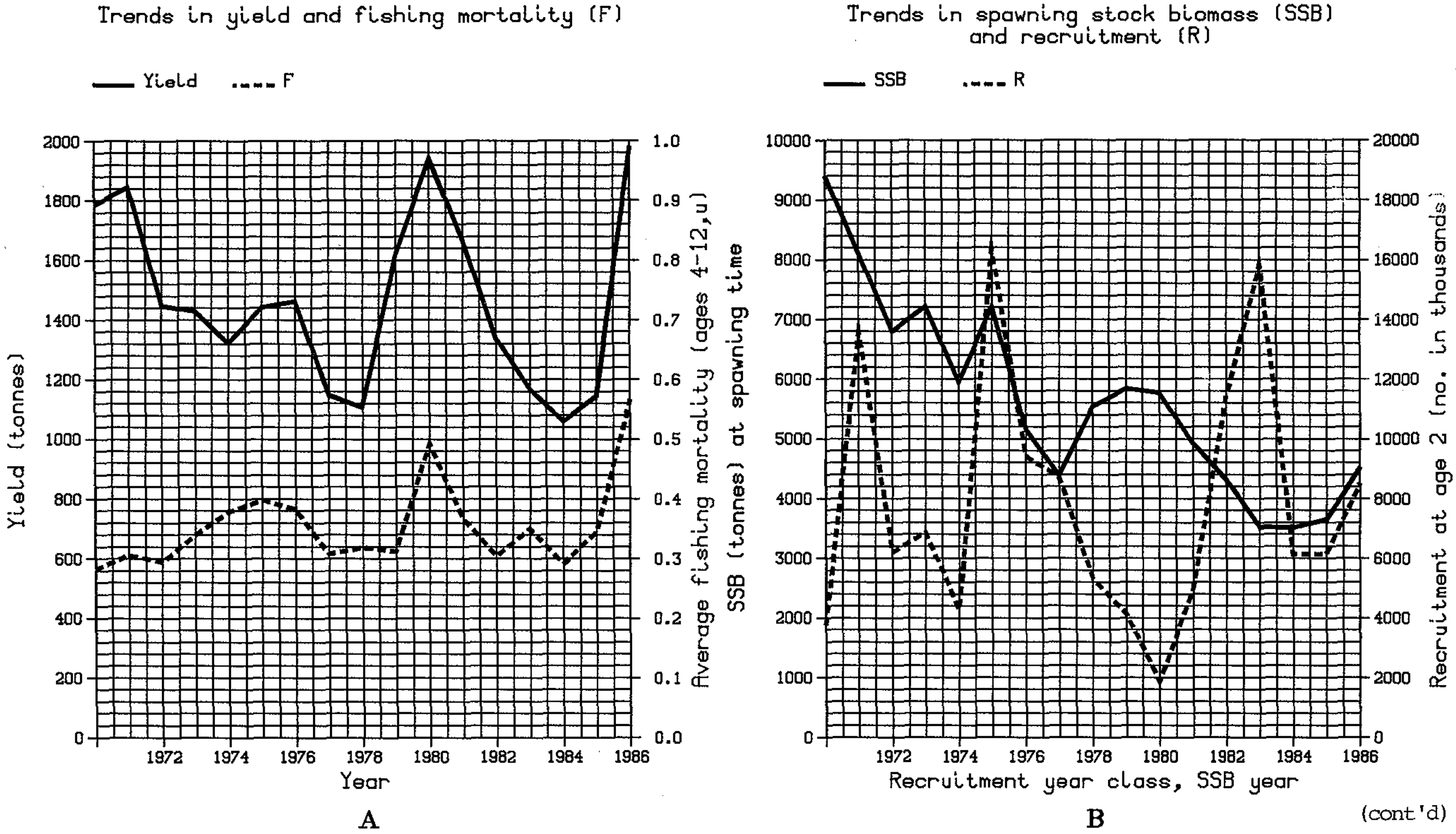
C



D

Figure 3.6.4.2

FISH STOCK SUMMARY
STOCK: Irish Sea Sole (M/F) (VIIA)
04–11–1987



(cont'd)

Figure 3.6.4.2 (cont'd)

FISH STOCK SUMMARY
STOCK: Irish Sea Sole (M/F) (VIIA)
04–11–1987

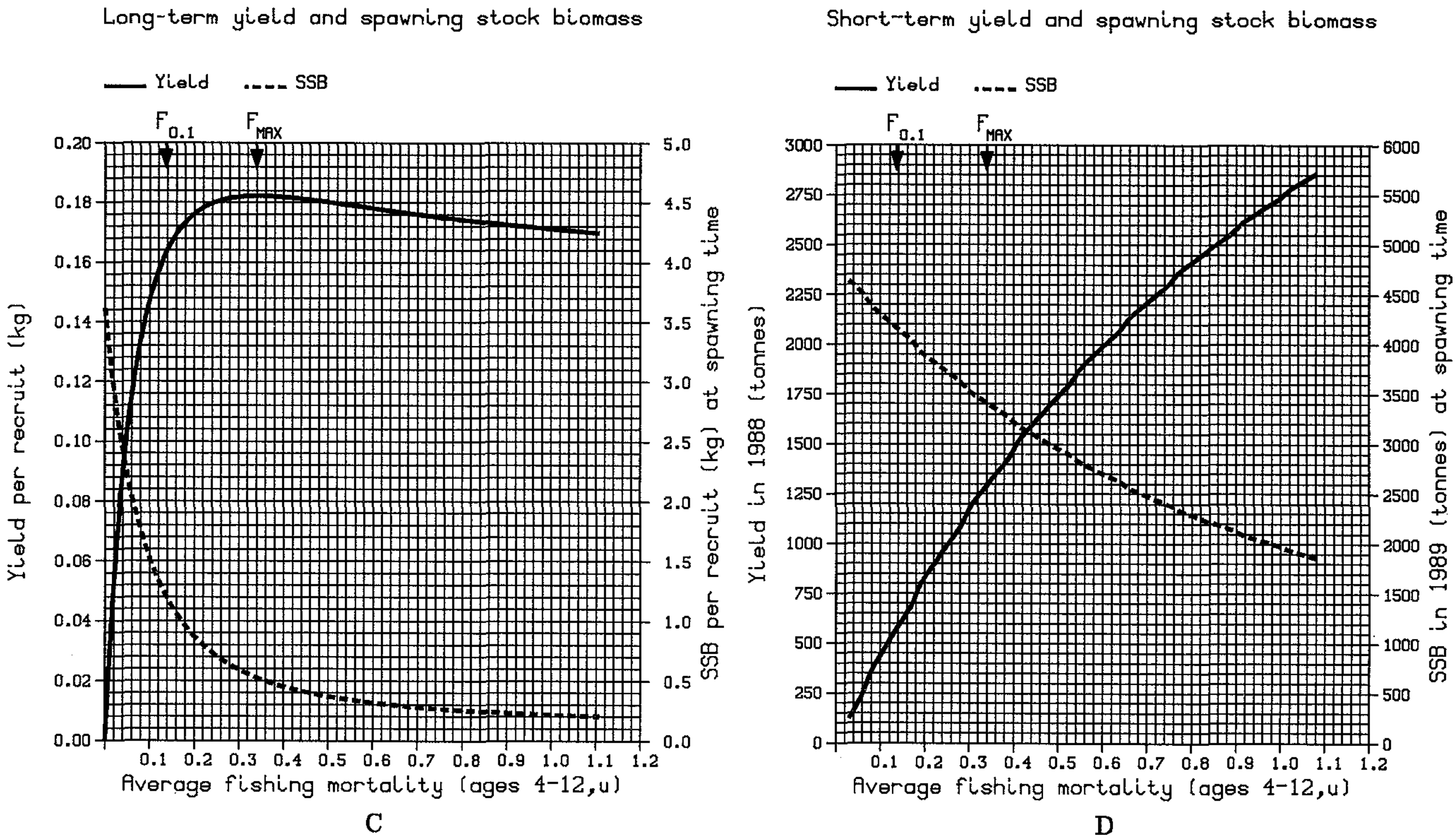
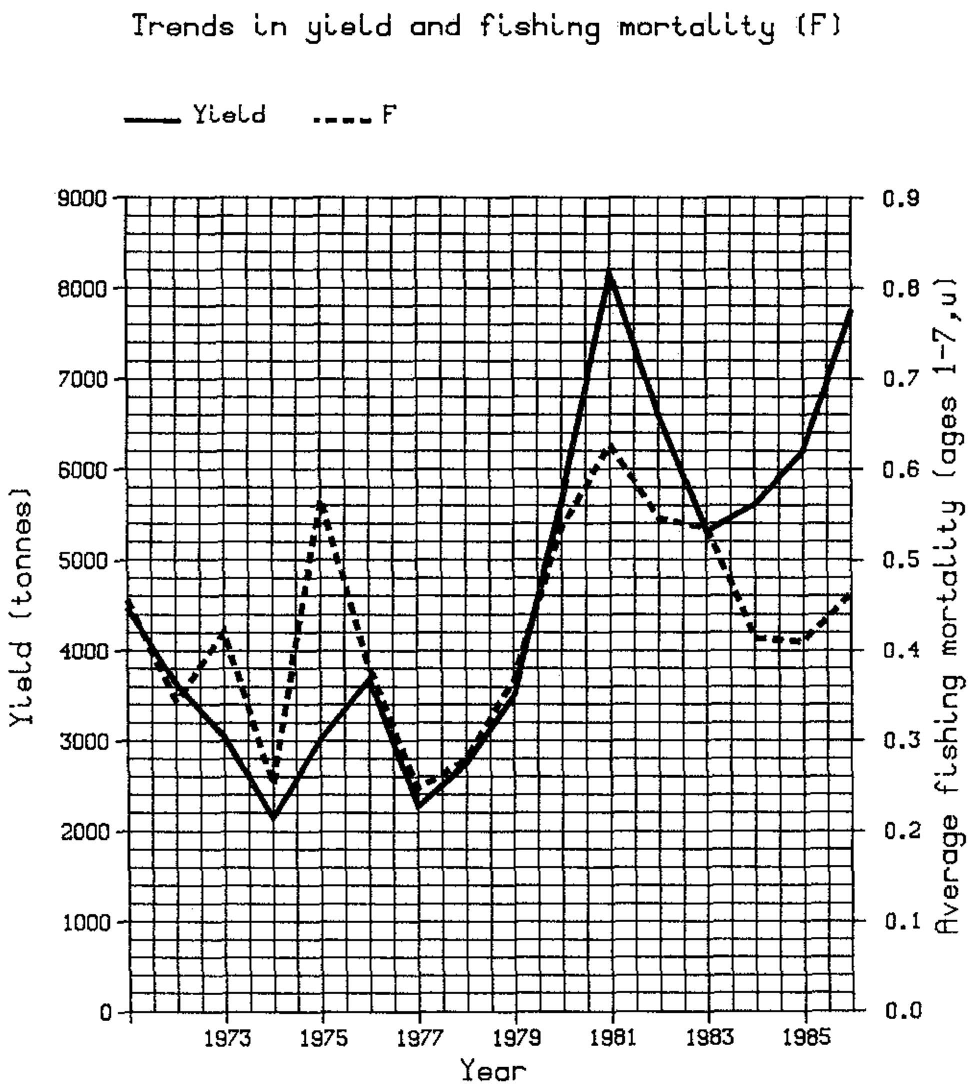
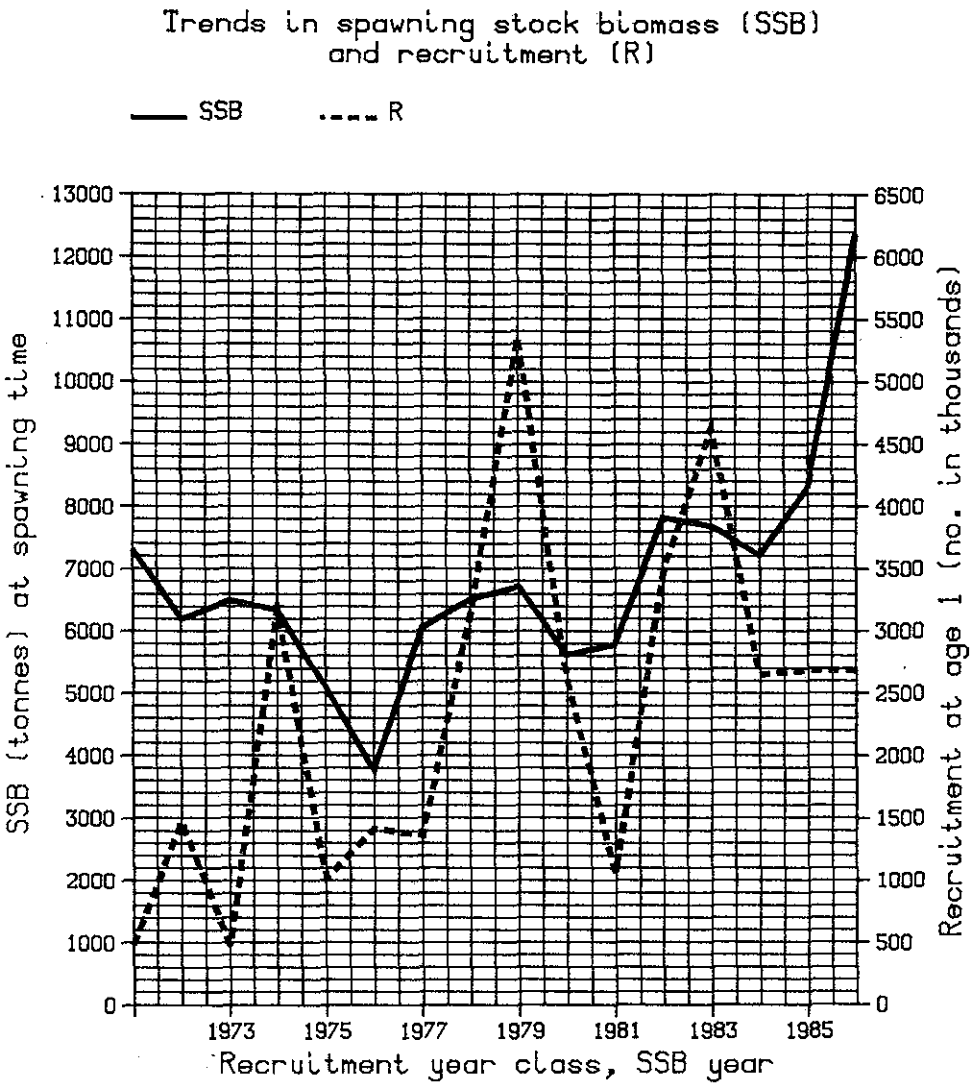


Figure 3.6.5

FISH STOCK SUMMARY
STOCK: Celtic Sea Cod
13-03-1987



A

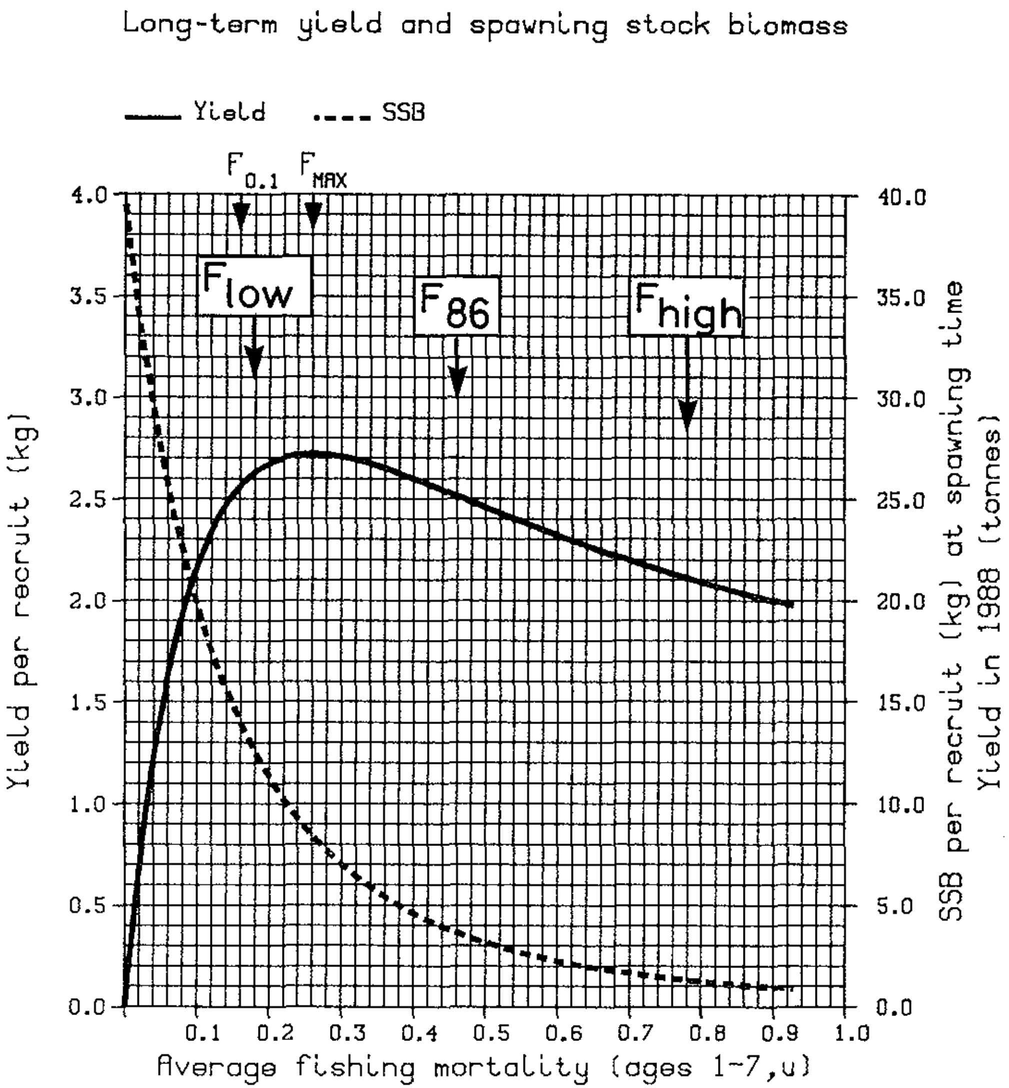


B

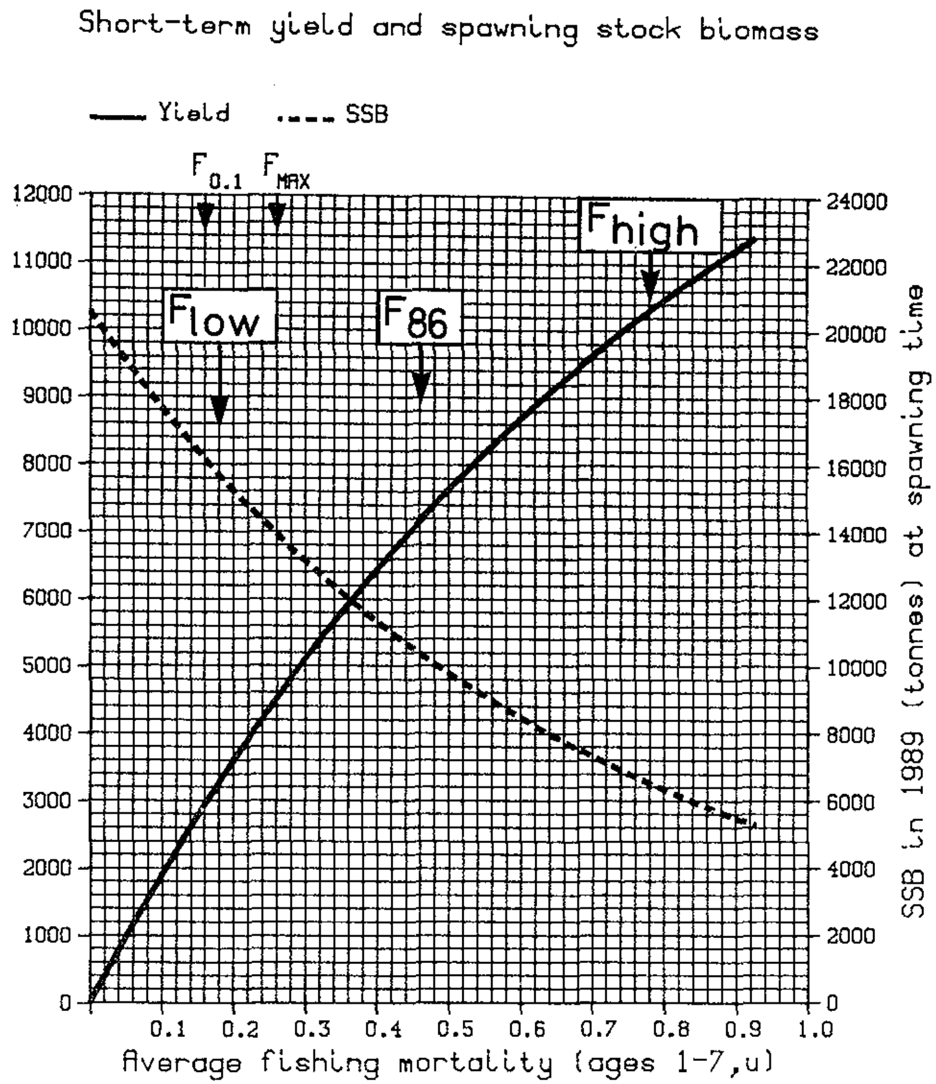
cont'd.

Figure 3.6.5 (cont'd)

FISH STOCK SUMMARY
STOCK: Celtic Sea Cod
13–03–1987



C

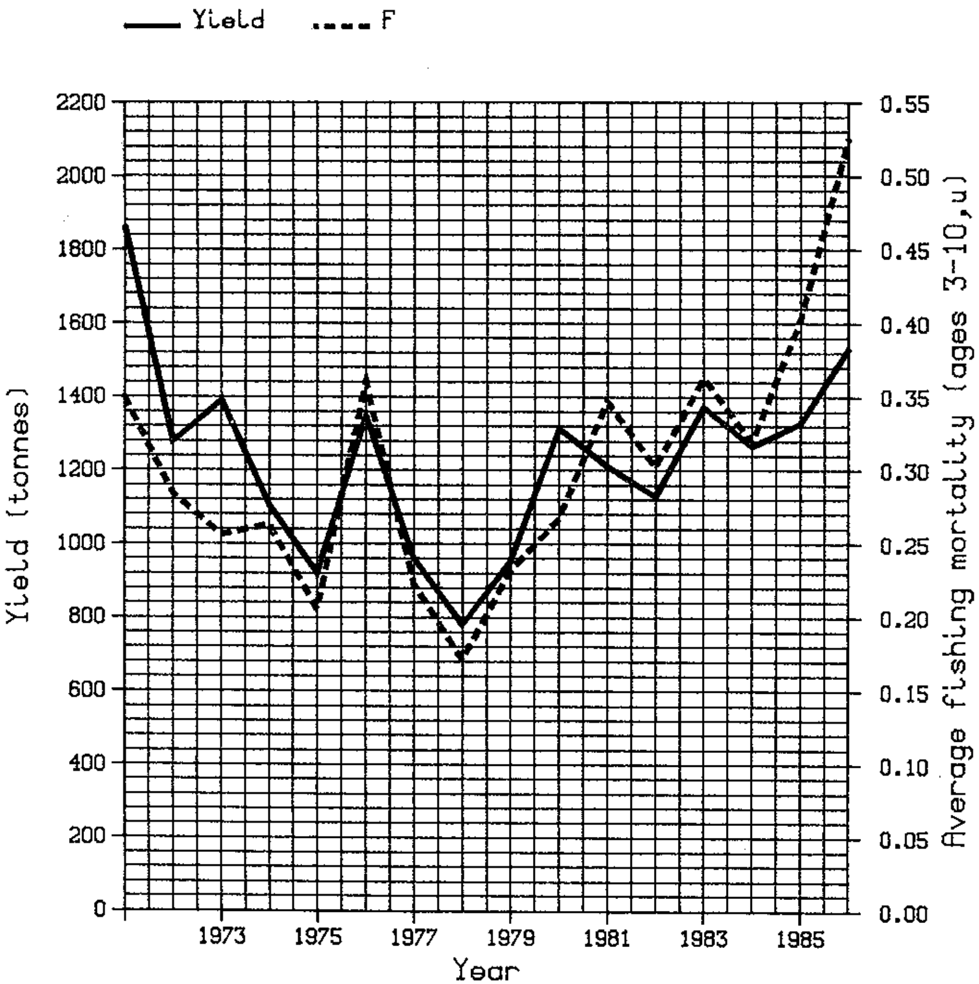


D

Figure 3.6.8

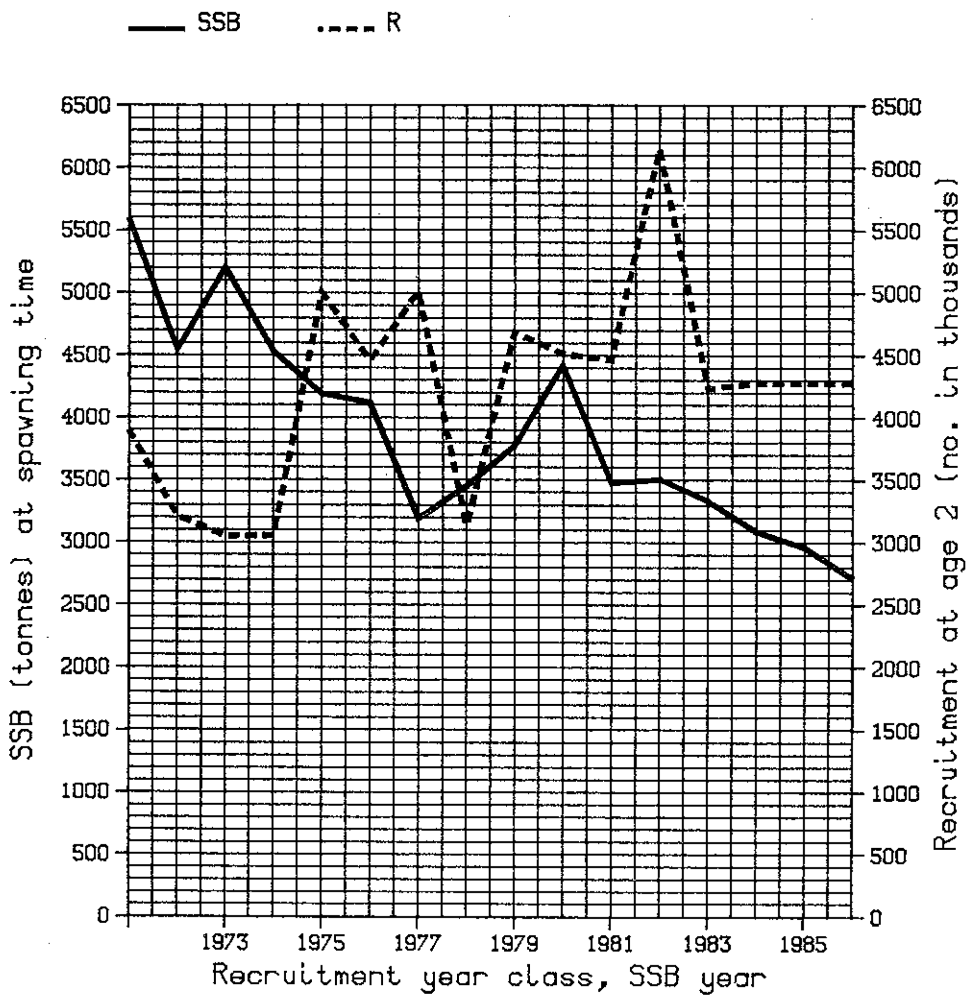
FISH STOCK SUMMARY
STOCK: Celtic Sea Sole (M/F), (VIIF and VIIG)
13-03-1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



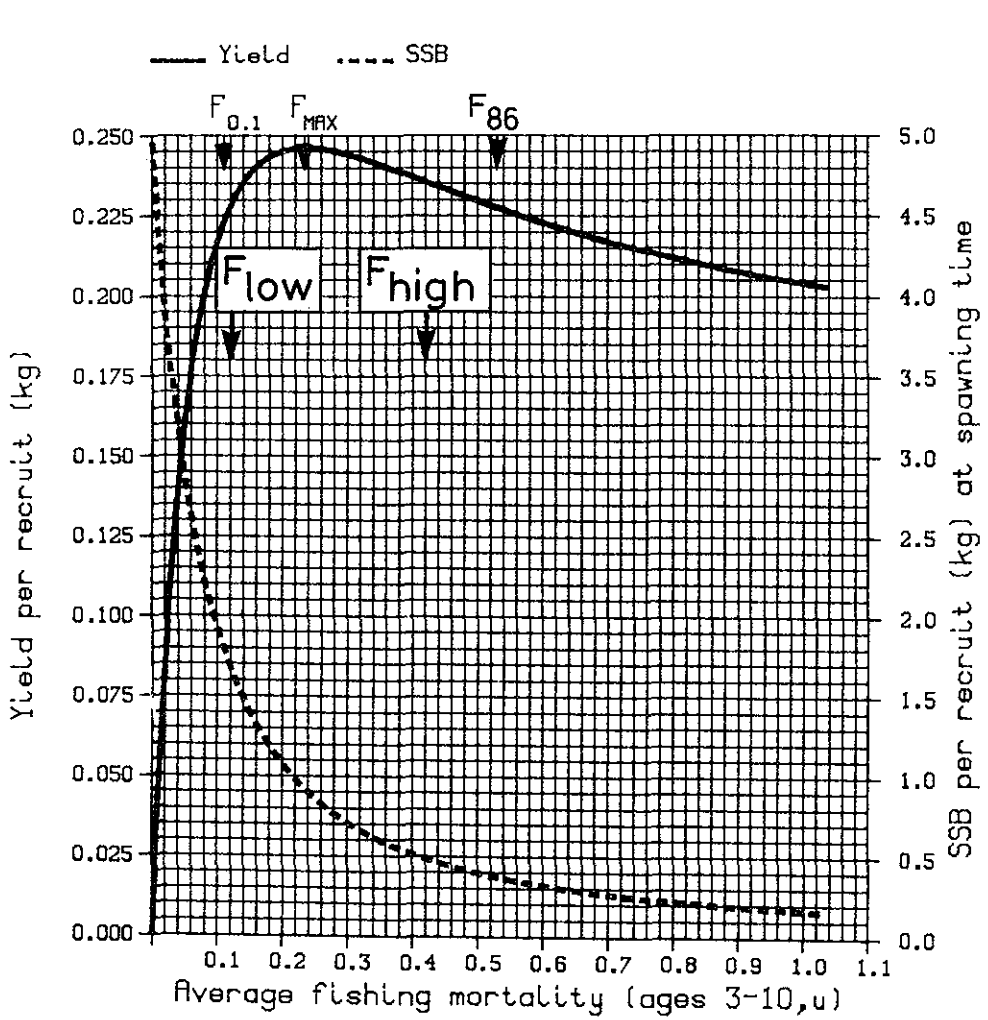
B

cont'd.

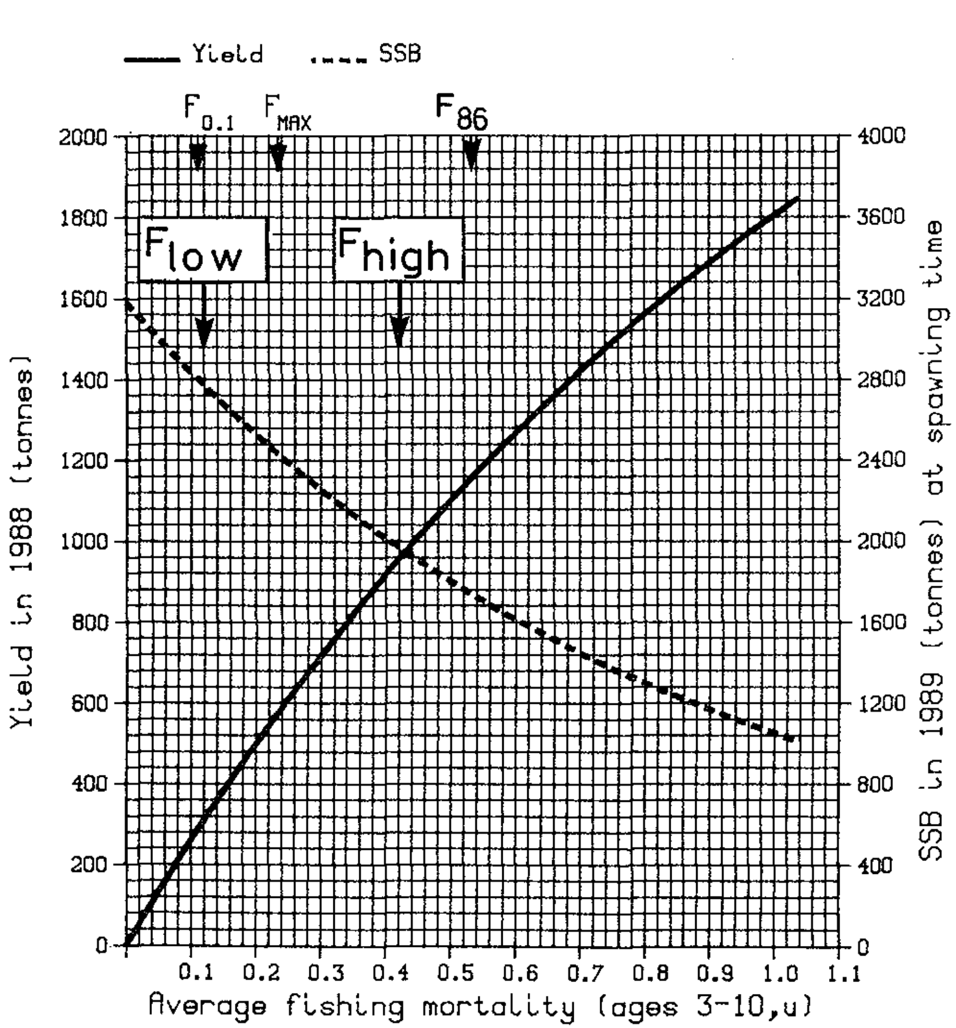
FISH STOCK SUMMARY

Figure 3.6.8 (cont'd) STOCK: Celtic Sea Sole (M/F), (VIIF and VIIG)

13–03–1987



C



D

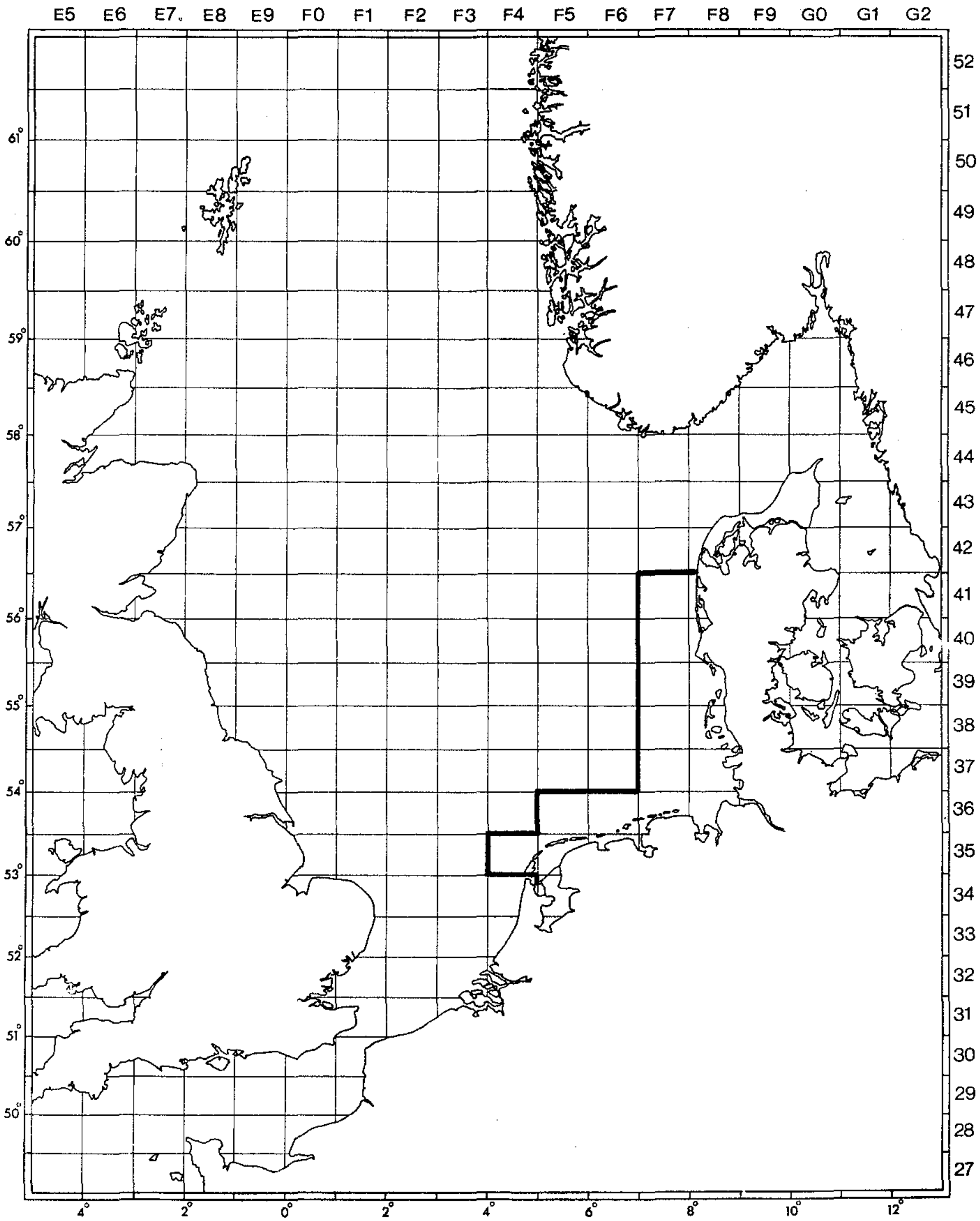


Figure 3.7.2 The plaice box in the second and third quarters.

Figure 3.7.3 The boundaries of 1) the original "plaice box" proposed by the ad hoc Working Group (Anon., 1987b), 2) the modified "plaice box", and 3) the "cod box"

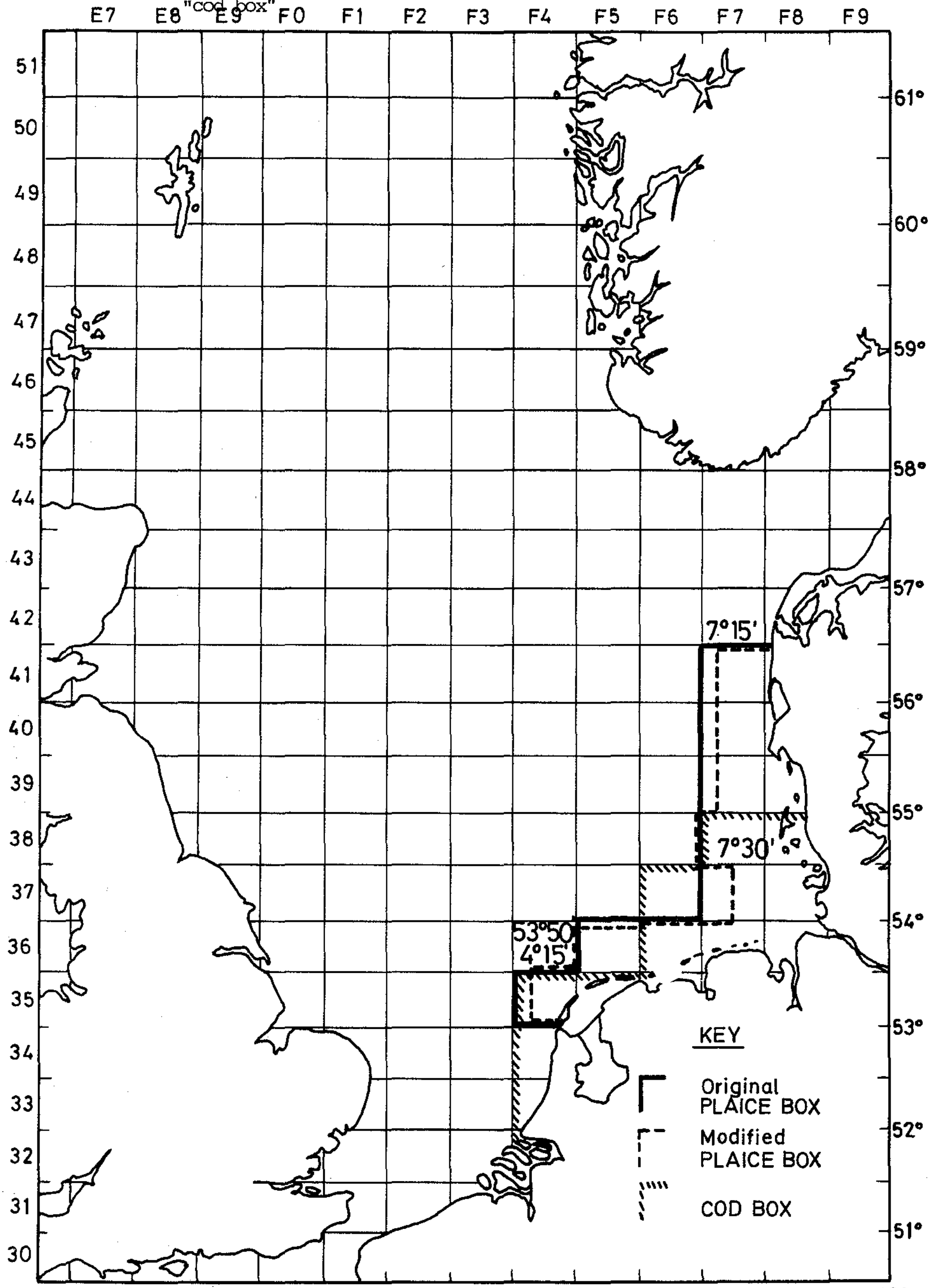
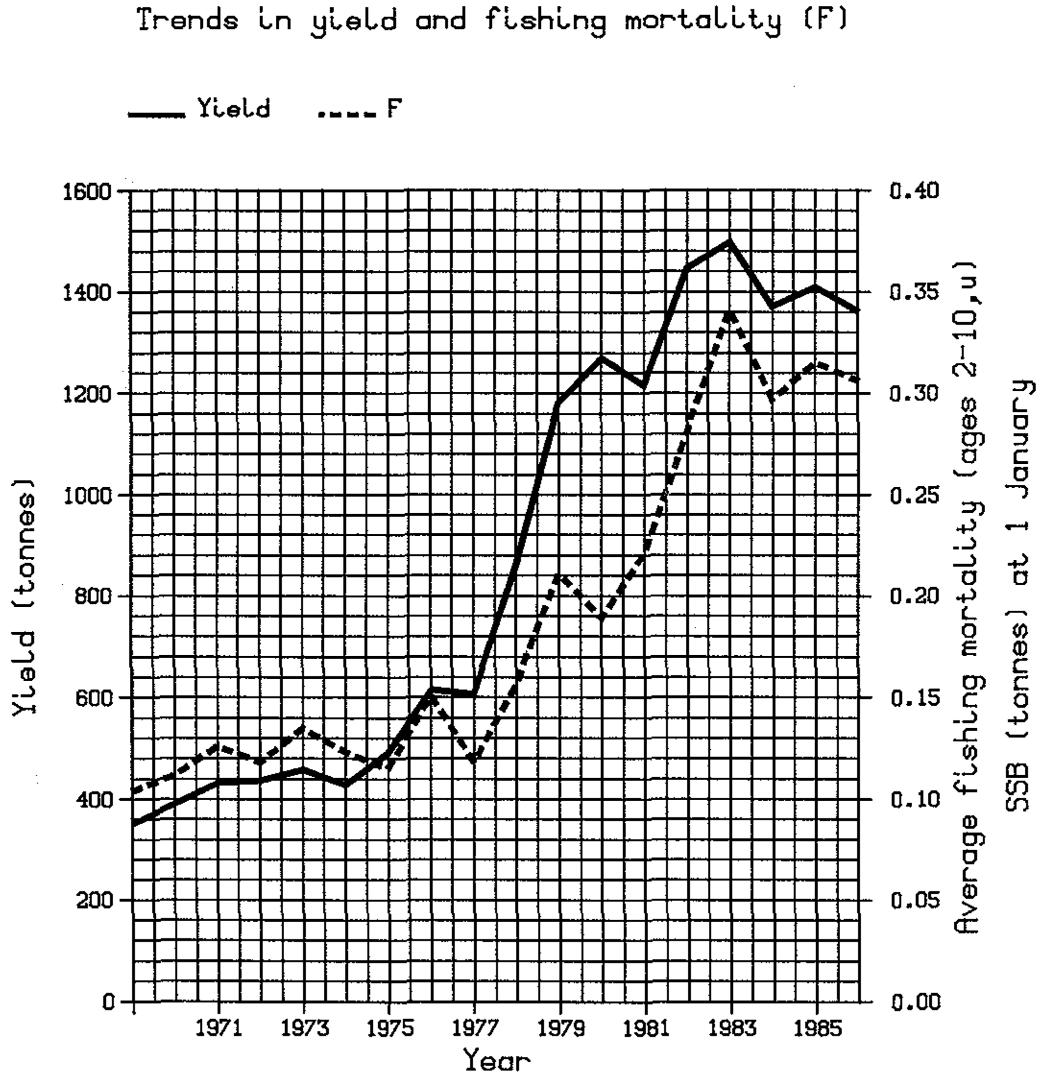
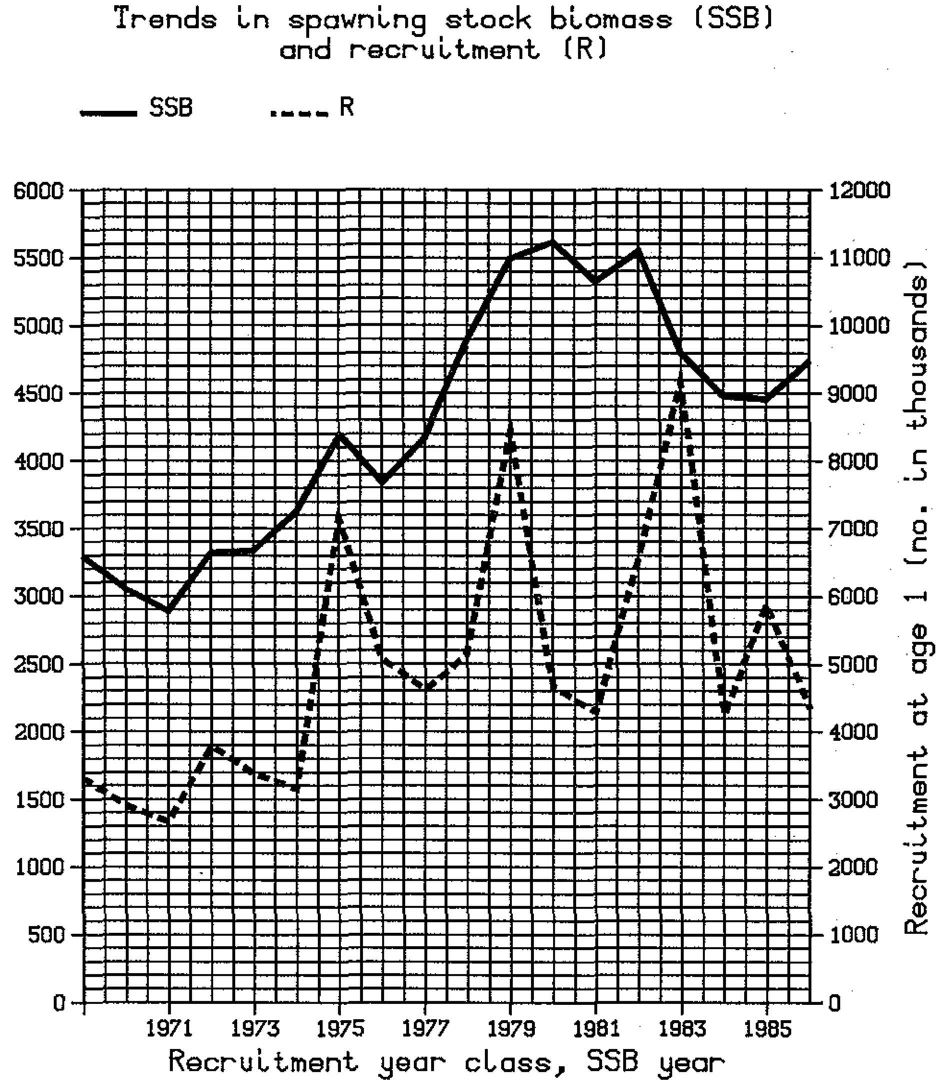


Figure 3.7.5

FISH STOCK SUMMARY
STOCK: Sole in Area VII E
26–10–1987



A

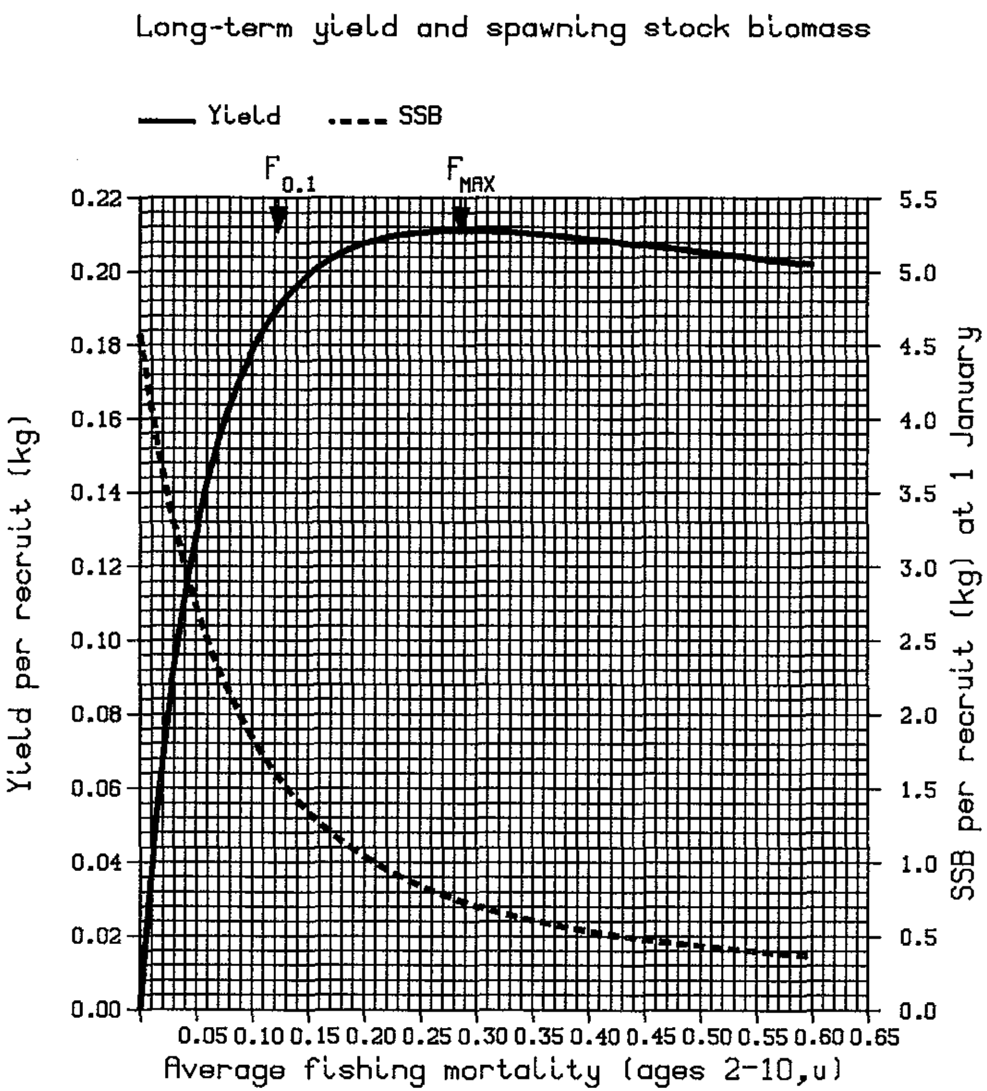


B

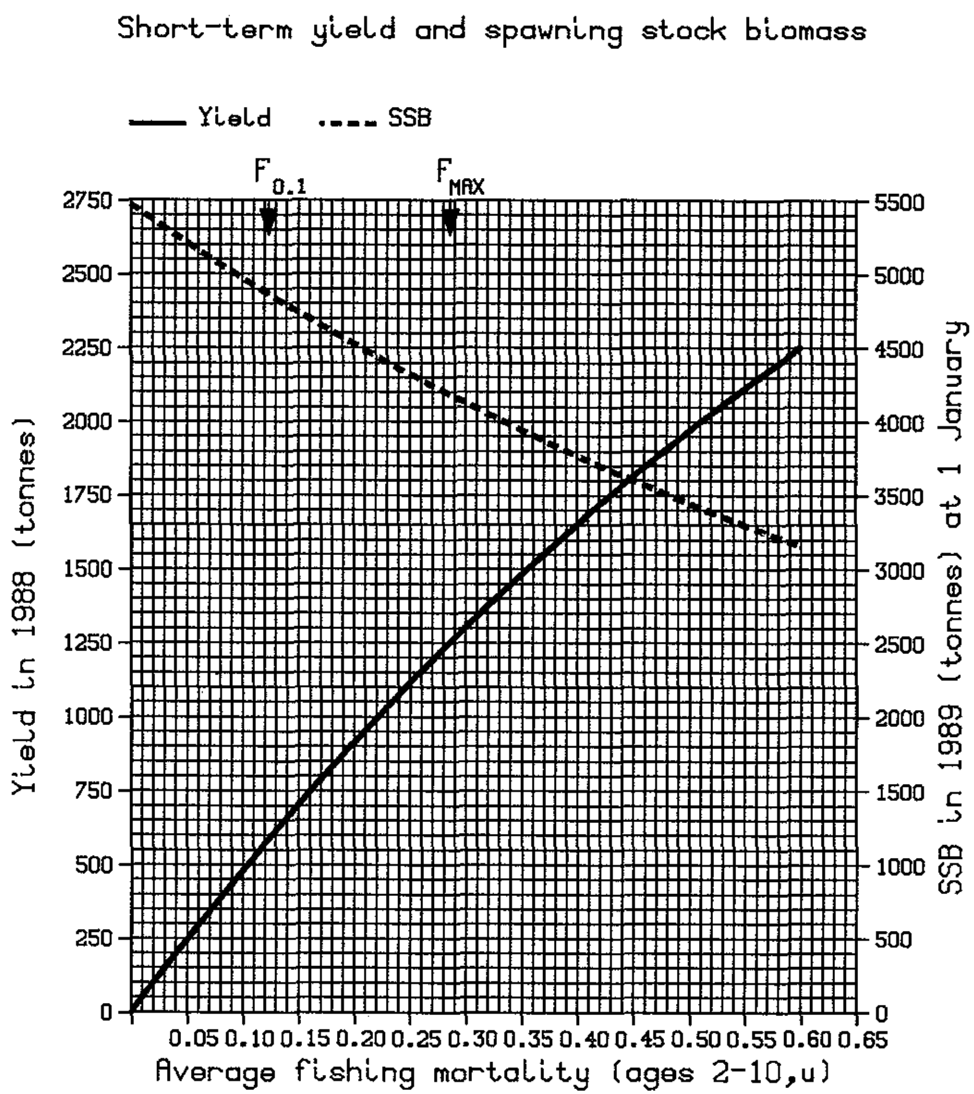
ctd.

Figure 3.7.5 (cont'd)

FISH STOCK SUMMARY
STOCK: Sole in Area VII E
26–10–1987



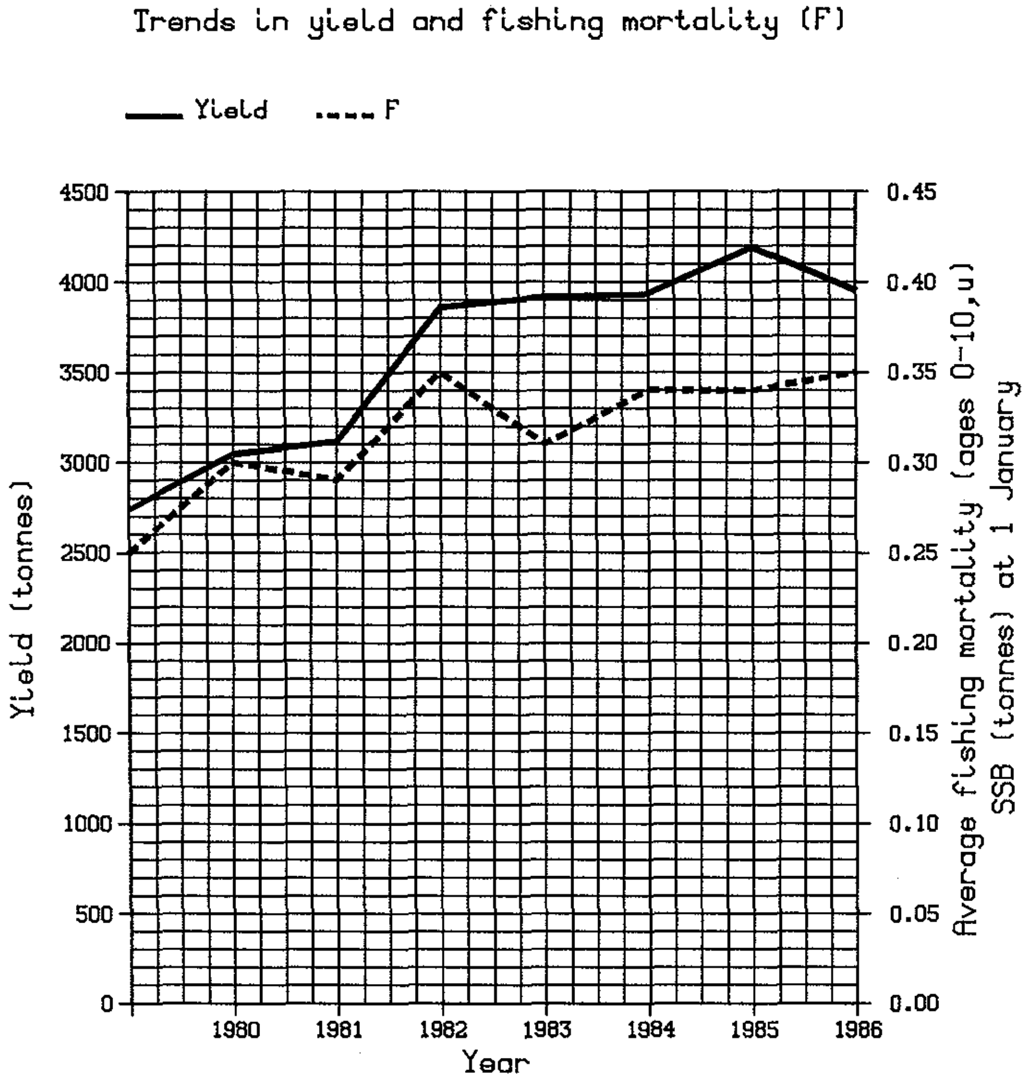
C



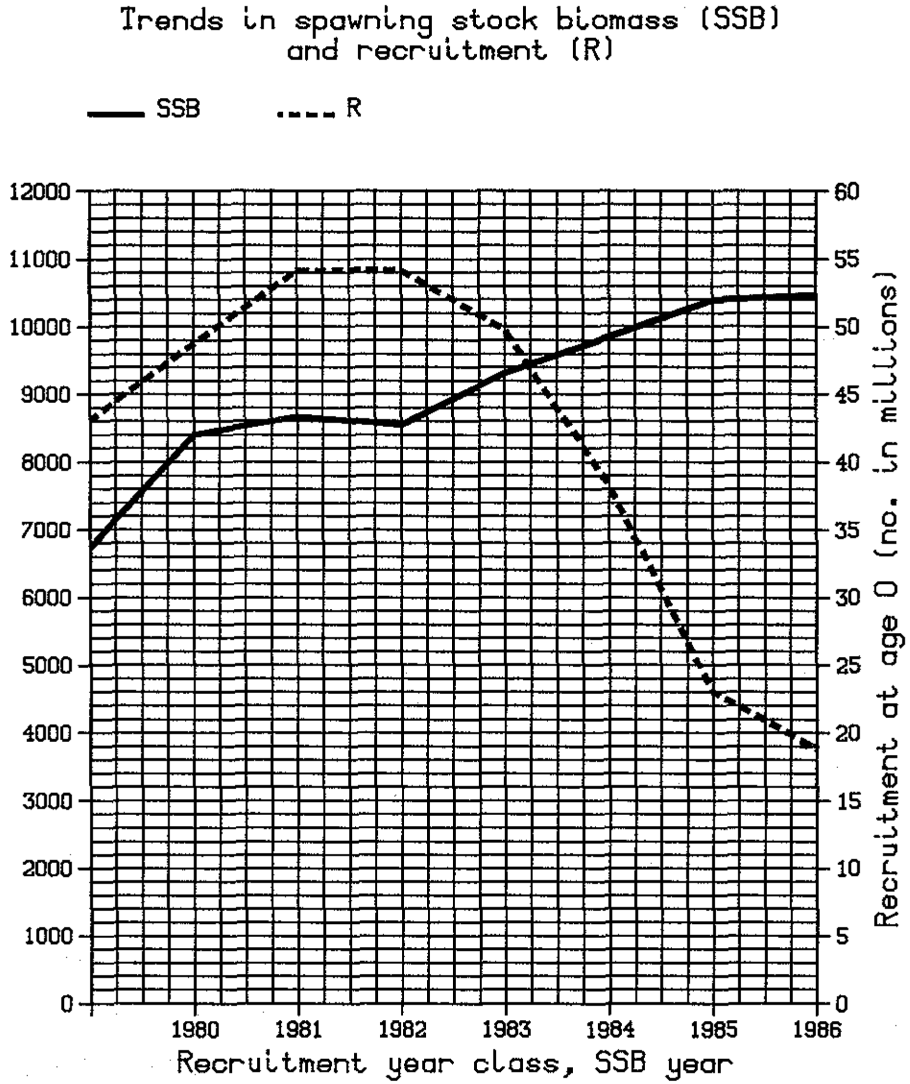
D

Figure 3.7.7.

FISH STOCK SUMMARY
STOCK: Bay of Biscay Sole
26–10–1987



A



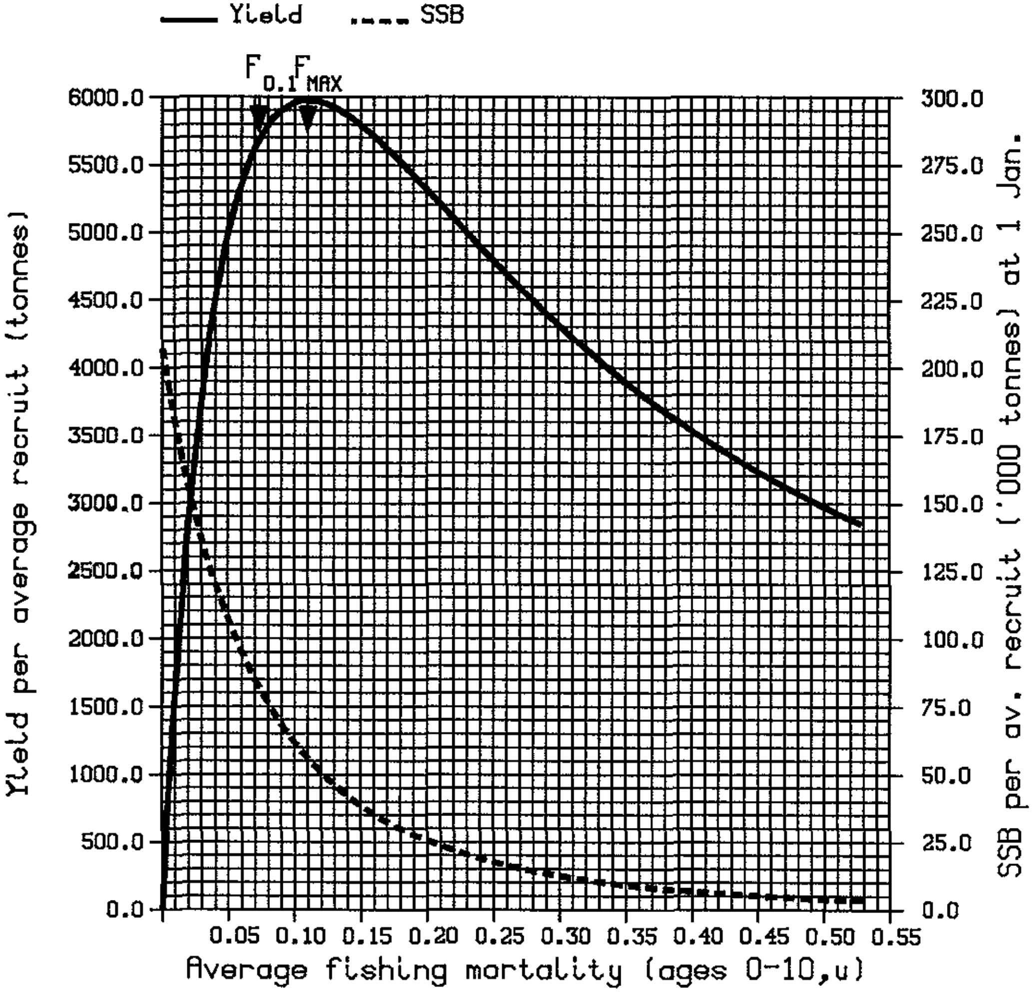
B

ctd.

Figure 3.7.7 (cont'd)

FISH STOCK SUMMARY
STOCK: Bay of Biscay Sole
26-10-1987

Long-term yield and spawning stock biomass



C

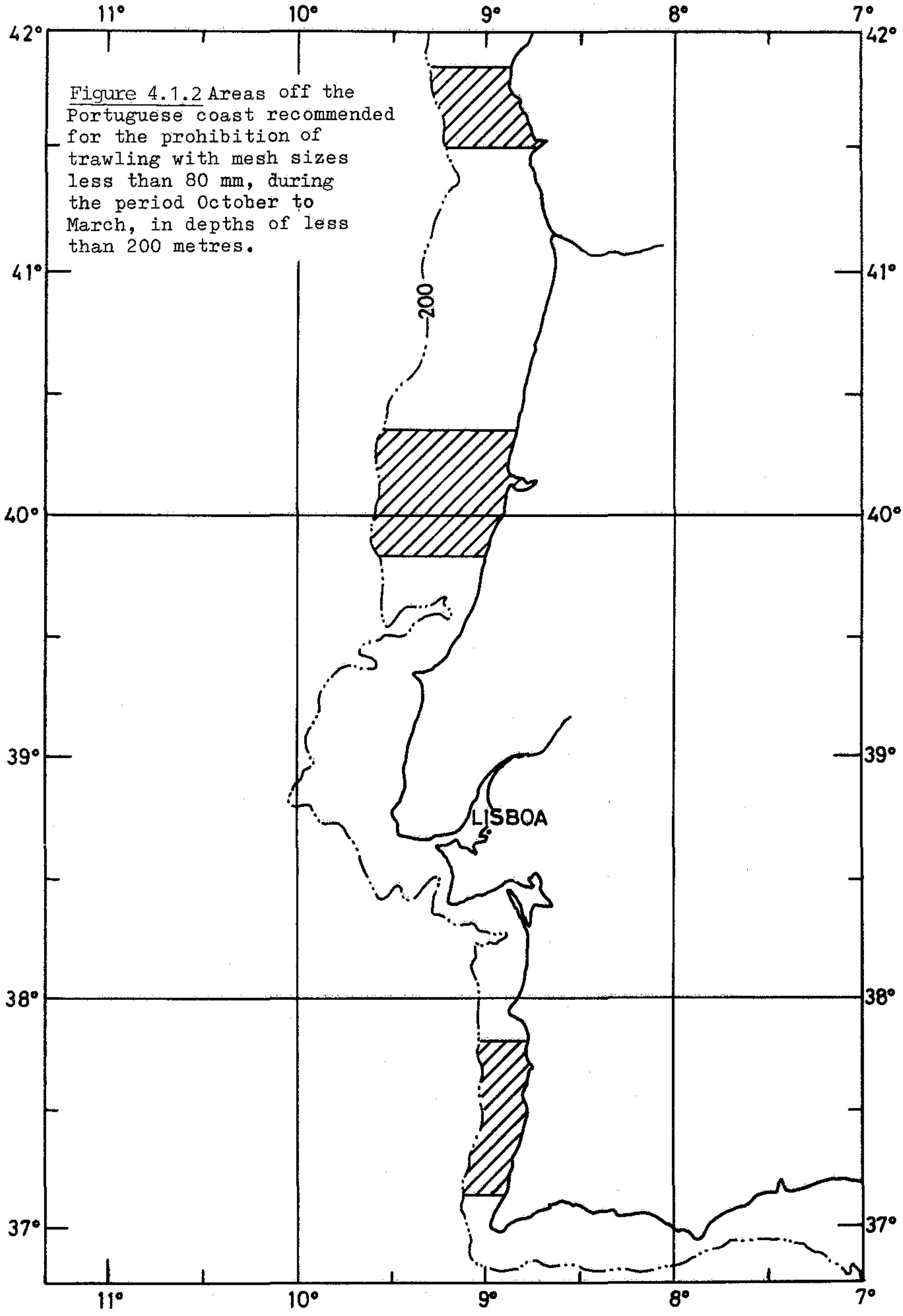


Figure 4.1.2 Areas off the Portuguese coast recommended for the prohibition of trawling with mesh sizes less than 80 mm, during the period October to March, in depths of less than 200 metres.

Figure 4.3.1 Distribution of stage I horse mackerel eggs during the peak of production in a) 1977, b) 1980, c) 1983 and d) 1986.

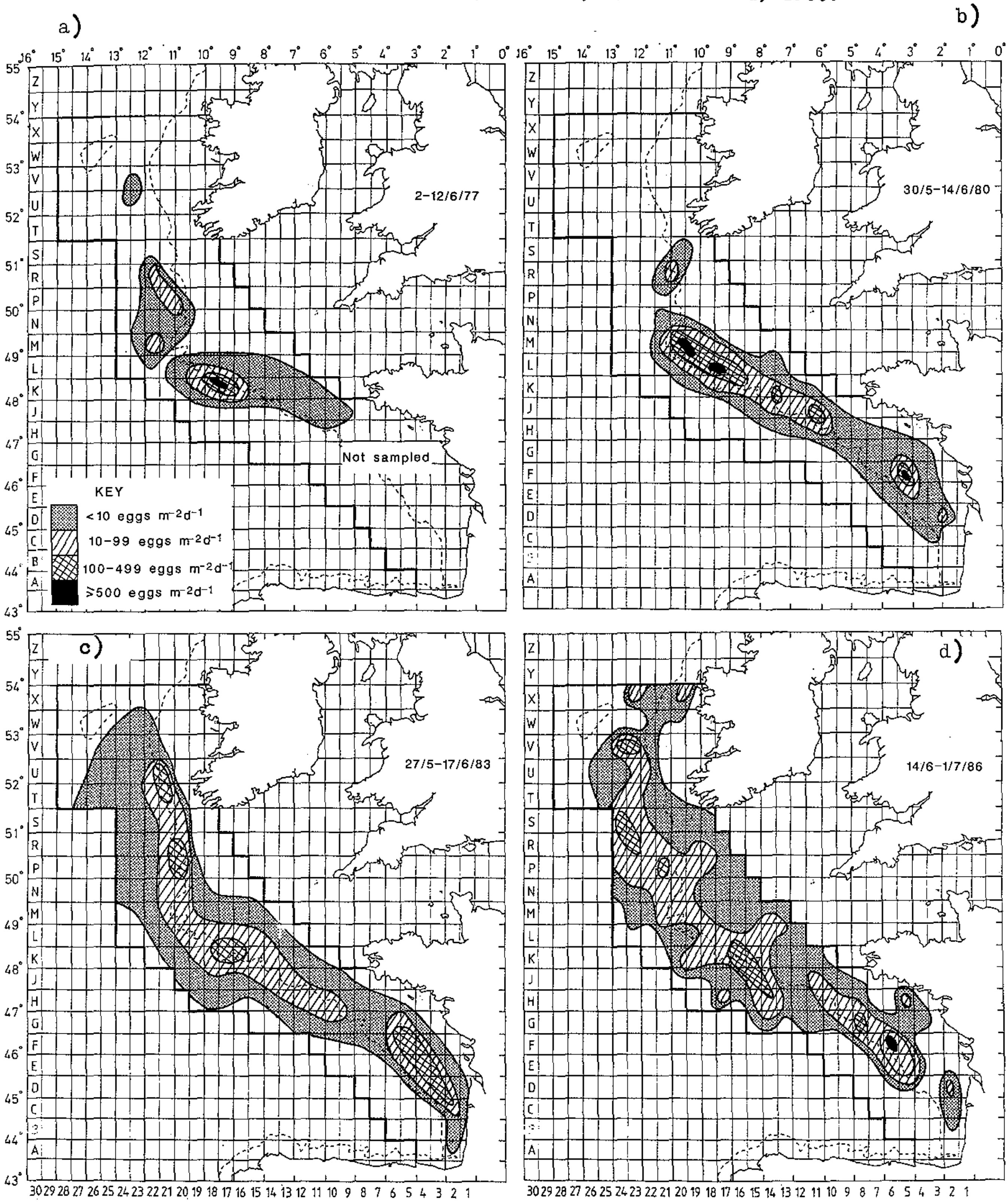
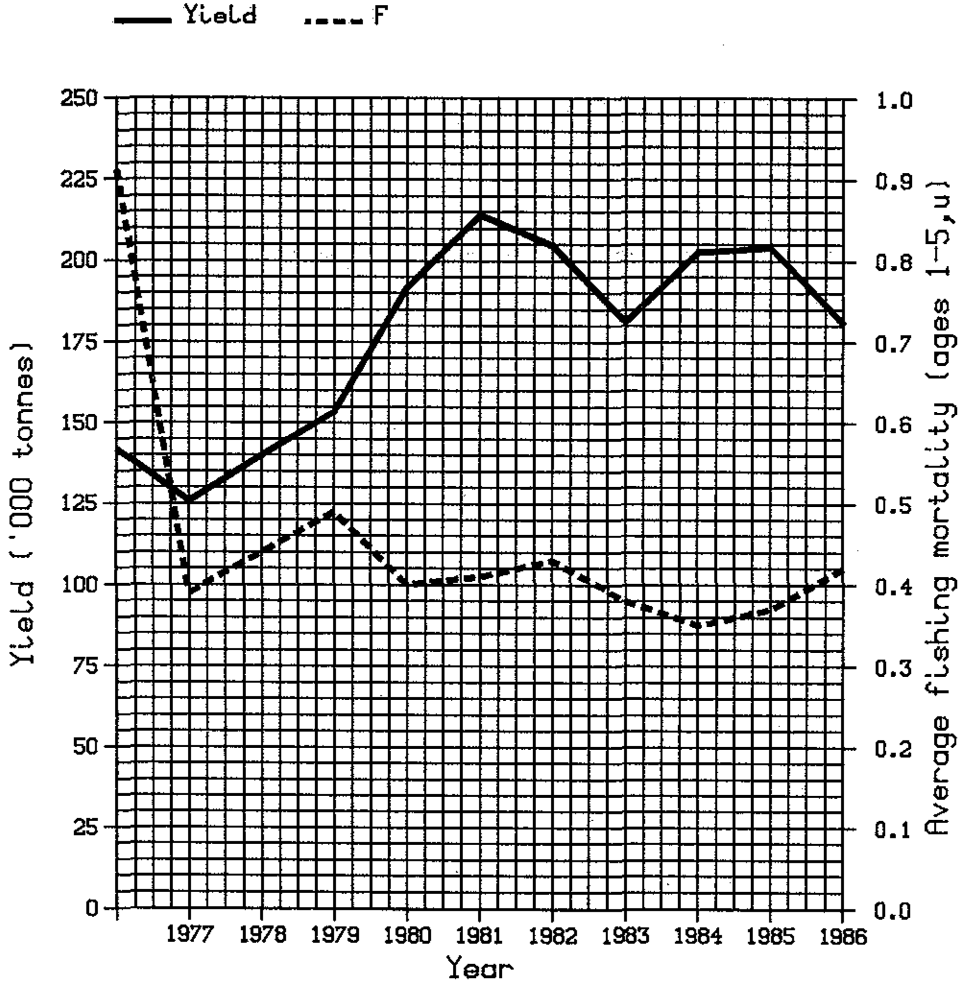


Figure 5.1

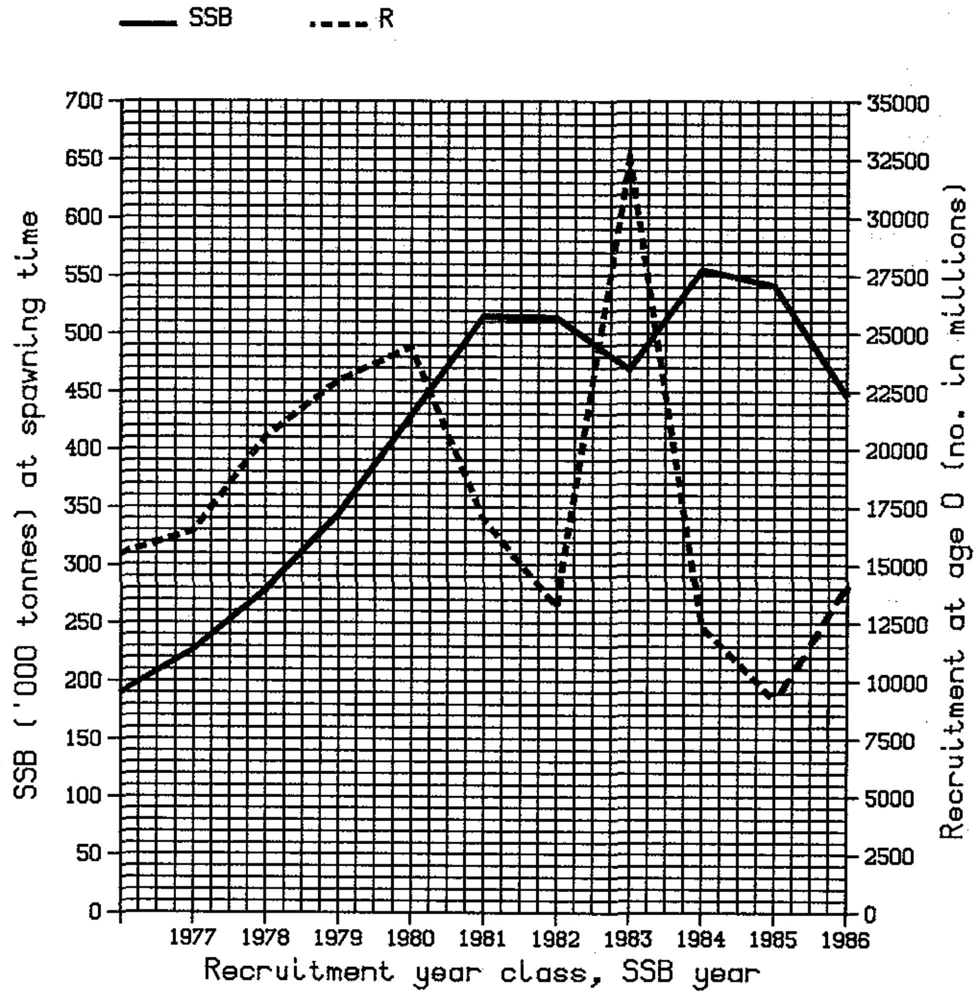
FISH STOCK SUMMARY
STOCK: Sardine – VIIIc and IXa
01–05–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)

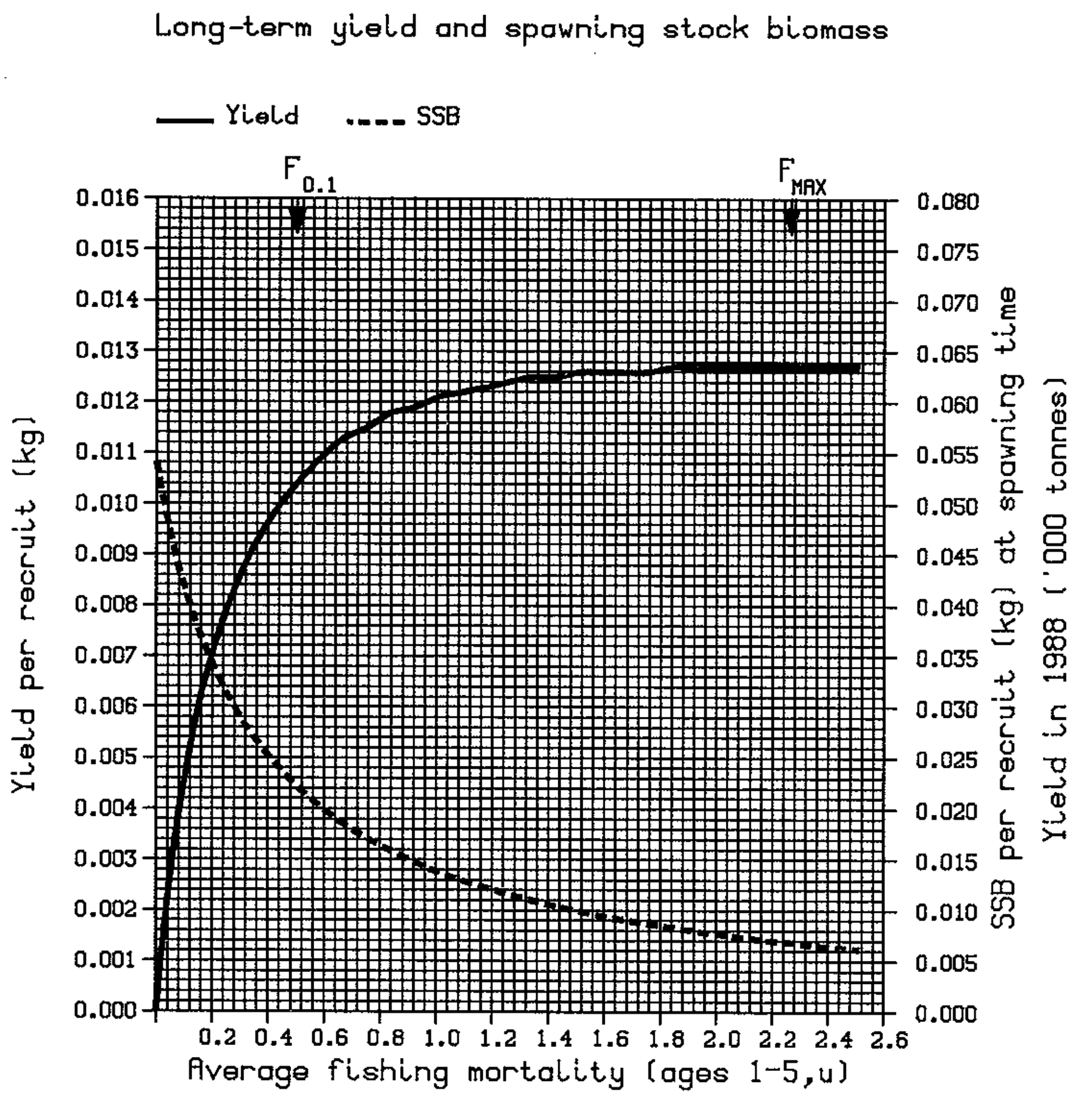


B

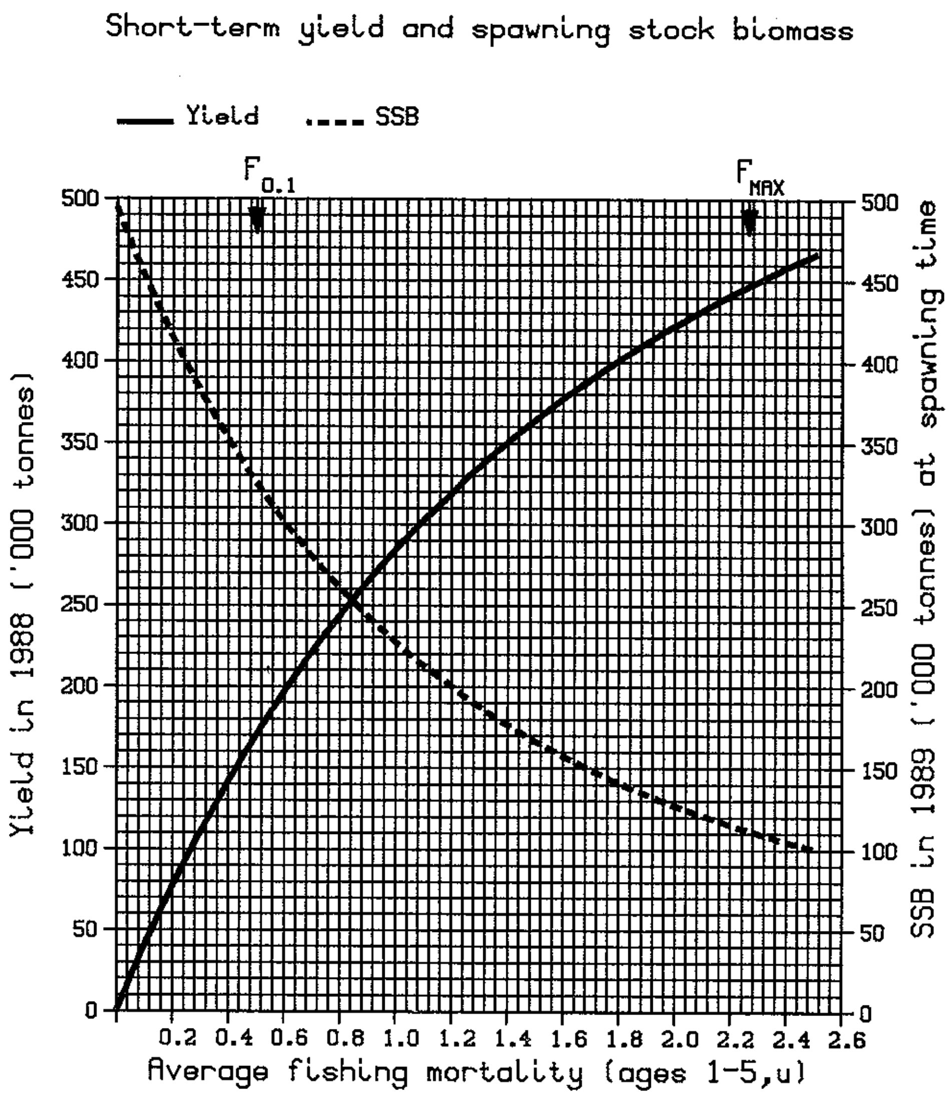
cont'd.

Figure 5.1 cont'd.

FISH STOCK SUMMARY
STOCK: Sardine – VIIIc and IXa
01–05–1987



C

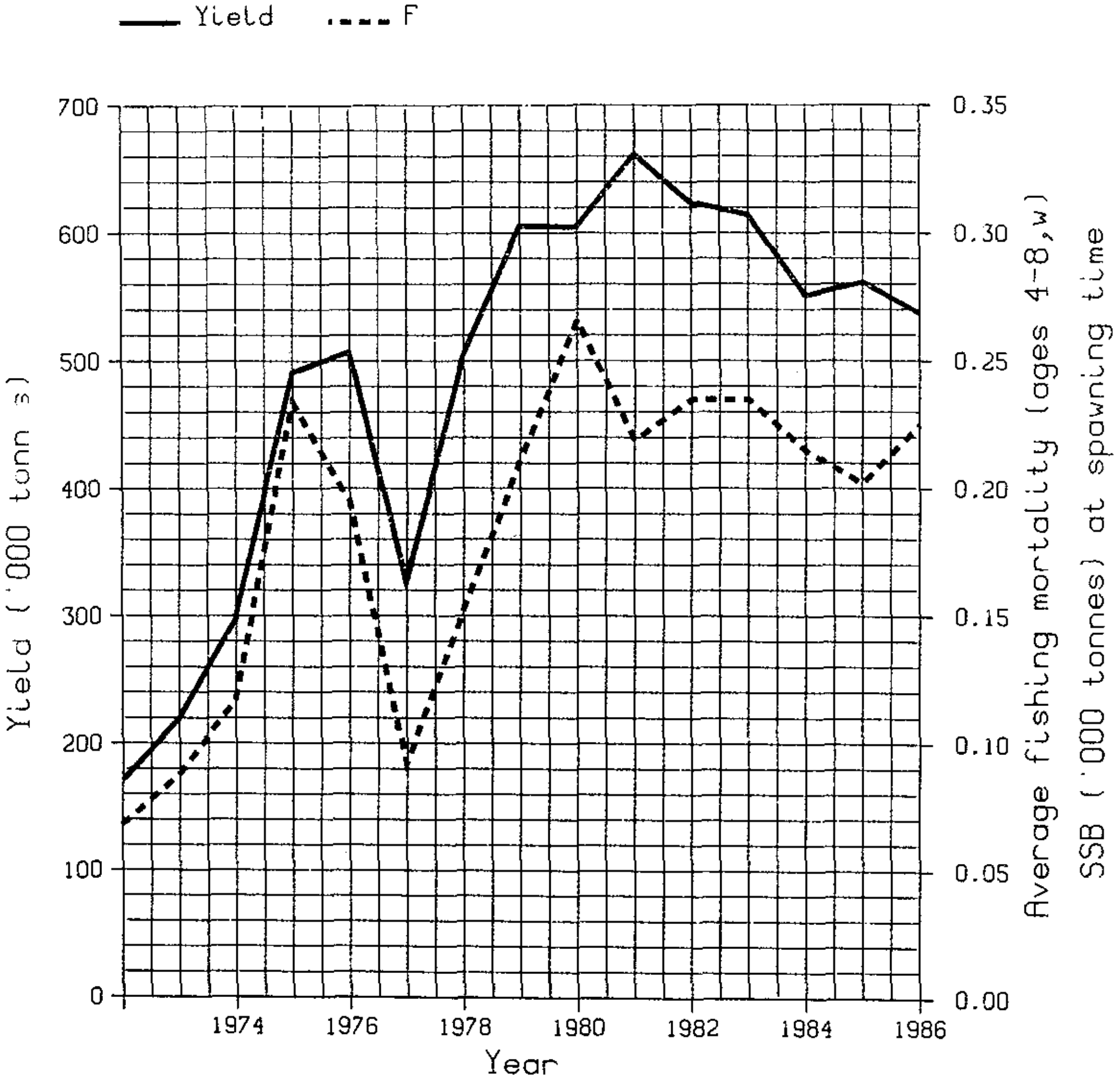


D

Figure 6.1

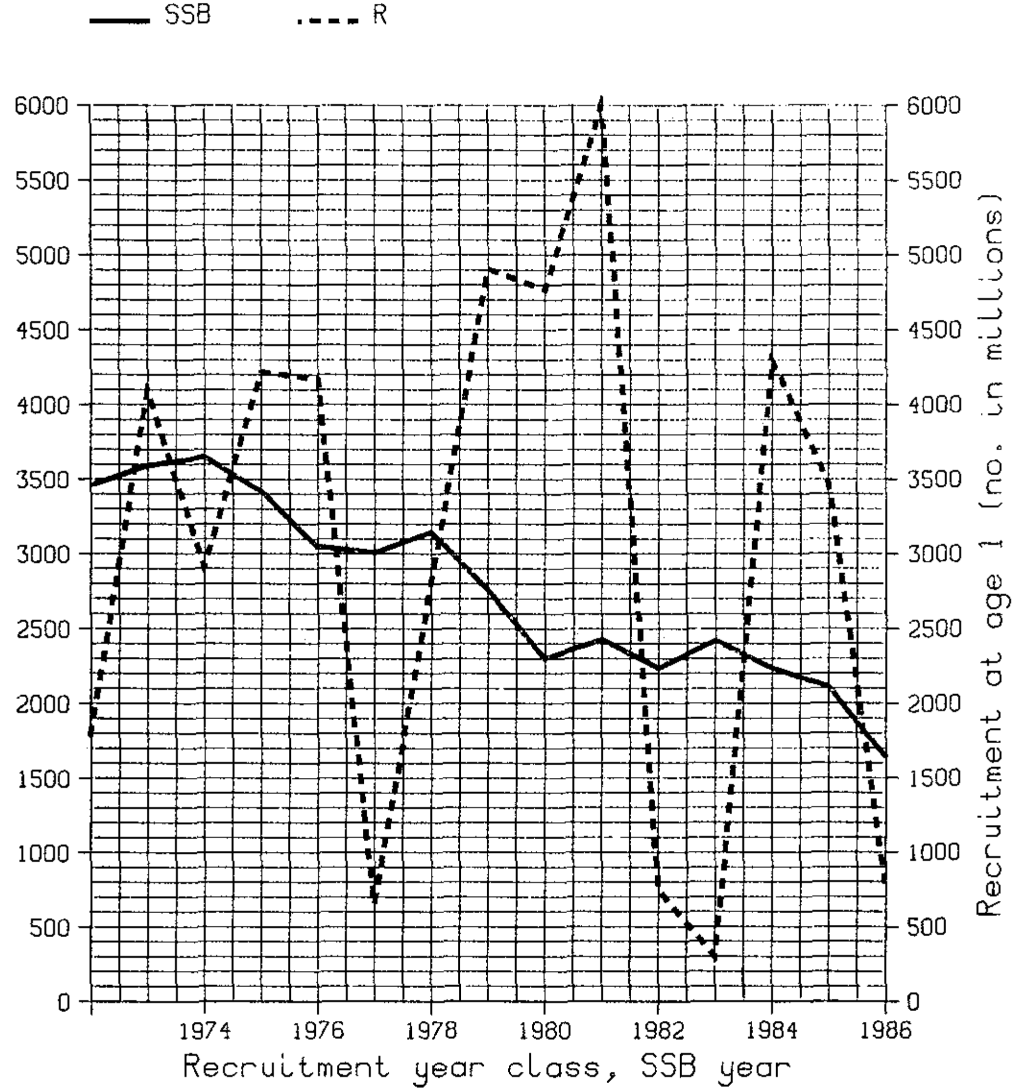
FISH STOCK SUMMARY
STOCK: Mackerel, Western Stock
02–03–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



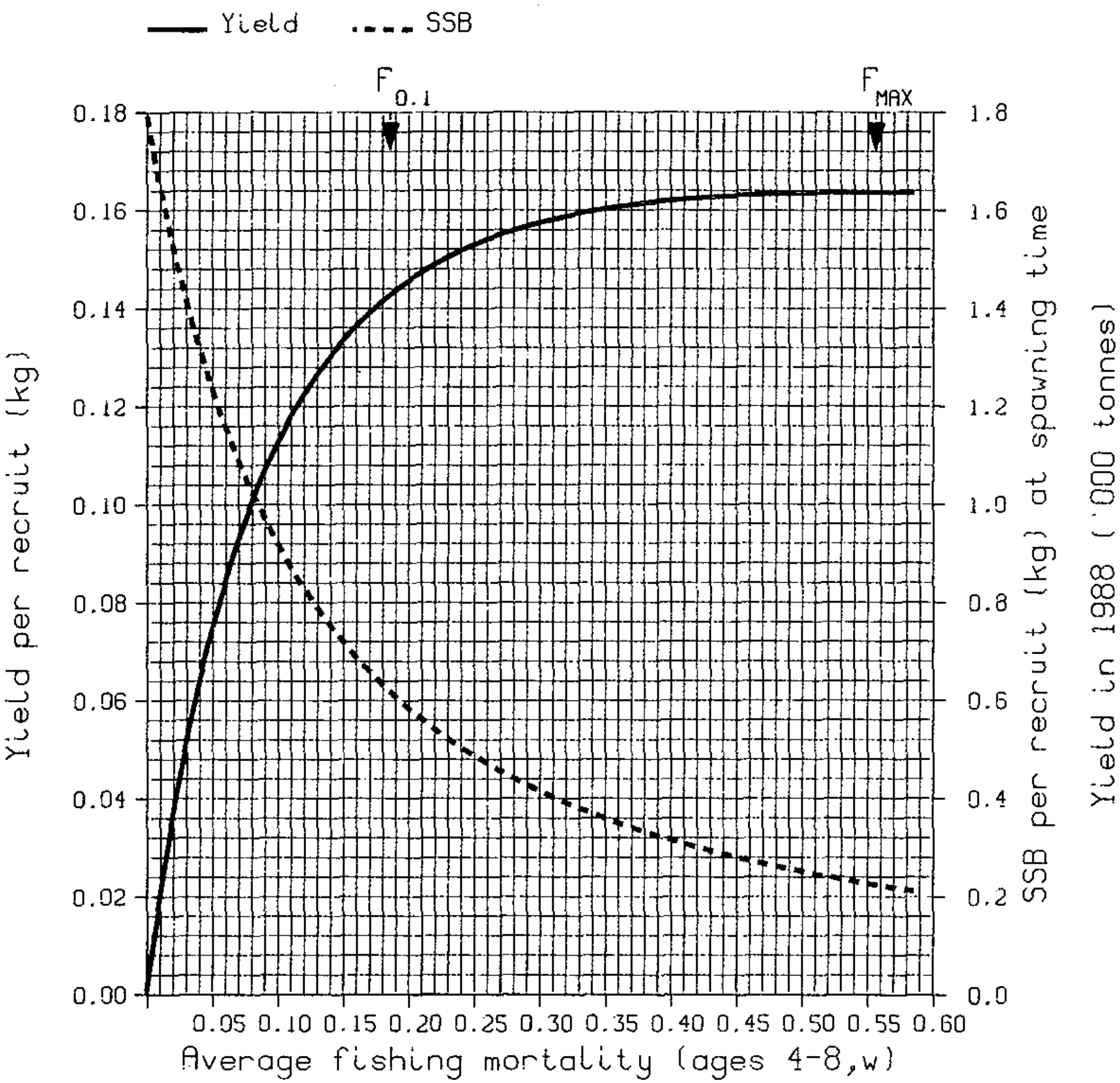
B

Figure 6.1 cont'd.

STOCK: Mackerel, Western Stock

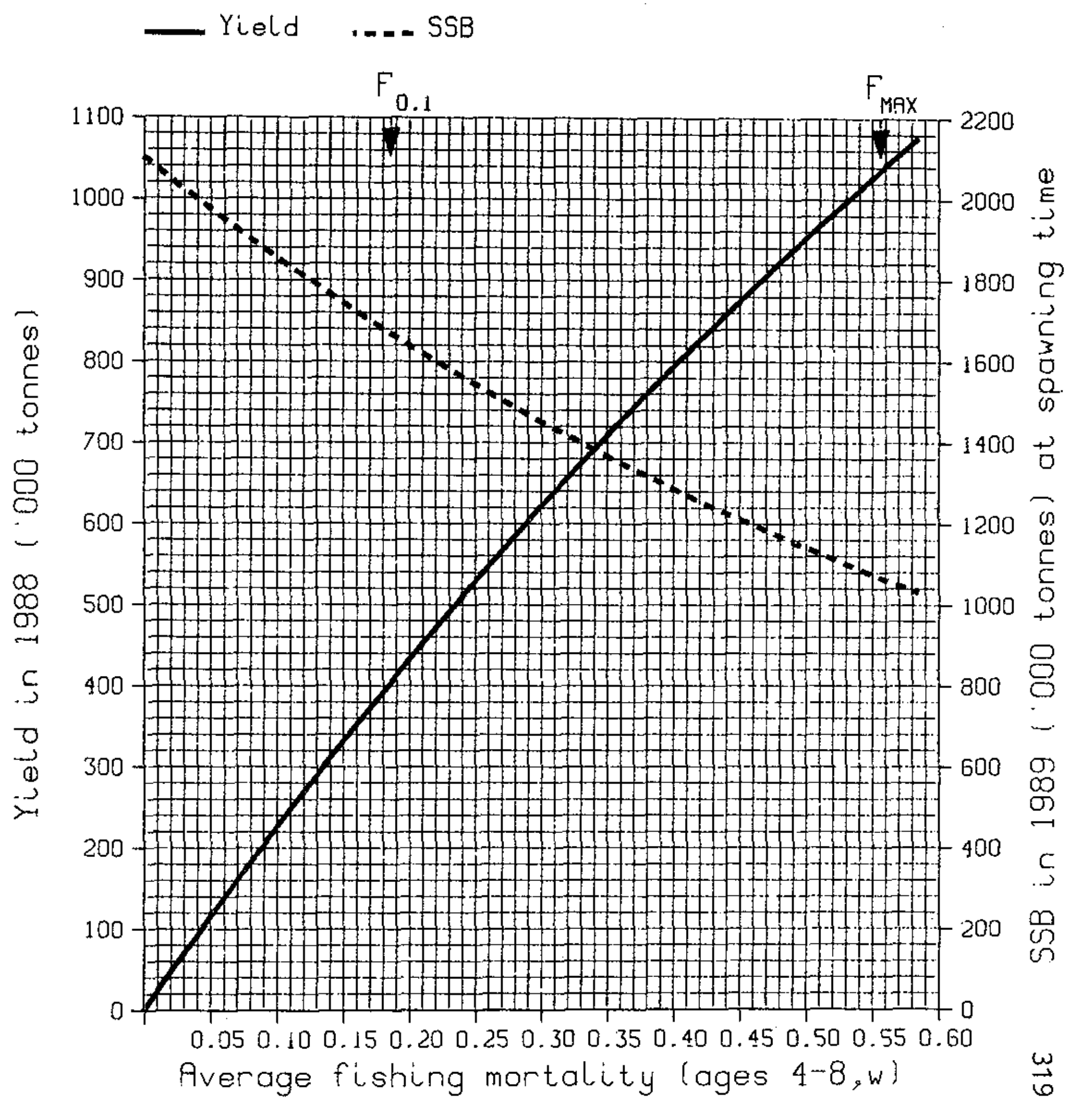
02-03-1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

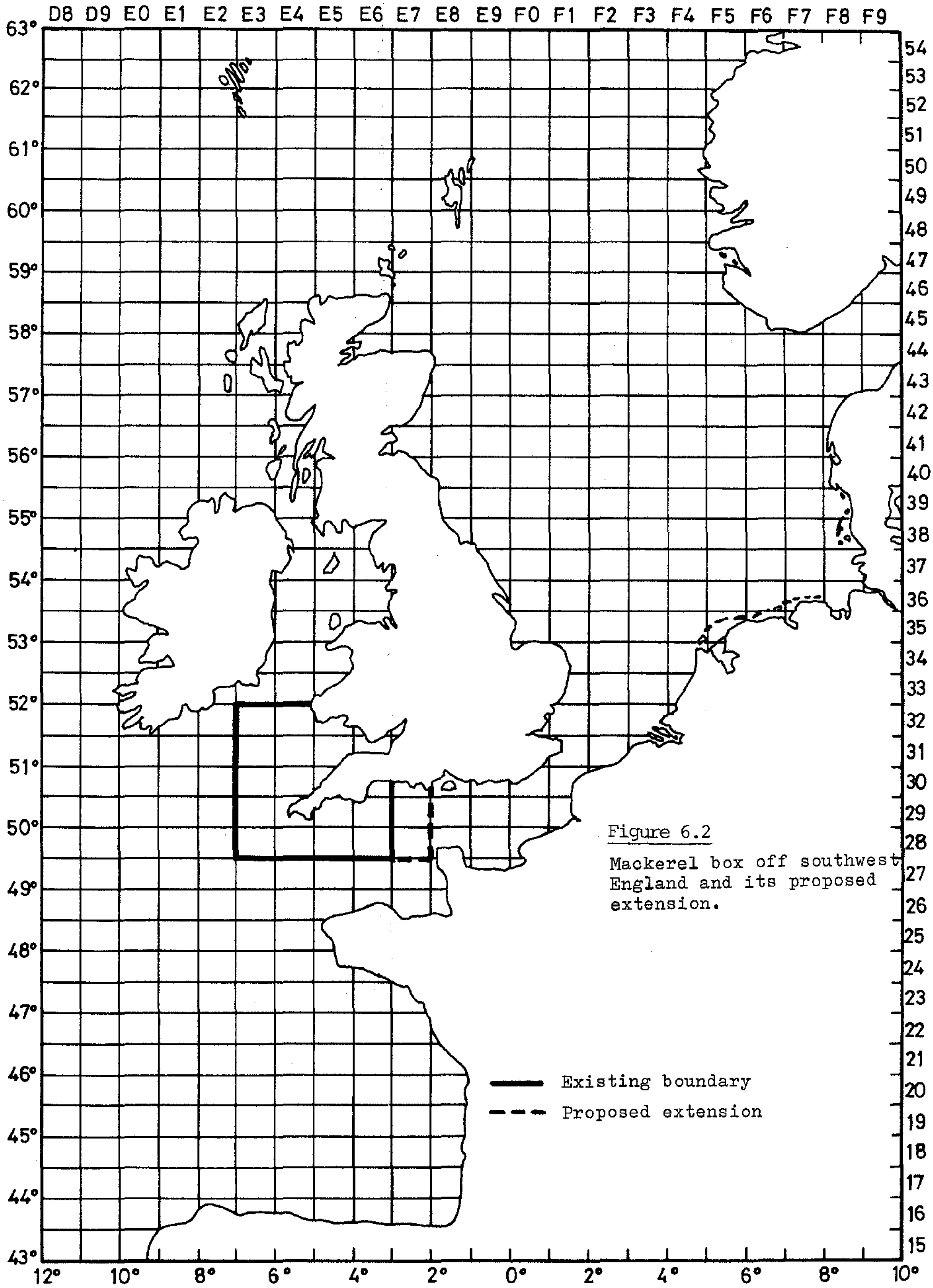
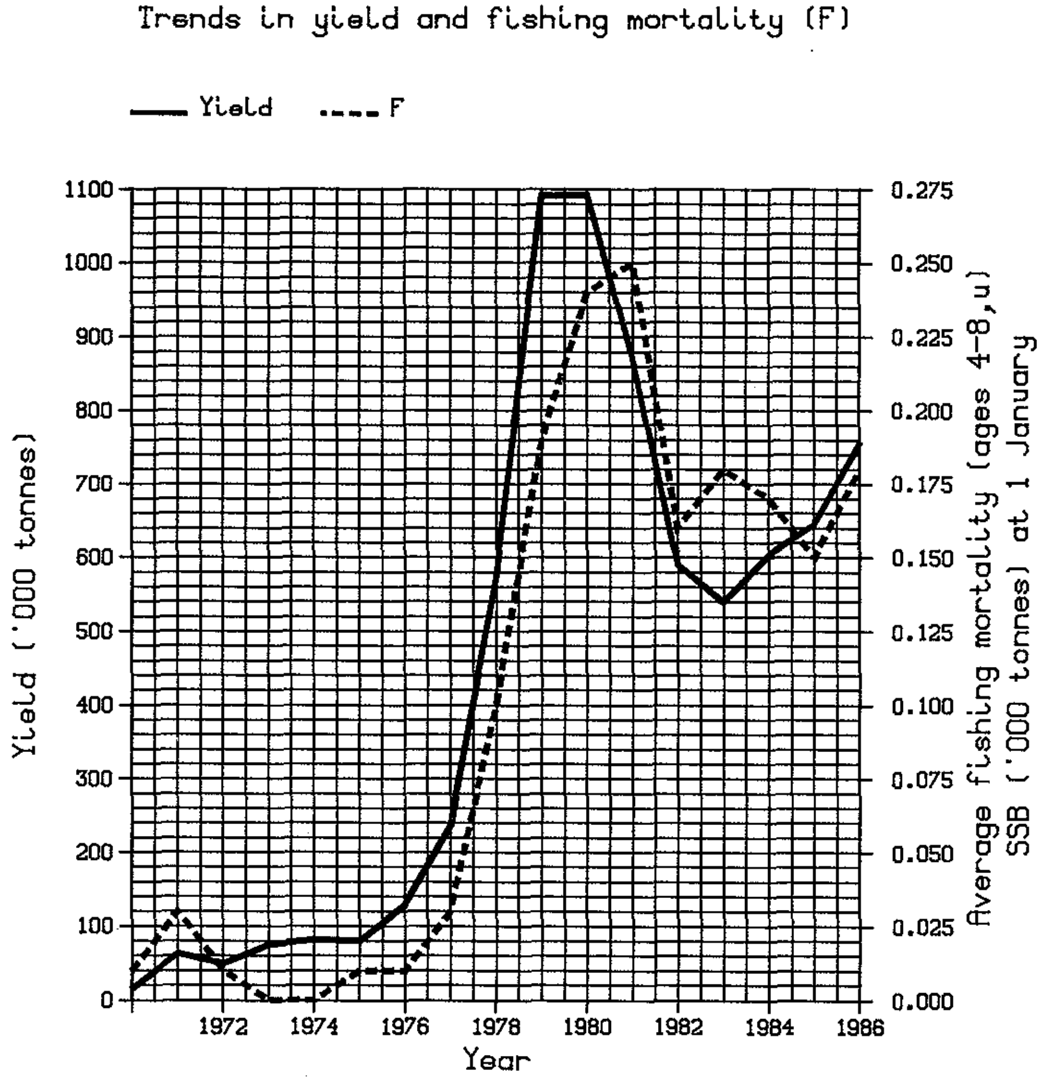


Figure 6.2

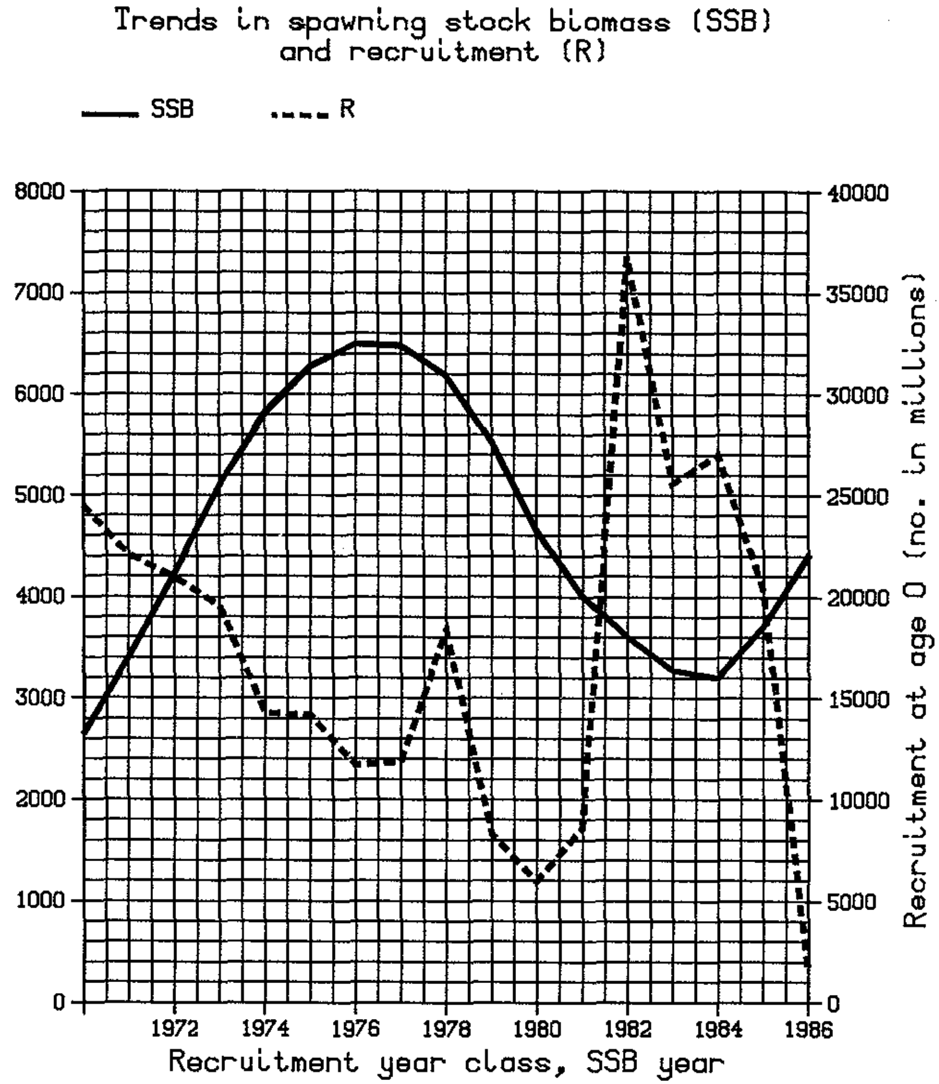
Mackerel box off southwest England and its proposed extension.

Figure 6.2.1

FISH STOCK SUMMARY
STOCK: Blue Whiting – Northern Area
13–10–1987



A

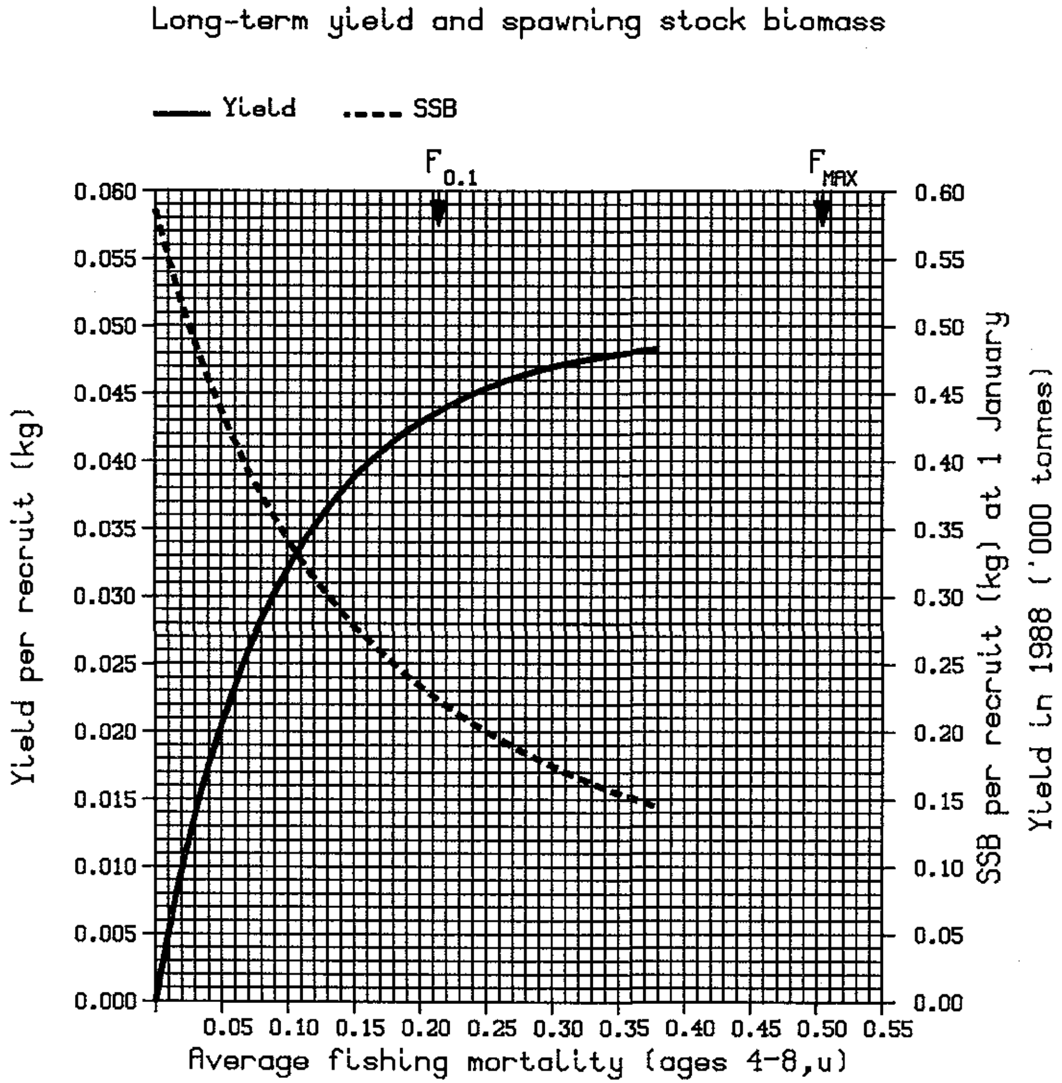


B

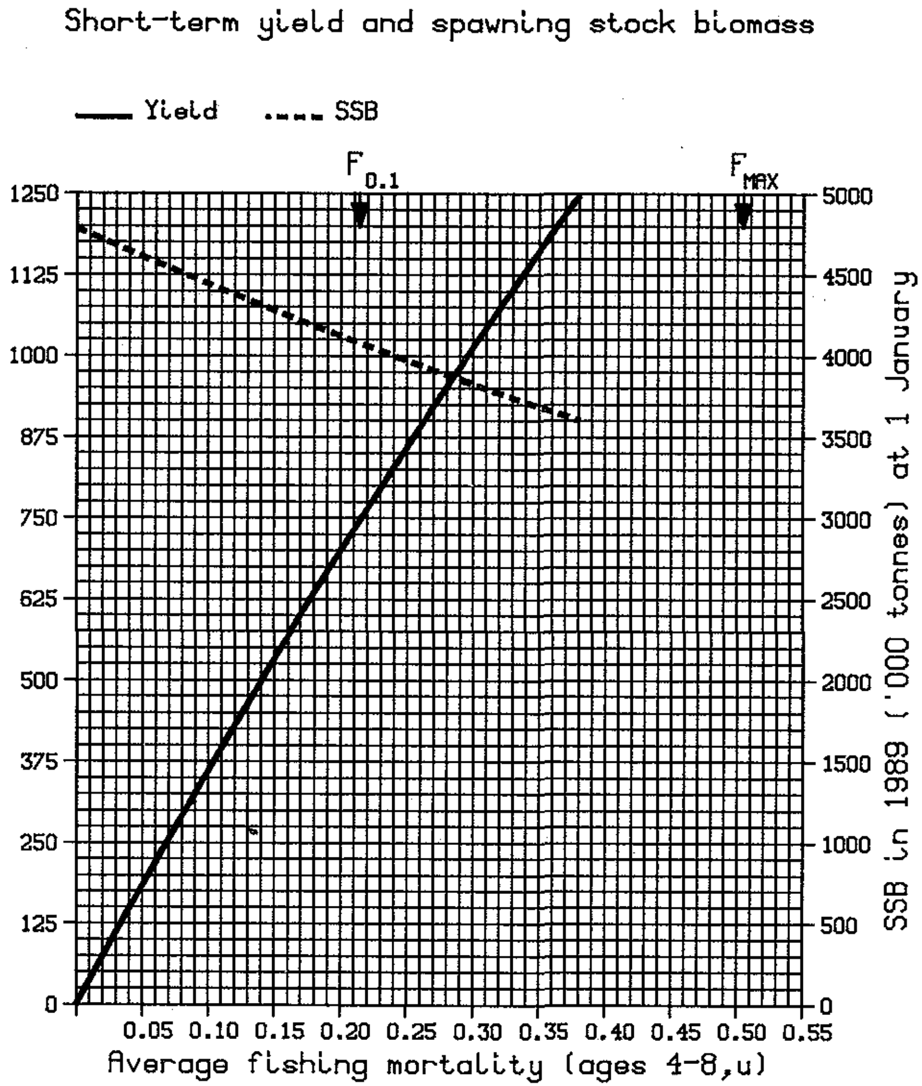
ctd.

Figure 6.2.1 (ctd.)

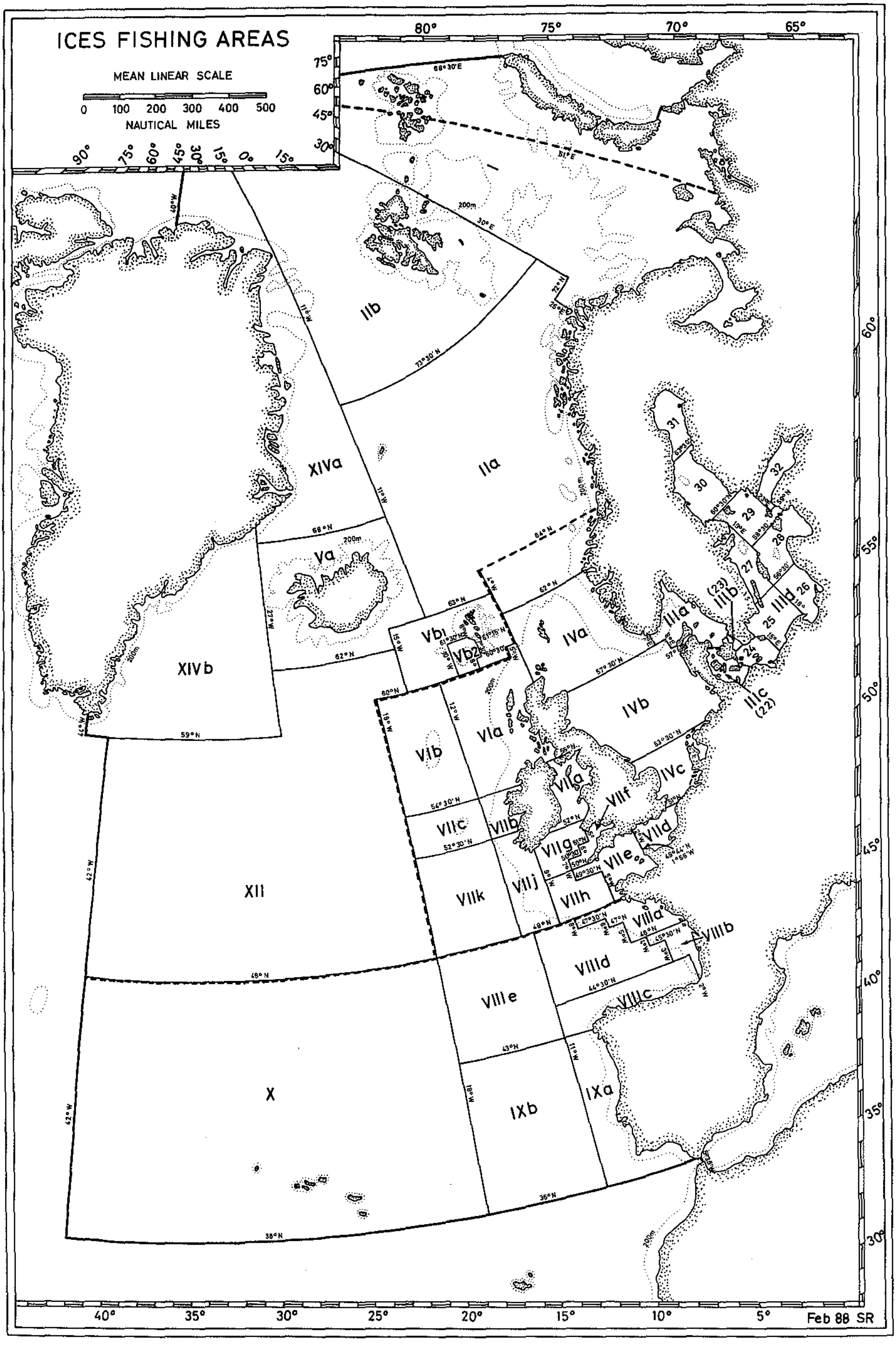
FISH STOCK SUMMARY
STOCK: Blue Whiting – Northern Area
22–09–1987



C



D


ICES FISHING AREAS
MEAN LINEAR SCALE
0 100 200 300 400 500
NAUTICAL MILES
IIb
IIa
XIVa
XIVb
Va
Vb1
Vb2
IVa
IVb
IVc
VIa
VIb
VIIa
VIIb
VIIc
VIId
VIIe
VIIf
VIIg
VIIh
VIIj
VIIk
VIIIa
VIIIb
VIIIc
VIIId
VIIIe
IXa
IXb
X
XII
IIIa
IIIb (23)
IIIc (22)
IIId
24
25
26
27
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REPORT TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

1. REVIEW OF NOMINAL CATCHES IN THE BALTIC AREA, 1963-1986

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 negligible in some cases and constituting important parts of the total removals from other stocks. 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 only, without any comment from ACFM.

The catch data used in the assessments are given in the table section on pages 345-360.

2. GENERAL ADVICE TO THE INTERNATIONAL BALTIC SEA FISHERY COMMISSION

ACFM provided biological advice on stocks of cod, herring, sprat, and salmon as requested by the International Baltic Sea Fishery Commission. The recommendations for a rational management of the stocks are based on the same basic criteria as in past years. Generally, the advice is provided in relation to biological reference points which give guidelines for levels of fishing mortality that will ensure high long-term, sustainable yields in the future. Recent trends in the development of spawning stock biomass and recruitment levels are also taken into account in the management considerations.

ACFM recommends again that in order to achieve proper management of the resources, it is necessary to set separate TACs for eacvh stock unit area.

It must also be pointed out that zones of national fisheries jurisdiction have generally little relevance to stock boundaries. Under these circumstances, there exists a considerable danger to the rational management of stocks occurring in two or more zones if catch quotas based on national zones are set independently.

3. BALTIC PELAGIC STOCKS

3.1 Herring

Catch statistics presented to the Working Group for 1985 and 1986 include herring catches from mixed fisheries and exclude sprat catches in the directed herring fisheries (Table 3.1). The final figure for the 1985 herring catch amounted to about 447,000 t which is roughly equal to the 1984 catch. Preliminary data indicate that the total herring catch in the Baltic Sea decreased 7% in 1986 to about 415,000 t. Catches diminished in the Western Baltic (mainly in Sub-divisions 23 and 24) and somewhat in the Southern Baltic (Sub-divisions 25-27). In the Northern Baltic proper, the Gulf of Bothnia, and the Gulf of Finland, the catches in 1985 and 1986 were roughly equal. Lower catches in the Western Baltic in 1986 were connected mainly with a decrease in effort because of low prices for herring. As in the previous year, fatness of herring was low in 1986.

As in 1984 and 1985, herring catches in 1986 were considerably less than the TAC set by IBSFC (489,700 t).

The percentage of autumn herring is at present low. Therefore, in the assessments, the catches of autumn herring have been added to the catches of spring-spawning herring.

3.1.1 Herring in Sub-divisions 22-24 and Division IIIa

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20). Report of the Herring Assessment Working Group for the Area South of 62°N, March/April 1987 (C.M.1987/Assess:19).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC (IIIa)[3]	-	-	40	40[4]	40[4]	80	132	112	-	-	-
Agreed TAC (IIIa)[3]	-	-	60	59	58	117	-	138	-	-	-
Actual landings (Baltic)[5]	143	158	151	152	191	211	164	-	211[7]	243[7]	167[7]
Actual landings (IIIa)[6]	82	172	158	198	233	242	217	-	242[7]	69[7]	157[7]
Sp. stock biomass	163	162	187	196	227	274	262	306[1]	274	162	210
Recruitment (2-ring)	1.58	3.16	1.99	2.58	3.55	2.79	3.14	2.87[1]	3.55	1.58	2.68
Mean F(1-6,u)	0.52	0.78	0.72	0.52	0.70	0.70	0.63	-	0.78	0.52	0.65

[1]Predicted or assumed. [2]Over period 1980-1986. [3]Adult herring fishery in Division IIIa only. [4]TAC for 1 Sep-31 Aug. [5]Includes Sub-divisions 22-24, 2-group and older from Division IIIa, and transferred amounts from North Sea. [6]Including landings of juvenile herring in mixed clupeoid fishery. [7]Over period 1977-1986. Weights in '000 t, recruitment in billions.

Catches: Sub-divisions 22-24: Fairly stable. A decrease in 1986 (Table 3.1) due to diversion of effort and low prices.

Division IIIa: Slight decrease after peak catch in 1985 (Table 3.1.1) due to decrease in Kattegat. Approximately 130,000 t taken in small-mesh trawl fishery or as by-catches of juveniles in human consumption fishery. Approximately 19,000 t of herring caught in North Sea transferred to Division IIIa/Western Baltic assessment.

Data and assessment: Analytical assessment of 2-group and older.

Division IIIa: Biological sampling of adult catches adequate, but sampling of industrial landings (60% of total herring landed) almost non-existent. Acoustic surveys in Division IIIa underestimated adult stock.

Fishing mortality: Slight decrease from 1985 to 1986 (Figure 3.1.1). Still 3 times $F_{0.1}$.

Recruitment: Steady increase in recruitment to stock during last 10-15 years.

Division IIIa: 0-group very abundant in 1986 acoustic surveys and this year class also abundant in young fish surveys in 1987, mostly autumn spawners, probably of North Sea origin. Abundance of 2-ringers in 1987 IYFS indicated good 1985 year class in Division IIIa/ western Baltic spring-spawning stock.

State of stock: Increasing; due to decreasing fishing mortality and fair recruitment.

Forecast for 1988: Assuming F(87) = 0.63, Catch(87) = 184,000 t, SSB(88) = 328,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.63	196	336	
B	$F_{0.1}$	0.19	72	461	

Continued fishing at current levels of fishing mortality will lead to increasing spawning stock size.

Recommendation: The fishing mortality should not be allowed to increase from the status quo level. The TAC for mixed clupeoids in Division IIIa should be set at not more than 80,000 t in 1988.

Special comments:

1. The assessment of the spring-spawning stock known to migrate between the Western Baltic and Division IIIa was carried out on data from Division IIIa and Sub-divisions 22, 23, and 24.

   Insufficient data on the numbers at age and racial composition of catches of juvenile herring in Division IIIa prevented an assessment of the exploitation level on the youngest age groups, and the combined assessment was based on catch data for 2-ring and older spring-spawning herring. In view of the marked difference in seasonality of the fisheries in Division IIIa and the Western Baltic, the assessment was made on a half-year basis.

   Racial investigations of the vertebral number of herring caught in the eastern part of the North Sea showed that in the last part of May and in June, July, August, and September, all 3-group and older herring were of Skagerrak-Kattegat and Western Baltic stock origin. Therefore, a proportion of the catch in the eastern part of the North Sea was included in the assessment of the combined stock. The amount transferred was 6,968 t in 1984, 17,386 t in 1985, and 19,654 t in 1986.

2. To provide the management bodies with separate catch options for Sub-divisions 22-24 and for Division IIIa, ACFM has calculated the proportion of the catch in the combined area that will be taken in the two areas assuming that the relative levels of fishing mortality and exploitation pattern in the two management areas remain the same as in recent years. For the status quo option given above, the share of the catch in the two areas in 1987 and 1988 will be as follows (in '000 t):

Year	Total catch in combined area	Predicted catch in Sub-divisions 22, 23, 24	Predicted catch in adult herring fishery in Division IIIa
1987	184	88	96
1988	196	97	99

   To the catch predicted in Sub-divisions 22, 23, and 24 should be added the amount of 0- and 1-group herring caught as by-catch in the consumption herring fishery, which was 7,700 t in 1986.

3. In 1986 and 1987, TACs of 80,000 t have been adopted for the fishery for mixed clupeoids in Division IIIa. In 1986, landings in this fishery were around 120,000 t.

   As pointed out by ACFM in its 1986 report, it is not possible to predict catch options for this fishery because the age groups of herring and sprat involved recruit at approximately the time the fishery starts each year. However, ACFM considers that adherence to a TAC of 80,000 t would be a significant step towards controlling the catches of juvenile herring in this area and recommends that the TAC be set at this level again in 1988.

   As in 1985, the monitoring of this fishery in 1986 was totally inadequate and ACFM is thus not able to evaluate the effect the fishery has had on the stocks of herring involved. Since it is likely that this fishery may have a significant effect on recruitment to both the North Sea stocks and indigenous spring-spawning stocks, ACFM must stress the importance of a reinstatement of adequate biological sampling in this fishery.

3.1.2 Herring in Sub-divisions 25-27

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	118	115	130	132	150	147	190	200	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	168	164	180	174	147	154	139	-	194	139	169
Sp. stock biomass	940	697	702	706	745	558	500	505[1]	1026	500	802
Recruitment (age 0)	10.7	6.2	6.0	5.6	4.9	7.5	6.0	6.2[1]	10.7	3.8	6.5
Mean F(1-8,u)	0.15	0.18	0.15	0.15	0.15	0.20	0.21	-	0.21	0.13	0.16

[1]Predicted or assumed. [2]Over period 1976-1986. Weights in '000 t, recruitment in billions.

Catches: Fairly stable (~170,000 t) up to 1983. Subsequent decrease partly due to diversion of effort and low prices.

Data and assessment: VPA tuned to acoustic stock estimates in 1981-1986.

Fishing mortality: Increasing to $F_{0.1}$ level.

Recruitment: Steady.

State of stock: Decreasing (Figure 3.1.2). Partly due to decreasing mean weight at age.

Forecast for 1988: Assuming F(87) = 0.20, Catch(87) = 151,000 t, SSB(88) = 528,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.20	149	518	
B	$F_{0.1}$	0.22	161	505	

Continued fishing at current levels of fishing mortality will lead to rather stable SSB values in 1988-1989.

Recommendation: ACFM recommends that the exploitation level of the combined stock should be kept close to the $F_{0.1}$ level.

Special comments:

Separate assessments for the coastal and for the open sea herring in Sub-divisions 25-27 were carried out in 1987. The data provided were improved compared to last year, but the splitting method could only be applied directly to samples from the Polish fisheries in Sub-divisions 25-27 and the USSR fishery in Sub-division 26. The Polish results were used to estimate the component proportions in the Danish catches (in Sub-division 25) and to Finnish, GDR, and USSR catches in the Swedish zone (Sub-division 25); the Swedish catches in Sub-division 27 can be assumed to be very largely open sea herring. This means that, of the total catch in Sub-divisions 25-27, 56% is split directly; together with the Swedish Sub-division 27 catches of open sea herring, 67% can be allocated directly, and a further 20% are allocated indirectly using the Polish data. 13% are allocated by the relatively crude method.

The results from the separate assessment can be checked against those of the combined assessment for predicted 1988 catches at the F levels of the last year; the combined assessment gives a catch of 149,000 t and the sum for the two separate assessments is 178,000 t.

ACFM agreed that the traditional assessment of the combined coastal and open sea stocks of Sub-divisions 25-27 carried out in 1987 is more reliable as the basis for its management than the two separate assessments. However, the two stocks have considerable differences in biological characters and exploitation pattern. Therefore, in principal, they should be managed separately. To enable reliable separate assessments of the stocks, all laboratories working on herring in Sub-divisions 25-27 should supply the Working Group with the following data:

- catches in numbers split into the two components by uniform methods;
- information on recruitment for both stocks;
- acoustic survey data for both stocks.

3.1.3 Herring in Sub-divisions 28 and 29S (excluding Gulf of Riga)

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	61	28	28	32	40	40	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	40.2	35.1	44.0	47.6	44.7	40.0	38.3	-	47.6	32.6	40.0
Sp. stock biomass	551	540	482	496	502	507	456	468[1]	551	355	469
Recruitment (age 0)	7.8	7.5	5.9	13.1	5.0	3.0	6.5	6.5[1]	13.1	3.0	6.4
Mean F(2-7,u)	0.08	0.07	0.09	0.11	0.10	0.11	0.11	-	0.16	0.07	0.10

[1]Predicted or assumed. [2]Over period 1975-1987. Weights in '000 t, recruitment in billions.

Catches: Have been rather stable in the 1980s.

Data and assessment: Catch in numbers, mean weight at ages, VPA tuned against acoustic stock estimates.

Fishing mortality: Decreased in the 1970s and has been rather stable from 1983 onwards.

Recruitment: 1985 year class poor, 1986 seemingly about average.

State of stock: The SSB has been stable at around 450,000-500,000 t since the end of the 1970s (Figure 3.1.3). The stock is exploited below $F_{0.1}$ (= 0.30) and an increase in the yearly catch is justifiable.

Forecast for 1988: Assuming F(87) = 0,10, Catch(87) = 40,000 t, SSB(88) = 452,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.10	39	445	
B	1.2F(86)	0.11	47	437	

Continued fishing at current levels of fishing mortality will lead to rather stable SSB values and F values considerably below $F_{0.1}$.

3.1.4 Herring in the Gulf of Riga

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	15	15	12	<13	<12	<16	<12	<12	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	15.0	16.8	12.8	15.5	15.8	15.6	16.9	-	24.2	12.8	16.7
Sp. stock biomass	43	44	41	47	38	45	38	34[1]	49	34	42
Recruitment (age 1)	1.1	1.0	1.6	1.2	1.6	0.7	0.6	2.3[1]	2.3	0.6	1.2
Mean F(4-7,u)	0.50	0.64	0.56	0.51	0.78	0.61	0.62	-	0.78	0.46	0.62

[1]Predicted or assumed. [2]Over period 1977-1987. Weights in '000 t, recruitment in billions.

Catches: From 1975-1978, catches decreased, then stabilized at the 15,000-16,000 t level.

Data and assessment: Catch in numbers, mean weight at age, and young fish survey data used.

Fishing mortality: Has been well above $F_{0.1}$ (1975-1986).

Recruitment: 1984-1985 year classes are poor, 1986 seemingly rich.

State of stock: After serious decrease in autumn spawners in 1975-1978, spawning stock size has fluctuated between 38,000-48,000 t (Figure 3.1.4).

Forecast for 1988: Assuming F(87) = 0.62, Catch(87) = 17,000 t, SSB(88) = 51,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.62	16	49	
B	$F_{0.1}$	0.21	6	61	

Continued fishing at current levels of fishing mortality will lead to some increase in SSB.

Recommendation: ACFM recommends a reduction in fishing mortality towards the $F_{0.1}$ level.

3.1.5 Herring in Sub-divisions 29NE and 30E

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	65[3]	62[3]	63[3]	65	67	57	54	52	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	59	49	55	59	64	65	66	-	65	49	57
Sp. stock biomass	319	303	290	302	306	281	295	296[1]	370	281	320
Recruitment (age 0)	4.9	5.7	5.6	10.9	6.5	1.1	5.7[1]	5.3[1]	10.9	1.1	4.8
Mean F(3-8,u)	0.18	0.15	0.18	0.18	0.22	0.20	0.19	-	0.22	0.15	0.17

[1]Predicted or assumed. [2]Over period 1977-1985. [3]Includes Sub-division 31E. Weights in '000 t, recruitment in billions.

Catches: In the last few years, catches have increased due to the increased fishing effort.

Data and assessment: Analytical using catch-in-number data and catch per unit effort.

Fishing mortality: The fishing mortality has increased to a level above $F_{0.1}$.

Recruitment: 1983 year class is strong and 1985 weak. There is no trend in the recruitment.

State of stock: The spawning stock size has been stable in the 1980s (Figure 3.1.5).

Forecast for 1988: Assuming F(87) = 0.19, Catch(87) = 64,000 t, SSB(88) = 270,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.19	63	264	
B	$F_{0.1}$	0.18	58	268	

Continued fishing at current levels of fishing mortality will lead to declining spawning stock size due to the weak 1985 year class.

Recommendation: The present fishing mortality is close to the $F_{0.1}$ level and ACFM recommends that it should not be allowed to increase.

3.1.6 Herring in Sub-division 31E

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	65[4]	62[4]	63[4]	10	9	9	-[3]	9	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	10	8	9	7	10	9	9	-	10	7	9
Sp. stock biomass	40	40	50	51	59	72	77	79[1]	72	40	51
Recruitment (age 0)	0.5	0.5	2.0	1.2	0.7	0.6	0.8[1]	0.8[1]	2.0	0.2	0.8
Mean F(3-8,u)	0.25	0.20	0.18	0.16	0.09	0.13	0.12[1]	-	0.25	0.09	0.18

[1]Predicted or assumed. [2]Over period 1977-1985. [3]Precautionary TAC based on recent catch levels. [4]Includes Sub-divisions 29N and 30E. Weights in '000 t, recruitment in billions.

Catches: Catches have increased in the 1970s and have been rather stable in the 1980s.

Data and assessment: Analytical using catch-in-number data and catch per unit effort.

Fishing mortality: The fishing mortality has decreased to a level below $F_{0.1}$.

Recruitment: There is a big variation between year classes without any obvious trend.

State of stock: The spawning stock has increased in the last few years due to the 1982 and 1983 year classes (Figure 3.1.6).

Forecast for 1988: Assuming F(87) = 0.12, Catch(87) = 9,000 t, SSB(88) = 78,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.12	10	79	
B	$F_{0.1}$	0.17	13	75	

Continued fishing at current levels of fishing mortality will remain at the recent high level of spawning stock size.

Recommendation: The fishing mortality can be allowed to increase towards the $F_{0.1}$ level.

3.1.7 Herring in Sub-divisions 29NW, 30W, and 31W

Source of information: Report of the Working Group on Assessment of the Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[1]	Min[1]	Mean[1]
Recomm. TAC	8	-	8	8	8	10	-[2]	-[2]	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	7.6	8.2	7.5	9.8	6.8	4.3	3.7	-	9.8	3.7	7.4

[1] Over period 1975-1986. [2] Precautionary TAC based on recent catch levels. Weights in '000 t.

Catches: Decreasing in the last few years due to a diversion of Swedish effort.

Data and assessment: Insufficient sampling intensity to permit an analytical assessment.

Fishing mortality: Most likely on a low level. About 50% of the fish in the age samples are older than 5 years (6-15+).

Recruitment: No information.

State of stock: Probably underexploited.

Forecast for 1988: Not available.

Recommendation: ACFM recommends that a precautionary TAC of 10,000 t is set for 1988.

3.1.8 Herring in the Gulf of Finland

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	40	50	54	55	40	45	<39	<41	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	43.9	45.2	44.6	56.8	49.6	49.1	47.7	-	56.8	39.6	48.0
Sp. stock biomass	99	97	101	123	108	104	96	87[1]	143	96	116
Recruitment (age 0)	5.4	3.9	2.9	5.2	3.5	1.0	3.3	3.4[1]	6.4	1.0	3.4
Mean F(2-5,u)	0.48	0.48	0.34	0.44	0.46	0.39	0.54	-	0.54	0.30	0.42

[1]Predicted or assumed. [2]Over period 1975-1986. Weights in '000 t, recruitment in billions.

Catches: Stable dominated by pelagic trawl fishery.

Data and assessment: Catch and effort data. Recruitment indices poor. Catch-curve analysis used in starting VPA.

Fishing mortality: Current level is slightly above F_{max}; $F_{0.1}$ about half of present level.

Recruitment: 1985 year class extremely low, 1986 year class around average.

State of stock: Stock size dropping because of poor 1985 year class (Figure 3.1.8).

Forecast for 1988: Assuming F(87) = 0.54, Catch(87) = 45,000 t, SSB(88) = 77,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.54	43	72	
B	$F_{0.1}$	0.24	21	94	

Continued fishing at current levels of fishing mortality will lead to a decrease in the spawning stock biomass.

Recommendation: ACFM recommends that the fishing mortality in 1988 should be reduced towards the $F_{0.1}$ level. ACFM considers it important that the exploitation pattern is improved by decreasing the fishing mortality on younger age groups (increasing minimum mesh size in herring trawls, closing young fish nursery areas, etc.).

3.2 Sprat

The total reported landings in 1986 (75,500 t) increased by about 6,000 t as compared with 1985 (Table 3.2). This is an increase of 8.6%, but shows a reduction in the yearly catch increase which started in 1984 after the steadily declining trend from 1977 to 1983.

The increase in catches took place in Sub-divisions 22, 25, 28, and 29. A marked decrease occurred in Sub-division 26.

The 1986 catches were well below the TAC set by IBSFC (105,000 t) for this year.

3.2.1 Sprat in Sub-divisions 22-25

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	17	15	0	0	50[4]	60[3]	16.0	16.0	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	12.1	14.0	14.3	14.0	11.3	15.8	23.2	-	36.3	11.3	18.8
Sp. stock biomass	33.3	52.2	97.2	178.2	272.8	259.5	187.5	190.0[1]	272.2	33.3	89.4
Recruitment (age 0)	15.6	11.5	29.1	16.2	5.0	10.5	10.0	10.3[1]	29.1	2.8	10.4
Mean F(1-5,u)	0.38	0.26	0.26	0.11	0.05	0.05	0.11	-	0.48	0.05	0.24

[1]Predicted or assumed. [2]Over period 1976-1985. [3]Includes Sub-divisions 26 and 28. [4]Whole Baltic. Weights in '000 t, recruitment in billions.

Catches: After a strong decrease from the mid-1970s up to 1984, the catch increased.

Data and assessment: Analytical, using acoustic surveys for tuning fishing mortalities.

Fishing mortality: The fishing mortality is well below $F_{0.1}$.

Recruitment: There is no clear trend in recruitment, although it has been on a high level since 1980.

State of stock: The spawning stock has been decreasing since 1985, after a peak in 1984 (Figure 3.2.1).

Forecast for 1988: Assuming F(87) = 0.13, Catch(87) = 25,000 t, SSB(88) = 175,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.11	21	171	
B	1.3F(86)	0.13	27	168	
C	1.6F(86)	0.16	32	158	

Continued fishing at current levels of fishing mortality will lead to a gradual decrease in spawning stock.

Recommendation: The fishing mortality on this stock is low compared to $F_{0.1}$ and catches, consequently, could be increased without endangering the prospects for future catches.

If, however, the objective for the management of the pelagic stocks in the area is to restrict catches of juvenile herring in the mixed sprat and herring fisheries in order not to adversely affect recruitment to the herring stocks, this could be achieved by a continuation of the present low fishing mortality on sprat.

3.2.2 Sprat in Sub-divisions 26 and 28

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	46	31	0	0	50[4]	60[3]	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	25.5	17.8	23.5	13.5	31.1	43.0	42.0	-	93.8	13.5	45.4
Sp. stock biomass	40.3	23.7	42.7	67.8	118.7	133.8	105.2	77.4[1]	267.5	23.7	112.3
Recruitment (age 0)	19.2	11.9	45.8	25.5	16.4	10.3	16.4	16.9[1]	50.8	3.8	19.5
Mean F(2-6,u)	0.60	0.35	0.40	0.07	0.32	0.33	0.45	-	0.75	0.07	0.45

[1]Predicted or assumed. [2]Over period 1975-1986. [3]Includes Sub-divisions 22-25. [4]Whole Baltic. Weights in '000 t, recruitment in billions.

Catches: Have been very low recently, but have partly recovered.

Data and assessment: Based on catches in numbers and hydroacoustic surveys.

Fishing mortality: F_{86} is about 1/2 x $F_{0.1}$.

Recruitment: All year classes after 1983 slightly below average.

State of stock: A modest increase has been observed, but lack of large year classes after 1982-1983 has caused a decline in the last years (Figure 3.2.2).

Forecast for 1988: Assuming F(87) = 0.45, Catch(87) = 34,500 t, SSB(88) = 71,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.45	29	75	

Continued fishing at current levels of fishing mortality will lead to declines in SSB to pre-1984 levels.

3.2.3 Sprat in Sub-divisions 27 and 29-32

Source of information: Report of the Working Group on Assessment of Pelagic Stocks in the Baltic, March/April 1987 (C.M.1987/Assess:20).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	14	14	0	0	50[3]	8	-	-	-	-	-
Agreed TAC	-	-	-	-	-	-	-	-	-	-	-
Actual landings	19.9	17.4	11.0	8.9	9.9	10.7	10.1	-	52.2	8.0	21.6
Sp. stock biomass	74	66	60	72	77	79	77	64[1]	208	60	96
Recruitment (age 0)	5.6	1.1	8.0	2.4	5.0	1.3	1.4	3.3[1]	8.0	0.7	2.9
Mean F(2-7,u)	0.43	0.34	0.23	0.27	0.23	0.16	0.14	-	0.44	0.14	0.28

[1]Predicted or assumed. [2]Over period 1977-1987. [3]Whole Baltic. Weights in '000 t, recruitment in billions.

Catches: In the second half of the 1970s, catches sharply decreased and since 1982, stabilized at a low level.

Data and assessment: Catch in numbers, mean weight at age, VPA tuned against acoustic stock estimates, some data on recruitment abundance level.

Fishing mortality: The fishing mortality rate has decreased and is at present well below $F_{0.1}$ (= 0.5).

Recruitment: Recent year classes are much lower than in the 1970s.

State of stock: Stock decreased substantially in the second half of the 1970s and in the 1980s stabilized at low level (Figure 3.2.3).

Forecast for 1988: Assuming F(87) = 0.14, Catch(87) = 8,000 t, SSB(88) = 56,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	F(86)	0.14	7	56	Probably stock will be fished in 1988 mainly as by-catch in herring fishery

Continued fishing at current levels of fishing mortality will lead to a stable SSB at a low level.

4. BALTIC DEMERSAL STOCKS

4.1 Cod

4.1.1 Cod in Sub-divisions 22 and 24

Source of information: Report of the Working Group on Assessment of Demersal Stocks in the Baltic, April 1987 (C.M.1987/Assess:22).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	33	27	29	<54	-[4]	<33	<24	9	-	-	-
Agreed TAC	-	227[3]	-	-	-	-	-	-	-	-	-
Actual landings	38	51	46	47	48	39	25	-	51	38	45
Sp. stock biomass	46	41	39	42	39	43	29	21[1]	48	29	39
Recruitment (age 1)	101	74	79	96	33	16	65	17[1]	117	33	76
Mean F(2-7,u)	0.76	1.06	0.80	0.83	0.82	1.01	0.93	-	1.17	0.70	0.92

[1]Predicted or assumed. [2]Over period 1975-1984. [3]For total Baltic Sea. [4]ACFM recommended that F should be reduced. Weights in '000 t, recruitment in millions.

Catches: Catch levels have been rather stable over a 20-year period up to 1985 (Table 4.1.1). In 1986, the total catch declined substantially and reached the lowest level on record. This decline was mainly pronounced in Sub-division 22. No agreed TAC exists.

Data and assessment: Age composition data were available for the main part of the catches. Analytical assessment, VPA tuning by using effort data and recruitment indices from young fish surveys.

Fishing mortality: Fishing mortality remained at a very high level over the period under consideration (1970-1986) and is far in excess of $F_{0.1}$ and F_{max} (Figure 4.1.1).

Recruitment: Recruitment fluctuated with a declining trend. The 1983 and 1984 year classes are far below average. The 1986 year class is also expected to be a weak one. The 1985 year class is slightly below average.

State of stock: Stock and spawning stock biomass remained rather stable up to 1985, but decreased considerably in 1986. SSB will further decline in 1987 to the lowest on record.

Forecast for 1988: Assuming F(87) = 0.93, Catch(87) = 29,000 t, SSB(88) = 24,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.6F(86)	0.56	16	26	SSB will increase slightly
B	0.8F(86)	0.75	20	22	No improvement in SSB
C	F(86)	0.93	23	18	No improvement in SSB

Continued fishing at current levels of fishing mortality will lead to a catch of 23,000 t in 1988. SSB will decrease by 15% in 1989 compared to 1987.

Recommendation: In view of the recent decrease in spawning stock biomass and the downward trend in recruitment levels, the exploitation rate needs to be reduced substantially. Under the present status, the fishery is highly dependent on incoming year classes. The 1985 year class appears to be at about average strength; however, its exploitation in 1987, when it is still generally immature, is very high. In order to arrest the declining trend in spawning stock biomass, ACFM recommends that fishing mortality be reduced significantly in 1988. A 40% reduction in fishing mortality has been calculated to restore the spawning stock biomass in 1989 to about the 1988 level. ACFM, therefore, recommends a TAC of not more than 16,000 t in 1988. ACFM also reiterates its previous advice to improve the exploitation pattern by an increase in minimum mesh size (see Section 4.3).

4.1.2 Cod in Sub-divisions 25-32

Source of information: Report of the Working Group on Assessment of Demersal Stocks in the Baltic, April 1987 (C.M.1987/Assess:22).

Year	1980	1981	1982	1983	1984	1985	1986	1987	Max[2]	Min[2]	Mean[2]
Recomm. TAC	179	170	-	-	<274	<162	<232	<245	-	-	-
Agreed TAC	179	227[3]	-	-	-	-	-	-	-	-	-
Actual landings	346	329	314	329	395	316	251	-	395	154	266
Sp. stock biomass	1057	978	1032	1057	1011	784	568	465[1]	1057	488	834
Recruitment (age 1)	1178	1200	756	501	412	527	458	556[1]	1376	412	850
Mean F(4-7,u)	0.66	0.77	0.71	0.64	0.77	0.63	0.84	-	0.80	0.45	0.67

[1]Predicted or assumed. [2]Over period 1975-1984. [3]For total Baltic Sea. Weights in '000 t, recruitment in millions.

Catches: Catches over the period 1980-1985 were at a high level (Tables 4.1.2.1 and 4.1.2.2) and well above the long-term average. In 1986, total catch decreased and a further decline is expected in 1987. No agreed TAC exists.

Data and assessment: Analytical assessment based on catch-at-age data. VPA tuning is based on effort data and recruitment indices from young fish surveys.

Fishing mortality: F is high and has increased in 1986 compared to the period 1980-1985. F is above $F_{0.1}$ and F_{max} (Figure 4.1.2).

Recruitment: Recruitment level of 1975-1981 year classes was high. From 1982 year class onwards, lower recruitment figures were observed. The actual strength of the 1985 year class is somewhat uncertain.

State of stock: The spawning stock size has shown considerable variation since 1970. Associated with a number of good year classes, the spawning stock size increased from around 300,000 t in the beginning of the 1970s to around 1 million t in 1980-1984. Chiefly as a result of reduced recruitment from 1981 onwards and a high exploitation rate, the stock decreased markedly in 1985 and 1986.

Forecast for 1988: Assuming F(87) = 0.84, Catch(87) = 197,000 t, SSB(88) = 432,000 t.

Option	Basis	F(88)	Predicted catch(88) ('000 t)	Predicted SSB(89) ('000 t)	Consequences/implications
A	0.8F(86)	0.67	154	475	
B	F(86)	0.84	182	443	

Continued fishing at current levels of fishing mortality will lead to a catch of 182,000 t in 1988. SSB will decrease compared to 1987.

Recommendation: ACFM recommends that fishing mortality be reduced to its average level observed over the period 1980-1985, which is about 0.70 and still above F_{max} (= 0.59). This recommendation is associated with a total allowable catch of 150,000 t in 1988. Under this management strategy, the spawning stock biomass in 1989 is predicted to remain at about the 1987 level.

4.1.3 Minimum mesh size and minimum landing size

ACFM has previously recommended an increase in mesh size for all the cod fisheries in the Baltic. ACFM reiterates that the mesh size should be increased to at least 100 mm. The application of a 100-mm mesh size would result in a 32-cm minimum landing size. The minimum landing size corresponding to a 110-mm mesh size would be 35 cm.

4.2 Flounder

In the Baltic Sub-divisions 22-32, there are several rather distinct flounder populations. According to spawning areas, some stock boundaries are fairly clear, despite the fact that there is some feeding migration between the stocks (Figure 4.2).

In the Southern Baltic, Sub-division 22, Sub-divisions 24-25, and Sub-division 26 should be handled separately for assessment purposes. In the Central and Northern Baltic, there is a distinct stock in Sub-division 27, which is coast-bound between the mainland and Gotland Island.

It is assumed that there are two stocks in Sub-division 28, one on the east coast of Gotland Island and one along the USSR coast.

In Sub-divisions 29N and 30, there is one stock which inhabits the coasts of the Aland Islands, the Archipelago Sea, and the southern and central parts of the Bothnian Sea.

Two flounder stocks are located in Sub-division 32, one on the USSR coast and one on the Finnish coast. The exchange between these two stocks is very low.

Data on landings of flounder from the Baltic Sea are available on a country and sub-division basis for the period 1973-1986 (Table 4.2). Annual total landings remained fairly stable over this period and amounted on average to 13,000 t (assuming annual USSR landings of about 2,000 t over the years 1983-1986).

Information on discards, age composition, and mean weight at age are also available for stock units Sub-division 22, Sub-divisions 24-25, Sub-division 26, Sub-divisions 29N-30, and Sub-division 32N and are given in the Working Group report. Based on these data, stock assessments were attempted. However, due to uncertainties in the data base (high discard rate) and problems in the VPA tuning, reliable assessments could not be provided.

5. BALTIC SALMON STOCKS

Source of information: Baltic Salmon and Trout Assessment Working Group report, April 1987 (C.M.1987/Assess:21).

5.1 Recalibration of the Salmon Assessment Model

The recalibration considered the following factors:

- Migration pattern: no changes.
- Fishing mortalities: based on the Swedish tagging data in 1980-1984.
- Mean weight at age: no changes.

These simulations give a yield of 380 kg/1,000 artificial smolt units (ASU). The escapement is 3.8%. This estimated escapement is much higher than previously found. Tag return rates of Swedish tagging experiments have decreased from 11.7% in 1969-1976 to 8.1% in 1980-1984. This should reflect a decrease in mortalities and hence improve escapement. The escapement would, on that basis, have increased by only about 50%. The homing migration parameters were increased compared to the calibration based on the 1976-1979 data. This is because the effort in the Main Basin seems to remain fairly stable, i.e., fishing mortality should have remained fairly constant. So instead, the salmon must leave the area to achieve a match between observed returning and the simulations. This accounts for the other 50% increase compared to the first calibration in 1980.

There is salmon smolt production also in the rivers running into the Gulf of Riga or the Main Basin. Salmon originating from these sources are assumed to stay mainly in the Main Basin during their entire life and also home to the rivers which have outlets into the Gulf of Riga or the Main Basin, respectively.

5.2 Salmon in the Main Basin and the Gulf of Bothnia (Sub-divisions 24-31)

Landings and recruitment are shown in the text table below and in Table 5.2.1.

Item	1980	1981	1982	1983	1984	1985	1986	1987
Landings (t)	2,437	2,578	2,024	2,344	3,522	3,873	3,232	-
Recruitment (ASU)[1]								
Wild	1.26	1.26	1.26	1.25	0.95	0.95	0.92	0.92
Artificial	2.80	2.74	2.74	2.75	3.40	3.55	3.98	3.64
Total	4.06	4.00	4.00	4.00	4.35	4.50	4.90	4.56

[1] Millions.

Catches

From a catch level averaging about 1,700 t in 1970-1983, the yield of the salmon fishery in the Baltic Main Basin jumped to more than 3,000 t in 1985 (Figure 5.2.1). In 1984, the catches in the Gulf of Bothnia showed a similar significant increase from a level of about 500 t to nearly 900 t.

Fishing effort

Since the 1960s, the effort of the fishery in the Main Basin seems to show a slight decline (Figure 5.2.1). The efficiency of the drift-net fishery has probably improved in recent years, but it is not considered to be of sufficient magnitude to explain an increase in the catches of about 100% from the 1982/1983 to 1983/1984 season (Figure 5.2.2).

Recruitment

Natural smolt production was revised from 0.95 million ASU in 1985 to 0.92 ASU in 1986 and 1987. On the basis of electrofishing surveys in the River Tornionjoki, no major changes have occurred in recent years (Figure 5.2.3). The production of wild smolts in the River Simojoki has decreased considerably (Figure 5.2.4). On the basis of recruitment, fishing effort, and CPUE data, the initial mortality seems to have been smaller in the 1983 and 1984 smolt year classes compared to the situation on average. In spite of this, no positive development has been observed in the salmon stocks of the Rivers Tornionjoki and Simojoki.

The percentage of wild smolts has decreased in this management unit from about 32% in 1979 to about 18% in 1986.

Assessment type

An assessment model made in 1978 was applied to the Baltic salmon. Recalibration of the model was done on the basis of the data available in 1987.

Forecast for 1988

On the basis of this model, the expected yield in 1988 would be 3,711 t provided the conditions remain unchanged.

Catch options

The target escapement of 2.4% was worked out in 1980 for River Tornionjoki under steady conditions. The high escapement rate of 3.8% should be reflected in the breeding fishery in the Swedish rivers, but this is not the case (Figure 5.2.5). The parr density in the River Simojoki and its salmon smolt production have decreased since around 1980 (Figure 5.2.4), even if escapement may have increased. Many rivers do not have enough spawners for filling all spawning sites (Table 5.2.2), so some escapement above the level required under steady conditions could be desirable, at least for a period. But it may also mean that the 2.4% originally calculated was an underestimate. The present very favourable conditions for smolt survival may not prevail, thus changing the assessment drastically once more.

Although the escapement level may have been on a higher level than previously, as suggested by the calibration of the model, there has been no noticeable increase in the wild salmon stocks of the Gulf of Bothnia. The fishing mortality should, therefore, be decreased significantly. This could, on a long-term basis, improve the state of the wild salmon stocks.

Continued fishing at current levels of fishing mortality will very soon lead to destruction of the River Simojoki salmon stock, and other Gulf of Bothnia wild stocks are in the same danger. ACFM recommends strongly that fishing effort should be reduced which would correspond to a considerable reduction in the present catch level.

5.3. River Neva Salmon in the Bothnian Sea (Sub-division 30)

Catches based on tagging experiments are shown in the text table below.

Item	1980	1981	1982	1983	1984	1985	1986	1987
Catches (t, calculated)	...	...	...	...	...	100	120	120
Recruitment (ASU)[1]	11	17	54	157	337	469	321	403

[1] Thousands.

Catches

The salmon catch in Sub-division 30 is partly based on releases of River Neva salmon in that area.

Recruitment

According to tagging experiments of River Neva salmon releases in Sub-division 30, about 80% have been caught in Sub-division 30. The average of 400,000 ASU was used for the assessment.

Catch options

Based on tagging experiments and catch statistics, the yield of the releases of River Neva salmon into Sub-division 30 was estimated to be 100-200 kg/1,000 ASU. Besides the known poor growth of River Neva salmon in this area, the background for these low stocking results is unknown. The yield based on stockings in 1985-1987 was estimated to be 40-80 t in 1988.

Catches from the River Neva salmon releases in the Bothnian Sea should be added to the catches from the Gulf of Bothnia when discussing catch regulatory measures.

5.4 Salmon in the Gulf of Finland (Sub-division 32)

Landings and recruitment are shown in the text table below and in Table 5.2.1.

Item	1980	1981	1982	1983	1984	1985	1986	1987
Landings (t)	71	73	133	196	239	318	405	-
Recruitment (ASU)[1]	150	212	351	436	436	552	544	533

[1] Thousands.

Catches

The salmon catch has increased from 71 t in 1980 to 405 t in 1986. The catches are based mainly on artificial smolt production.

Fishing effort

The Finnish coastal fishery has been established to be at the level which should ensure the desired escapement of breeders for Finnish hatcheries. The effort by the Finnish long-line fishery has increased slightly from 1981 to 1985. The drift-net effort has increased in the USSR fishery in 1986.

Recruitment

Wild salmon smolt production in the Gulf of Finland rivers has been estimated to be 20,000 (40,000 ASU). Natural spawning occurs in the USSR rivers along the Gulf of Finland coast.

There is wild salmon production in the rivers running into the Gulf of Riga. According to the taggings, part of the wild salmon from this area migrates to the Gulf of Finland.

Hatchery-reared smolt production has increased significantly from 150,000 ASU in 1980 to 544,000 ASU in 1986.

Assessment type

The catch prognosis has been calculated on the basis of total recruitment in ASU in 1984-1987 and the tagging results for the corresponding year classes.

Forecast for 1988

The prognosis for 1988 predicts a catch of 300-375 t. In the higher figure, an estimated rate of unreported tags (15%) has been taken into account.

Catch options

In the Rivers Kymijoki and Neva, the number of spawners is expected to be sufficient for breeding purposes. In other rivers, there is a shortage of spawners. The migration behaviour and scale structure of the salmon originating from these rivers are unknown. In the Finnish longline fishery, there have been no salmon of wild origin (on the basis of scale structure) in the samples. In the Finnish coastal fishery, about 8% of the catches have been of wild origin. This discrimination is also based on the scale structure of these salmon. The origin of these salmon is unknown. A remarkably high smolt age (3-4 years) suggests that they probably do not originate from the rivers in the Gulf of Finland.

The catch prognosis for 1988 is 300-375 t continuing at the current level of fishing.

5.5 Distribution of Fishing Effort and Catch per Unit Effort

Data on effort and CPUE presented are given in Tables 3, 4, and 17 of the Working Group report. Detailed data for all fisheries are recommended.

5.6 Coded-Wire Tagging Programme

Pilot programmes of coded-wire tagging will be carried out by Finland in the Gulf of Finland area and by the USSR in the Gulf of Riga area.

It was recommended that national programmes on tagging and scanning of salmon be initiated with coded-wire tags and that finclipping as a marking technique should primarily be used for such programmes.

Table 1.1 Nominal fish catches in the Baltic from 1973-1986 (in '000 t). 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	446	437	54	15	4.0	18	17	991
1985	348	442	71	17	4.3	16	16	914[1]
1986[2]	268	317	75	18	2.7	11	19	711

[1] Subject to revision.
[2] The figures for 1986 exclude catches from Finland. The cod figure includes a preliminary catch by the Faroe Islands.

Table 1.2 Nominal catch (tonnes) of HERRING in Divisions IIIb,c,d, 1963-1986. (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	97,277	50,073	8,166	78,326	65,519	105,577	437,210
1985	27,847[3]	98,999	51,607	9,079	85,865	57,554	110,783	441,734
1986	21,599	–[4]	53,061	9,382	77,109	39,909	115,665	–[4]

[1] Including Division IIIa.
[2] Large quantity of herring used for industrial purposes is included with "Unsorted and Unidentified Fish".
[3] Subject to revision.
[4] Not available.

Table 1.3 Nominal catch (tonnes) of SPRAT in Divisions IIIb,c,d, 1963-1986. (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	3,450	2,436	2,762	642	10,954	7,807	25,891	53,942
1985	2,417[2]	2,923	1,950	638	22,156	7,111	34,003	71,198
1986	5,693	-[3]	2,514	392	26,967	2,573	36,484	-[3]

[1] Including Division IIIa.
[2] Subject to revision.
[3] Not available.

Table 1.4 Nominal catch (tonnes) of COD in Divisions IIIb,c,d, 1963-1986. (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	22,521	76,474	54,876	92,248	380,024[5]
1984	121,297	9,162	9,886	39,632	93,429	65,788	100,761	446,309[6]
1985	107,614[8]	7,224	6,593	24,199	63,260	54,723	78,127	347,630[7]
1986	98,081	-[9]	3,179	18,243	43,237	48,804	52,148	-[9]

[1] Including Division IIIa.
[2] Includes catches by the Faroe Islands of 1,250 t and United Kingdom (England & Wales) of 2,901 t.
[3] Includes catches by the Faroe Islands of 2,765 t.
[4] Includes catches by the Faroe Islands of 4,300 t.
[5] Includes catches by the Faroe Islands of 6,065 t.
[6] Includes catches by the Faroe Islands of 6,354 t.
[7] Includes catches by the Faroe Islands of 5,890 t.
[8] Subject to revision.
[9] Not available. Preliminary catches by the Faroe Islands 4,600 t.

Table 1.5 Nominal catch (tonnes) of FLATFISH in Divisions IIIb,c,d 1963-1986. (Data as officially reported to ICES.)

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Total
1963	9,888	-	3,390	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	5,165	329	3,173	662	3,865	176	1,859	15,229
1985	6,506[3]	391	4,290	542	3,533	170	1,528	16,960
1986	6,806	-[4]	3,480	494	5,044	250	1,438	-[4]

[1] Including Division IIIa.
[2] Excluding subsistence fisheries.
[3] Subject to revision.
[4] Not available.

Table 3.1 HERRING catches in the Baltic Sea by countries and sub-divisions, 1984 and 1985 (tonnes). By-catch of sprat in directed herring fisheries excluded and by-catch of herring in sprat fisheries included.

Year and country	Total catch	Sub-divisions 22	23	24	25	26	27	28	29S	29N	30	31	32
1985													
Denmark	30,341	10,322	6,849	5,620	7,550	-	-	-	-	-	-	-	-
Finland	98,999	-	-	-	-	-	-	-	8	39,740	25,857	9,154	24,240
German Dem.Rep.	51,607	1,940	-	48,006	1,566	-	95	-	-	-	-	-	-
Germany,Fed.Rep.	7,925	7,353	-	535	37	-	-	-	-	-	-	-	-
Poland	89,531	-	-	16,721	49,840	22,970	-	-	-	-	-	-	-
Sweden	57,554	-	1,113	11,373	21,093	22	17,990	2,317	34	1,010	1,885	717	-
USSR	110,783	-	-	-	14,175[1]	18,465	-	28,209	25,035	-	-	-	24,899
Total	446,740	19,615	7,962	82,255	94,261	41,457	18,085	30,526	25,077	40,750	27,742	9,871	49,139
1986													
Denmark	19,441	9,035	1,490	5,011	3,905	-	-	-	-	-	-	-	-
Finland[2]	98,244	-	-	-	-	-	154	116	513	39,762	26,409	9,090	22,200
German Dem.Rep.[2]	53,061	1,907	-	49,273	1,881	-	-	-	-	-	-	-	-
Germany,Fed.Rep.	8,550	7,845	-	705	-	-	-	-	-	-	-	-	-
Poland	80,442	-	-	12,344	47,336	20,762	-	-	-	-	-	-	-
Sweden	39,842	-	1,365	5,946	19,315	-	7,870	1,964	51	494	2,501	336	-
USSR	115,665	-	-	-	20,090	17,430	-	28,695	23,930	-	-	-	25,520
Total	415,245	18,787	2,855	73,279	92,527	38,192	8,024	30,775	24,494	40,256	28,910	9,426	47,720

[1] Catches in Sub-divisions 25 and 27.
[2] Preliminary data.

Table 3.1.1 HERRING in Division IIIa. Landings in tonnes 1977-1986. (Data mainly provided by Working Group Members.)

Country	1977	1978	1979	1980	1981
Skagerrak					
Denmark	14,152	7,753	8,729	22,811	45,525
Faroe Islands	10,064	1,041	817	526	900
Germany, Fed.Rep.	32	28	181	-	199
Norway (Open sea)	-	1,860	2,460	1,350	6,330
Norway (Fjords)	1,837	2,271	2,259	2,795	900
Sweden	8,109	11,551	8,140	10,701	30,274
Total	34,194	24,504	22,586	38,183	83,768
Kattegat					
Denmark	38,205	29,241	21,337	25,380	48,922
Sweden	37,160	35,193	25,272	18,260	38,871
Total	75,365	64,434	46,609	43,640	87,833
Division IIIa total	109,559	88,938	69,195	81,823	171,601

Country	1982	1983	1984	1985	1986[1]
Skagerrak					
Denmark	43,328	54,102	64,621	88,192	94,022
Faroe Islands	715	1,980	891	455	520
Germany, Fed.Rep.	43	40	-	-	11
Norway (Open sea)	10,140	500	-	2,752	677
Norway (Fjords)	1,560	2,834	1,494	1,673	860
Sweden	24,859	35,176	59,195	40,349	42,996
Total	80,645	94,632	126,201	133,421	139,086
Kattegat					
Denmark	38,609	62,901	71,359	69,235	41,669
Sweden	38,892	40,463	35,027	39,829	35,852
Total	77,501	103,364	106,386	109,064	77,521
Division IIIa total	158,146	197,996	232,587	242,485	216,607

[1] Preliminary.

Table 3.2 SPRAT catches in the Baltic Sea by country and sub-division, 1985 and 1986 (tonnes). By-catch of herring in directed sprat fisheries excluded and by-catch of sprat in herring fisheries included.

Year and country	Total catch	Sub-division 22	23	24	25	26	27	28	29	30	31	32
1985												
Denmark	4,148	2,905	-	473	770	-	-	-	-	-	-	-
Finland	2,923	-	-	-	-	-	-	-	1,872	3	-	1,048
German Dem.Rep.	1,950	155	-	1,795	-	-	-	-	-	-	-	-
Germany,Fed.Rep.	879	868	-	11	-	-	-	-	-	-	-	-
Poland	18,483	-	-	313	5,147	13,023	-	-	-	-	-	-
Sweden	7,111	-	-	1,366	2,025	712	1,312	1,683	11	2	-	-
USSR	34,003	-	-	-	-	18,559	-	9,001	4,471	-	-	1,972
Total	69,497	3,928	-	3,958	7,942	32,294	1,312	10,684	6,354	5	-	3,020
1986												
Denmark	5,954	4,816[2]	-	-	1,138	-	-	-	-	-	-	-
Finland[1]	2,935	-	-	-	-	-	-	-	1,882	3	-	1,050
German Dem.Rep.[1]	2,514	256	-	2,258	-	-	-	-	-	-	-	-
Germany,Fed.Rep.	473	472	-	1	-	-	-	-	-	-	-	-
Poland	23,653	-	-	765	11,292	11,596	-	-	-	-	-	-
Sweden	3,469	-	239	217	1,936	-	63	1,010	-	4	-	-
USSR	36,484	-	-	-	-	10,003	-	19,353	5,191	-	-	1,937
Total	75,482	5,544	239	3,241	14,366	21,599	63	20,363	7,073	7	-	2,987

[1]Preliminary data.
[2]Sub-division 24 included.

Table 4.1 Total catch of COD by countries in Sub-divisions 22-32.

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Faroe Islands	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	3,850	272,755
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	2,723	367,786
1983	107,624	8,927	10,521	25,154	76,474	53,740	92,248	3,063	377,751
1984	113,701	9,358	9,886	42,031	93,429	65,927	100,761	9,343	444,436
1985	107,627	7,224	6,593	31,798	63,260	54,723	78,127	6,826	356,178
1986[1]	92,618	5,960	3,179	22,422	43,236	49,572	52,148	8,846	277,981

[1] Provisional data.

Table 4.1.1 Total catch of COD in Sub-divisions 22, 23, and 24.

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
1985[1]	15,563	1,076	7,461	1,508	3,870	4,992	531	263	4,895	22,063	1,336	16,767	38,820
1986[1]	8,893	732	6,805	825	2,173	2,236	666	227	3,622	11,954	959	13,266	25,220

[1] Provisional data.

Table 4.1.2.1 Total catch of COD in Sub-divisions 25-32.

Year	Denmark	Finland	German Dem.Rep.	Germany Fed.Rep.	Poland	Sweden	USSR	Faroe Islands	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	3,850	227,699
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	2,723	314,475
1983	84,406	8,927	1,424	15,894	76,474	46,710	92,248	3,063	329,146
1984	90,089	9,358	1,793	30,483	93,429	59,685	100,761	9,343	394,941
1985[1]	83,527	7,224	1,215	26,275	63,260	49,565	78,127	6,826	316,019
1986[1]	76,188	5,960	181	19,520	43,236	45,723	52,148	8,846	251,802

[1] Provisional data.

Table 4.1.2.2 Total catch of COD in Sub-divisions 22-32.

Year	Denmark				Faroe Islands	Finland			
	22	23	24	25-28	25-28	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	3,850	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	2,723	4,557	1,368	42	2,159
1983	14,100	1,257	7,861	84,406	3,063	5,322	2,013	36	1,556
1984	13,867	1,703	8,042	90,089	9,343	5,433	2,741	7	1,177
1985	15,563	1,076	7,461	83,527	6,826	4,646	1,706	7	865
1986[1]	8,893	732	6,805	76,188	8,846	3,820	1,406	5	729

Year	Federal Republic of Germany					German Democratic Republic						
	22	24	25	26	28	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	11,340	208	21,048	7,926	603	1,774	6,319	-	1,793	-	-	-
1985	4,992	531	12,733	11,572	1,970	1,508	3,870	-	1,215	-	-	-
1986[1]	2,236	666	10,545	8,399	576	825	2,173	1	180	-	-	-

ctd.

Table 4.1.2.2 (cont'd)

Year	Poland		Sweden								
	25[4]	26	23	24	25	26	27[3]	28	29	30	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	35,261	58,168	228	6,014	33,493	4,413	8,223	11,947	1,338	271	-
1985	19,332	43,928	263	4,895	22,737	8,170	7,068	9,523	1,115	929	23
1986[1]	18,297	24,939	227	3,622	19,214	7,764	7,554	9,606	1,233	298	54

Year	USSR						Total
	25	26	27	28	29	32	
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	272,755
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	363,466
1983	-	33,600	-	39,464	6,095	13,089	377,751
1984	-	39,871	-	43,802	6,185	10,903	444,436
1985	-	32,096	-	27,137	8,822	10,072	356,178[5]
1986[1]	-	22,818	-	21,840	3,289	4,201	277,981[5]

[1] Provisional.
[2] Finland: 1971-1974, Sub-divs. 29-32 combined.
[3] Sweden: 1971-1974, Sub-divs. 27 and 29 combined.
[4] Poland: some by-catches from Sub-division 24 included.
[5] Sum of figures used in assessments.

Table 4.2 Total catch (t) of FLOUNDER in Sub-divisions 22-32.

	Denmark				Finland				German, Dem.Rep.				Germany, Fed. Rep.			Poland		
Year	22	23	24-25	Total	29	30	32	Total	22	24	25-26[2]	Total	22	24	Total	24-25	26	Total
1973	1,983	-	386	2,279	-	-	-	-	181	1,624	1,518	3,323	349	4	353	1,812	2,113	3,925
1974	2,097	-	2,578[1]	4,675	-	-	-	-	165	1,482	654	2,301	804	2	306	1,783	2,595	4,378
1975	1,992	-	1,678[1]	3,670	113	22	47	182	163	1,469	406	2,038	469	1	470	2,052	2,733	4,785
1976	2,038	-	482	2,520	118	23	59	200	174	1,556	901	2,630	392	6	398	1,727	2,377	4,104
1977	1,974	-	389	2,363	115	32	56	203	555	2,708	1,096	3,263	393	4	397	2,348	2,170	4,518
1978	2,965	-	415	3,380	174	61	155	390	348	2,572	-	2,720	477	1	478	1,636	2,399	4,035
1979	2,451	-	405	2,856	192	54	153	399	189	2,509	-	2,698	259	3	262	1,814	2,118	3,932
1980	2,185	-	286	2,471	194	69	165	428	138	2,775	-	2,913	212	1	213	1,613	1,380	2,993
1981	1,964	-	548	2,512	227	56	135	418	271	2,595	-	2,866	351	1	352	1,151	1,541	2,692
1982	1,563	104	257	1,924	219	58	144	421	263	3,202	-	3,465	248	1	249	2,484	1,623	4,107
1983	1,714	115	450	2,279	181	67	120	368	281	3,572	-	3,853	418	-	419	1,828	905	2,733
1984	1,733	85	306	2,123	174	108	135	417	349	2,270	-	3,069	371	1	372	2,471	1,285	3,756
1985	1,561	130	649	2,340	157	97	137	391	236	3,253	-	3,489	199	3	203	1,818	1,302	3,120[6]
1986	1,465	65	1,246	2,796	164	102	144	410	127	2,838	-	2,965	125	3	129	2,231	1,784	4,015

Year	Sweden[4]						USSR[5]						Total
	24	25	27	28	29-30	Total	25	26	28	29	32	Total	22 - 32
1973	-	502[3]	-	-	-	502	-	-	2,610	-	-	2,610	12,992
1974	-	470	-	-	-	470	-	-	2,510	-	-	2,510	14,640
1975	-	400	-	-	-	400	-	-	6,455	-	-	6,455	18,000
1976	-	400	-	-	-	400	35	436	1,779	409	359	3,018	13,270
1977	-	416	-	-	-	416	-	210	1,081	321	414	2,026	13,183
1978	-	346	-	-	-	346	-	288	1,290	334	395	2,307	13,656
1979	-	315	-	-	-	315	1	157	1,170	330	1,012	2,670	13,132
1980	16	46	20	181	32	295	-	93	798	334	1,080	2,305	11,618
1981	21	30	21	194	34	300	-	58	742	445	1,078	2,323	11,463
1982	27	31	9	72	4	143	-	195	665	615	1,121	2,596	12,905
1983	26	50	11	53	5	145	-	-	-	-	-	-	9,797
1984	14	42	9	50	2	117	-	-	-	-	-	-	9,854
1985	19	48	8	30	2	107	-	-	-	-	-	-	9,650
1986[4]	20	66	15	22	1	123	-	-	-	-	-	-	10,438

[1] Flounder landed for industrial purposes in Sub-divisions 24 and 25 included.
[2] 90% of the catch caught in Sub-division 25 and 10% in Sub-division 26.
[3] Sub-divisions 24, 25, 27, and 30 combined until 1979.
[4] Provisional data.
[5] USSR catch data for 1983-1986 not available at this meeting.
[6] Polish catches in Sub-divisions 24-25 assumed.

Table 5.2.1

Annual nominal catches in tonnes of Baltic salmon in 1977-1986.
(S = Sea; C = Coastal; R = River).

Year	Baltic Main Basin (Sub-divisions 24-29)							
	Denmark	Finland		Fed.Rep.of Germany	Poland	Sweden	USSR	
	S	S	C	S	S	S	S	C/R
1977	951	134	-	77	6	317	68	96
1978	810	191	-	22	4	252	90	48
1979	815	199	-	31	4	264	167	29
1980	849	305	-	40	22	325	303	16
1981	844	302	-	43	45	401	282	17
1982	604	212	-	20	38	375	275	31
1983	697	189	-	25	76	370	362	105
1984	1,145	263	2	32	72	549	491	89
1985	1,351	303	2	30	162	842	426	90
1986[1]	862	320	24	41	137	771	414	130

Year	Gulf of Bothnia (Sub-divisions 30-31)							Gulf of Finland (Sub-division 32)					Total
	Denmark	Finland			Sweden			Finland			USSR		
	S	S	C	R	S	C	R	S	C	R	S	C/R	
1977	60	348	142	-	49	240	60	75	-	-	-	13	2,649
1978	-	127	145	-	18	212	40	68	1	-	-	6	2,040
1979	-	172	121	-	20	171	35	63	3	-	-	4	2,098
1980	-	162	148	-	23	172	35	51	2	-	11	7	2,469
1981	-	190	157	-	26	242	35	65	1	-	5	2	2,657
1982	-	177	133	-	-	135	30	102	27	-	-	5	2,164
1983	-	193	161	-	-	140	32	129	65	-	-	2	2,546
1984	-	454	245	-	-	140	52	165	62	-	12	-	3,773
1985	-	262	297	4	-	114	38	143	149	2	22	2	4,191
1986[1]	-	100	230	4	-	157	41	200	150	2	52	1	3,637

[1] Preliminary data. 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 5.2.1

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 offshore catches 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.

The main part of the coastal and river catches of Baltic salmon by the USSR are 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 some non-commercial catches. In the Gulf of Finland, such catches comprise one third of the total yield.

The Finnish catches in the rivers were not estimated before 1985.

Table 5.2.2

Number of female spawners required for some Swedish river stocks and number of such fish caught and stripped, 1975-1986.

River	Number required	Category	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Lule	300	Catch	533	254	301	152	231	251	340	416	405	345	191	416
		Stripped	217[1]	167[1]	287	108	215[3]	227[3]	288[2]	299	298	313	182	394
Skellefte	60	Catch	60	64	80	60	91	54	66	35	51	53	46	74
		Stripped	47	59	73	45	89	54	62	35	48	50	42	68
Indal	250	Catch	490[2]	283[2]	211[2]	257	265	198	325	488	544	616	412[2]	604[2]
		Stripped	202[1]	198[1]	165	151[3]	205[3]	171	214[3]	182[3]	226[3]	219[3]	251	245
Ume Reared stock	75	Catch	159	86	95	130	140	127	82	131	82	57	82	52
Ume Wild stock	1500	Catch	187	309	457	629	648	443	194	134	140	159	316	136

[1] High mortality rate due to UDN.

[2] Number of females selected for stripping from the catch.

[3] Some females not suitable for stripping for various reasons.

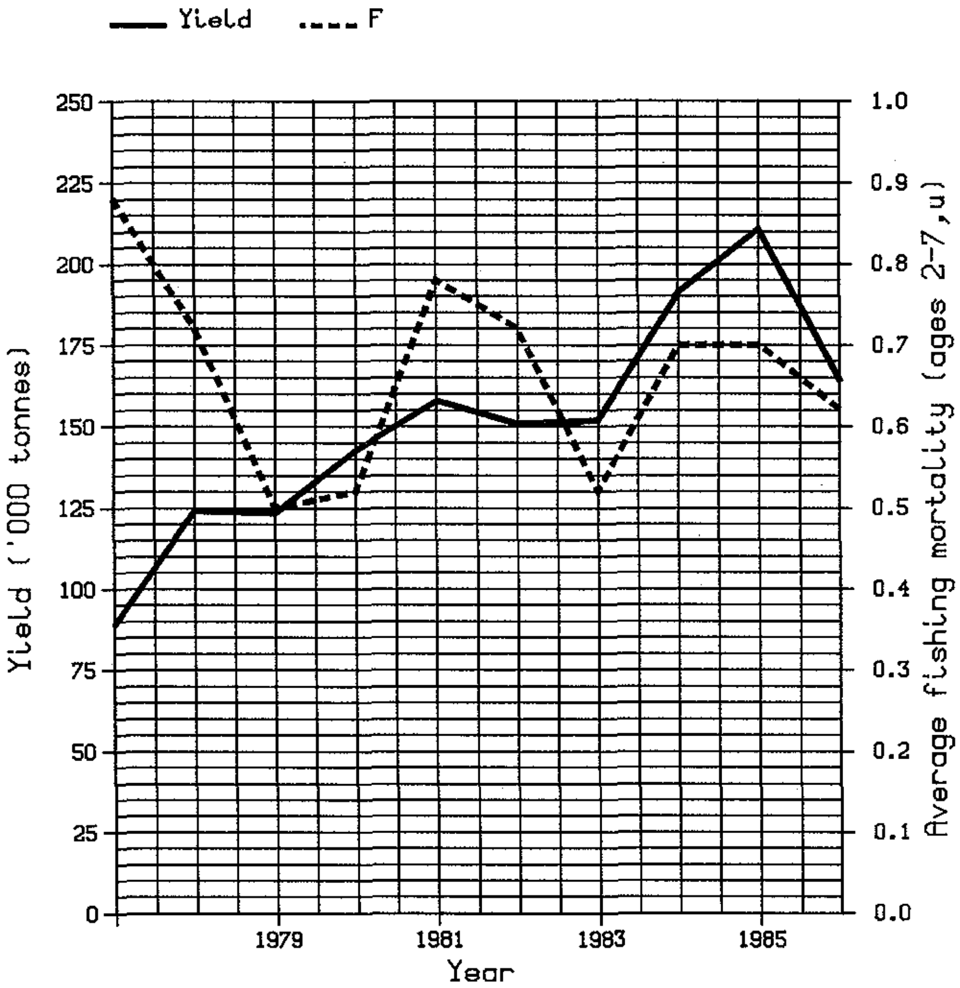
FISH STOCK SUMMARY

Figure 3.1.1

STOCK: Herring – Div. IIIa and Sub-divs. 22–24

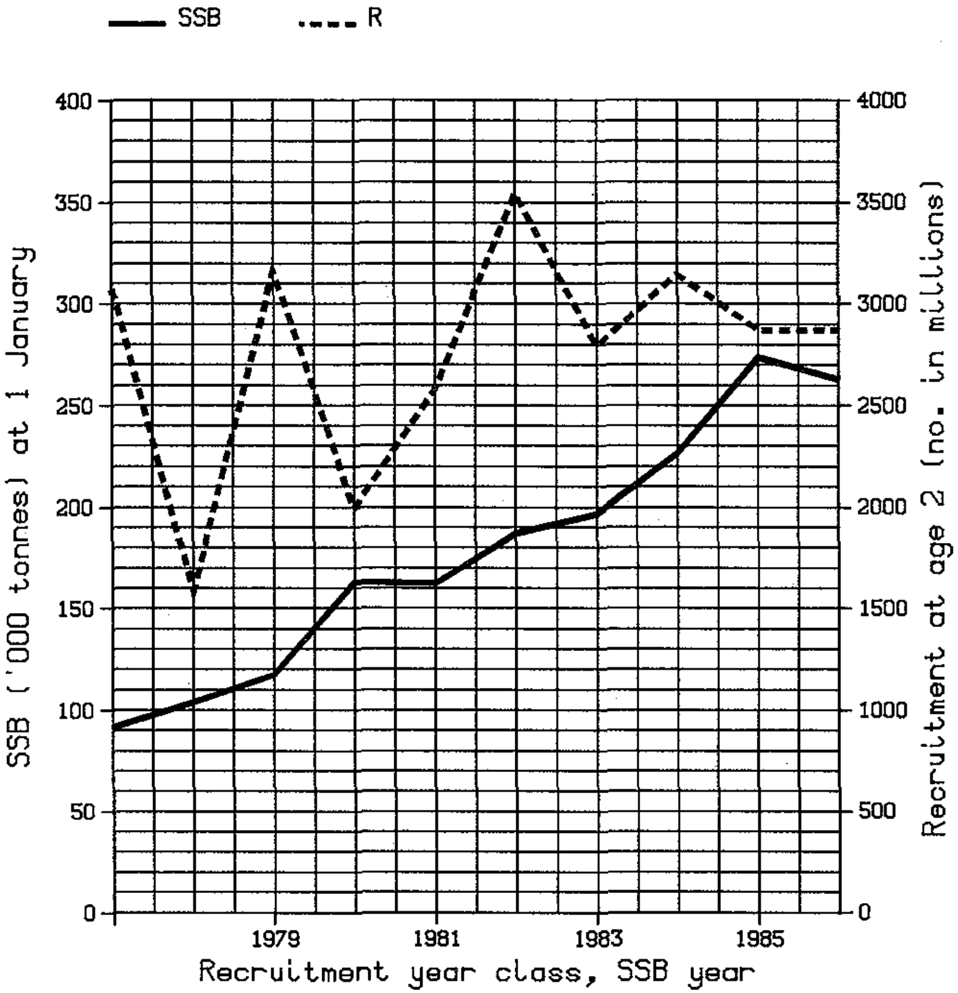
22–04–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



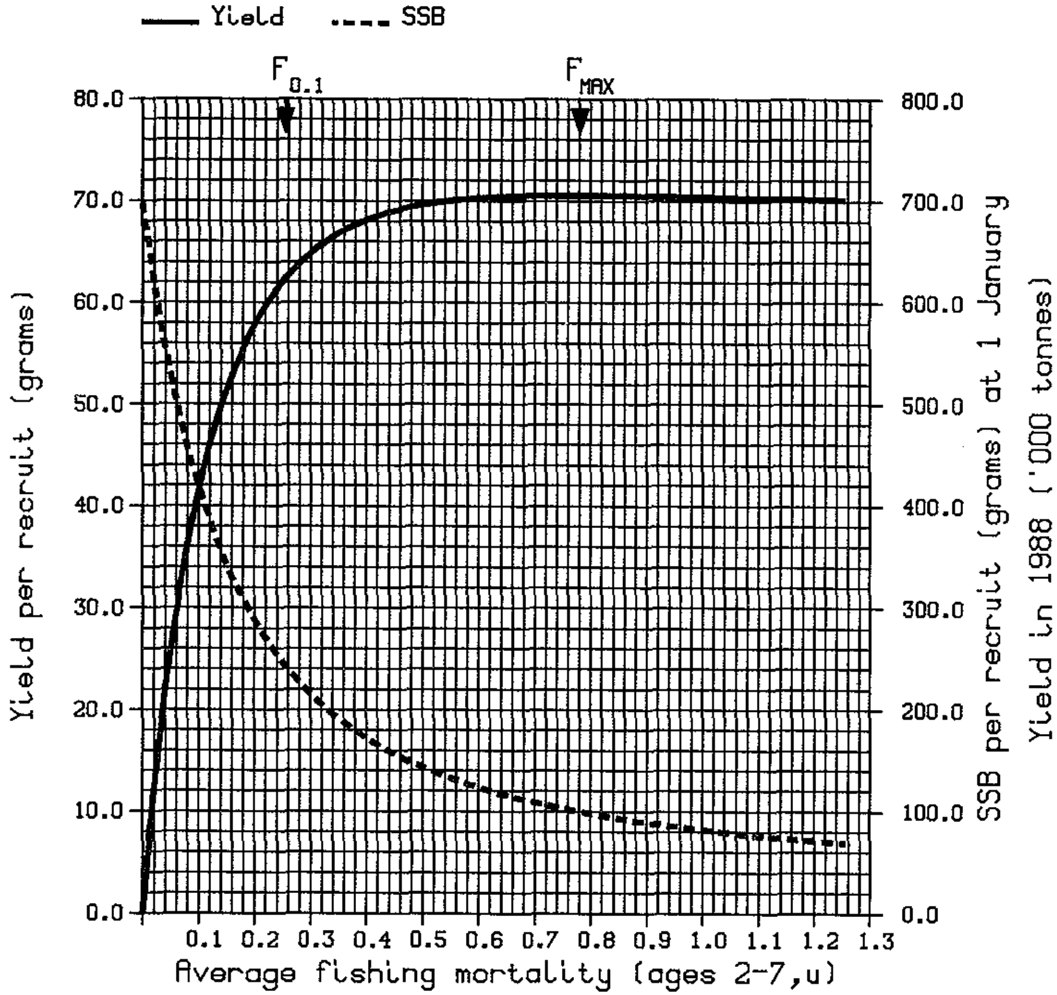
B

cont'd.

Figure 3.1.1 (cont'd)

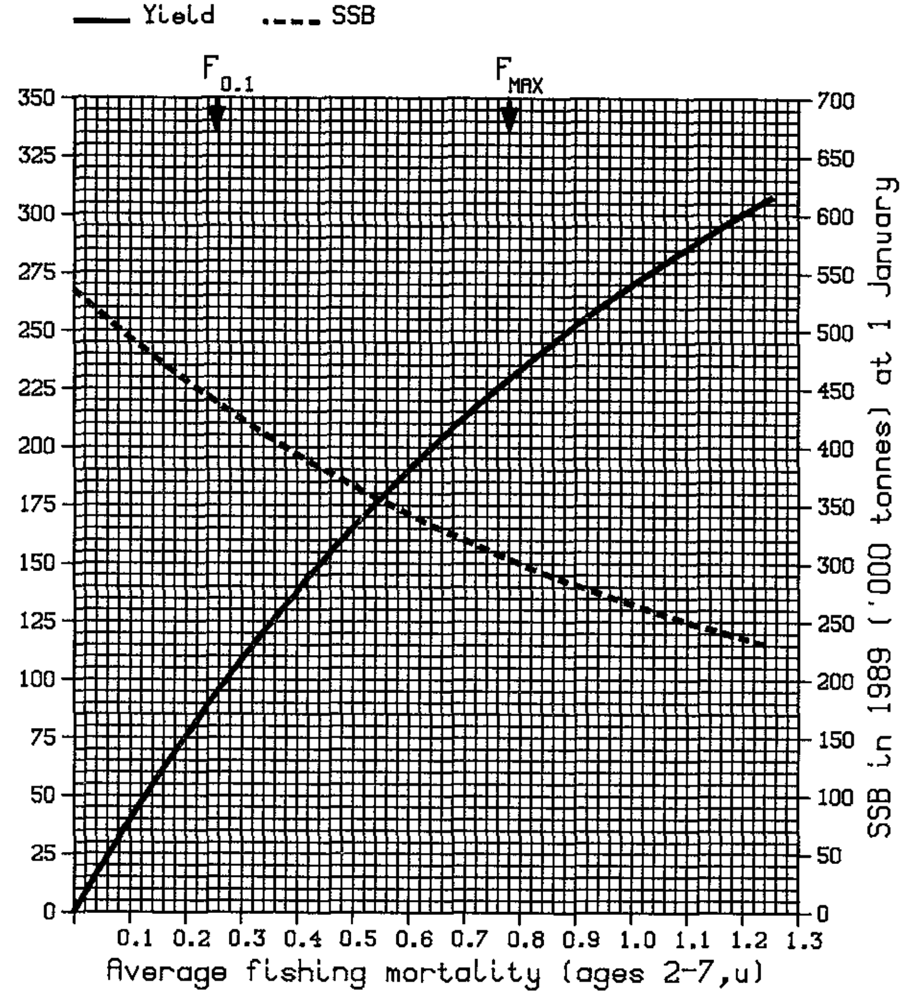
FISH STOCK SUMMARY
STOCK: Herring – Div. IIIa and Sub-divs. 22–24
22–04–1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass

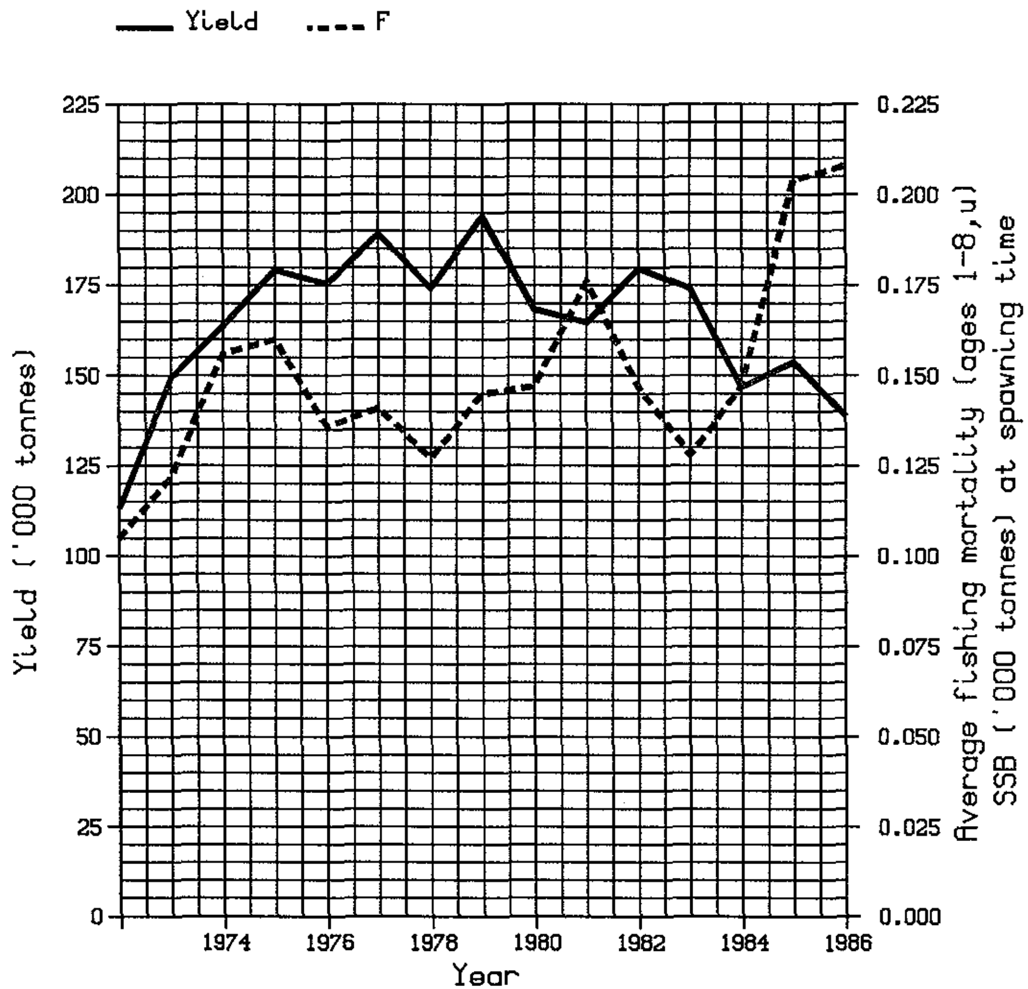


D

FISH STOCK SUMMARY
STOCK: Herring – Sub-divs. 25–27
22–04–1987

Figure 3.1.2

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB)
and recruitment (R)

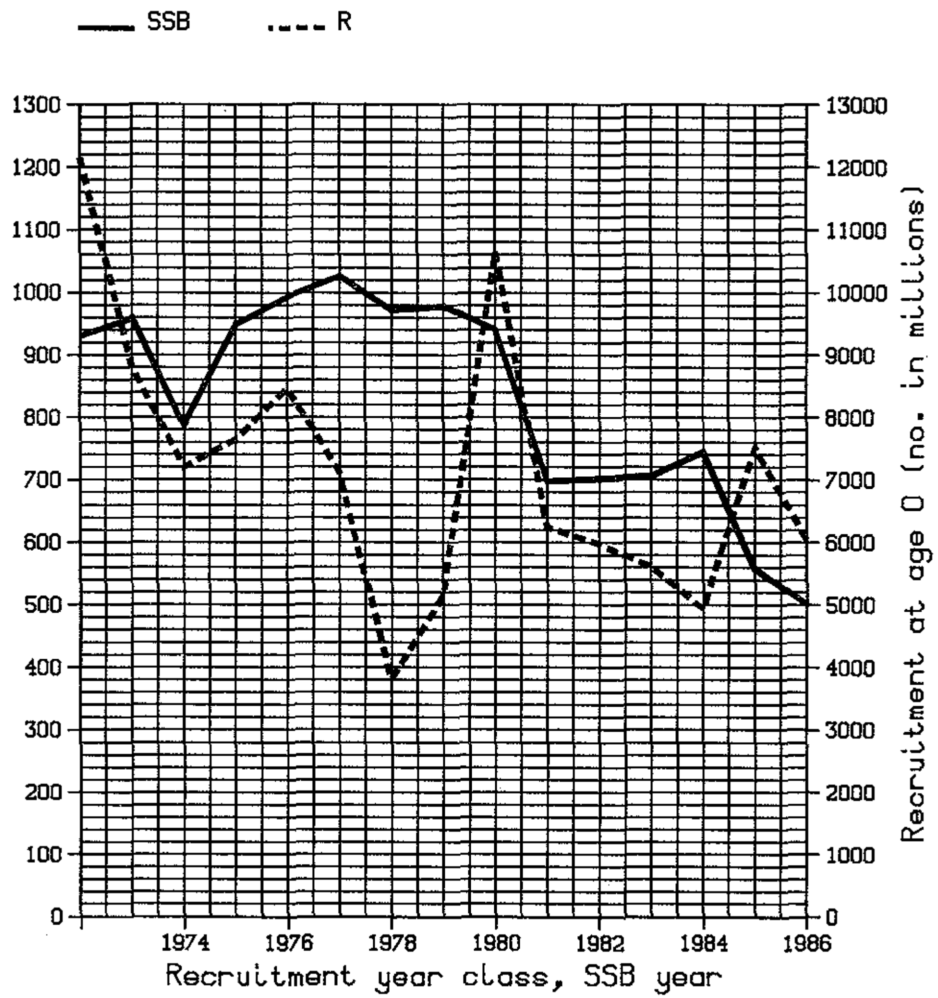


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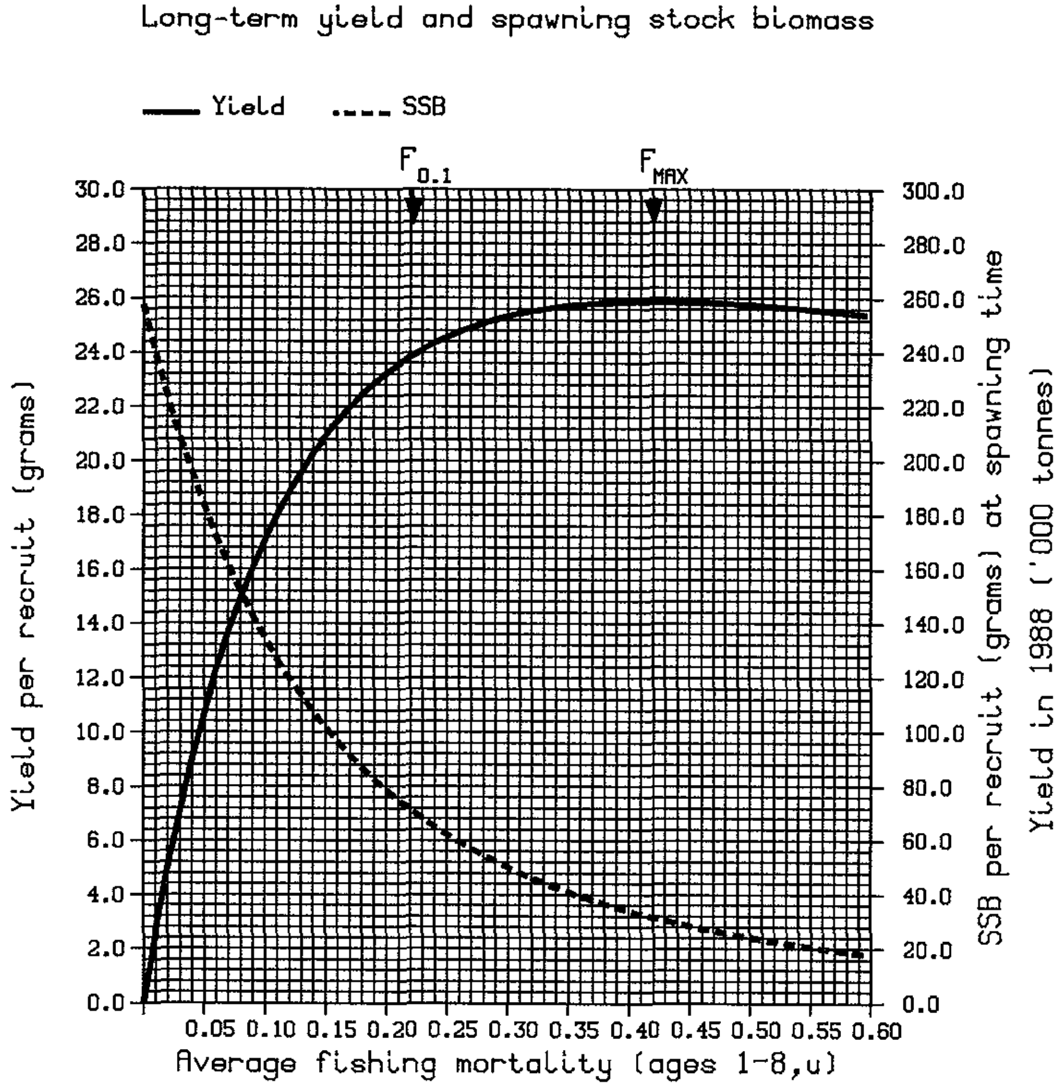
Figure 3.1.2 (cont'd)

FISH STOCK SUMMARY
STOCK: Herring – Sub–divs. 25–27
22–04–1987



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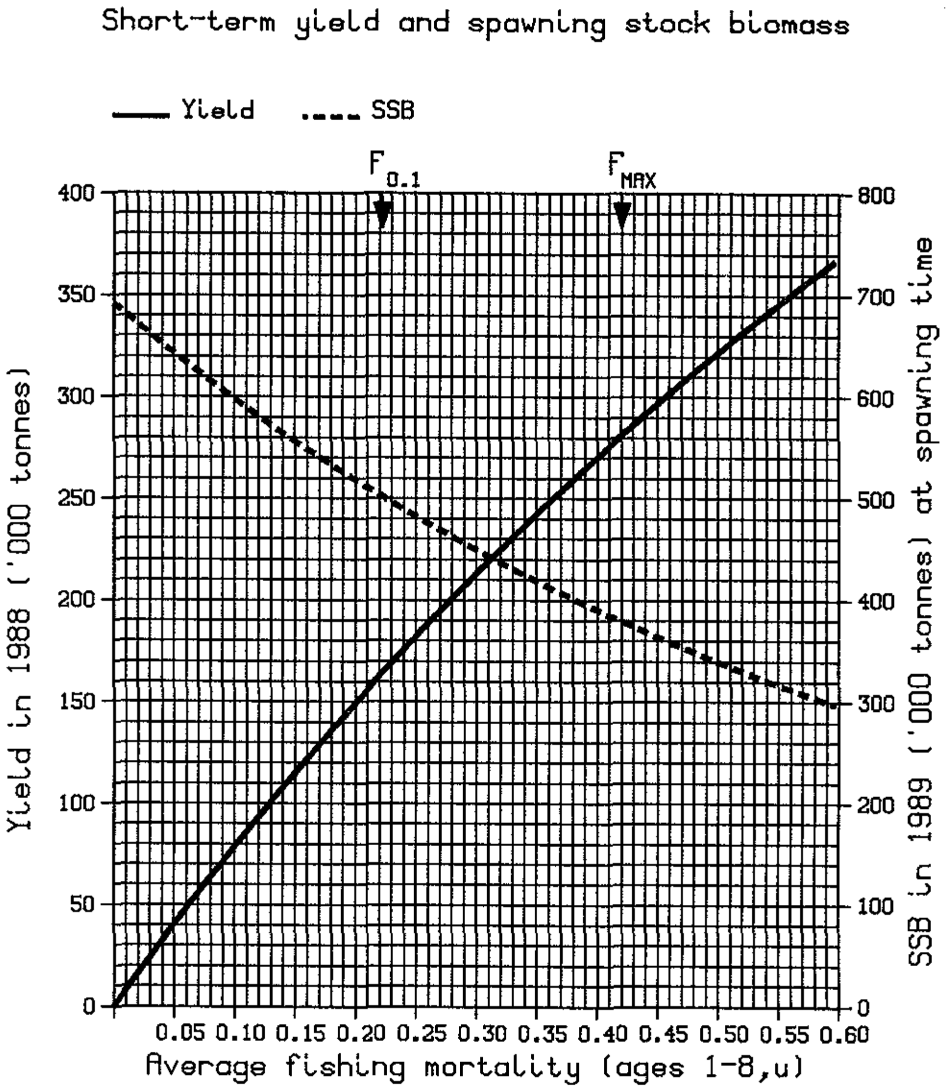
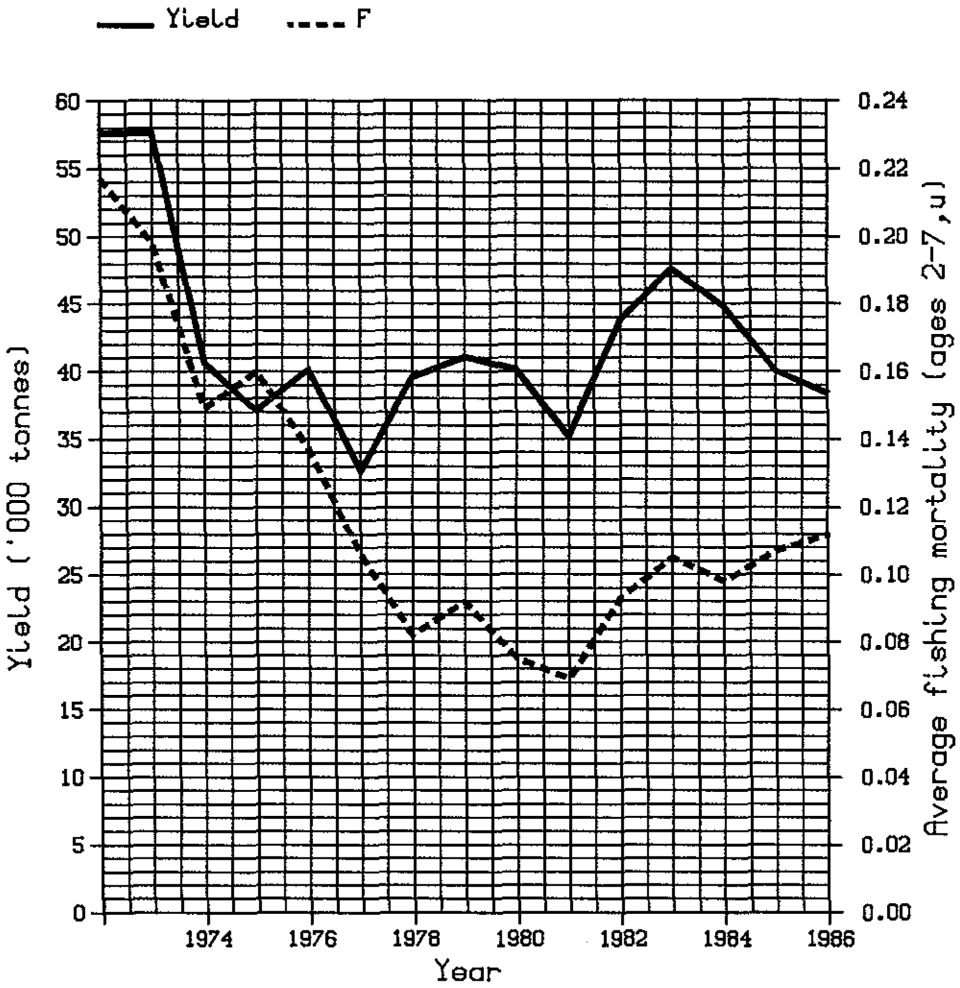


D

FISH STOCK SUMMARY
STOCK: Herring – 28 and 29S
23–04–1987

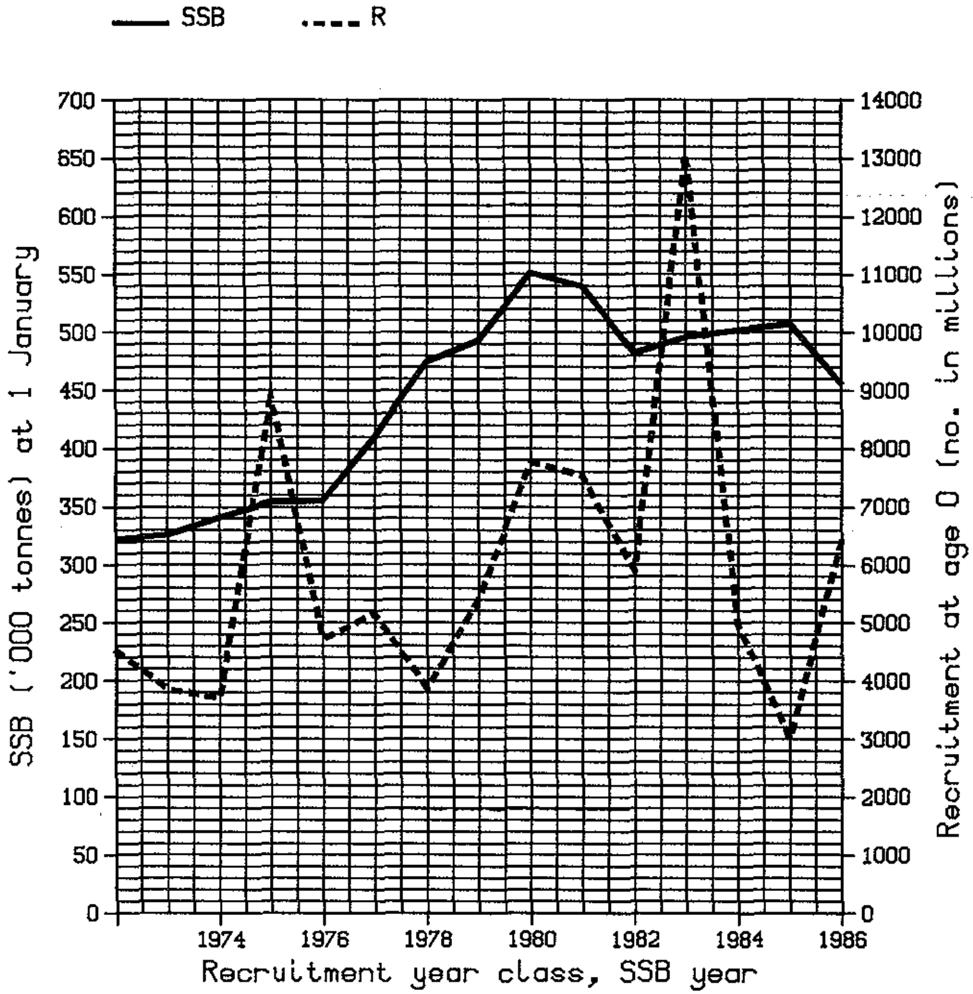
Figure 3.1.3

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

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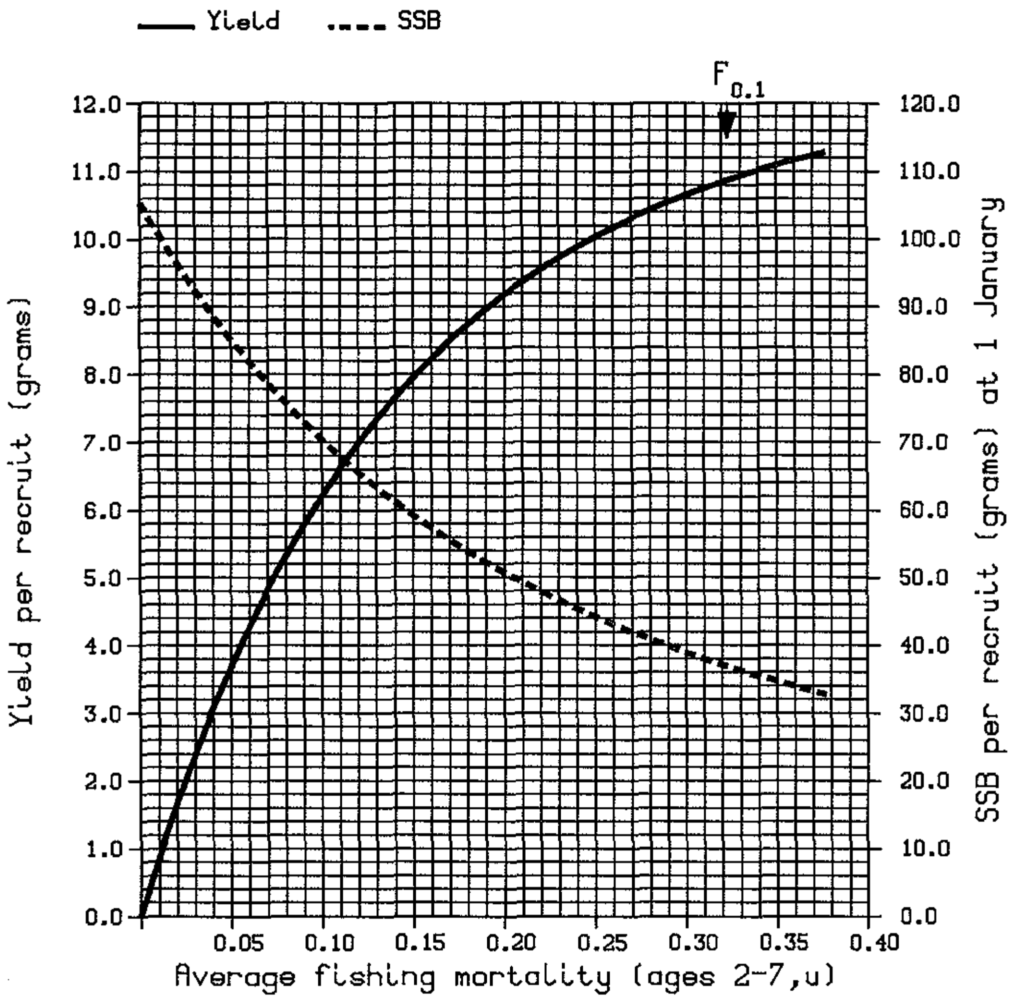
Figure 3.1.3 (cont'd)

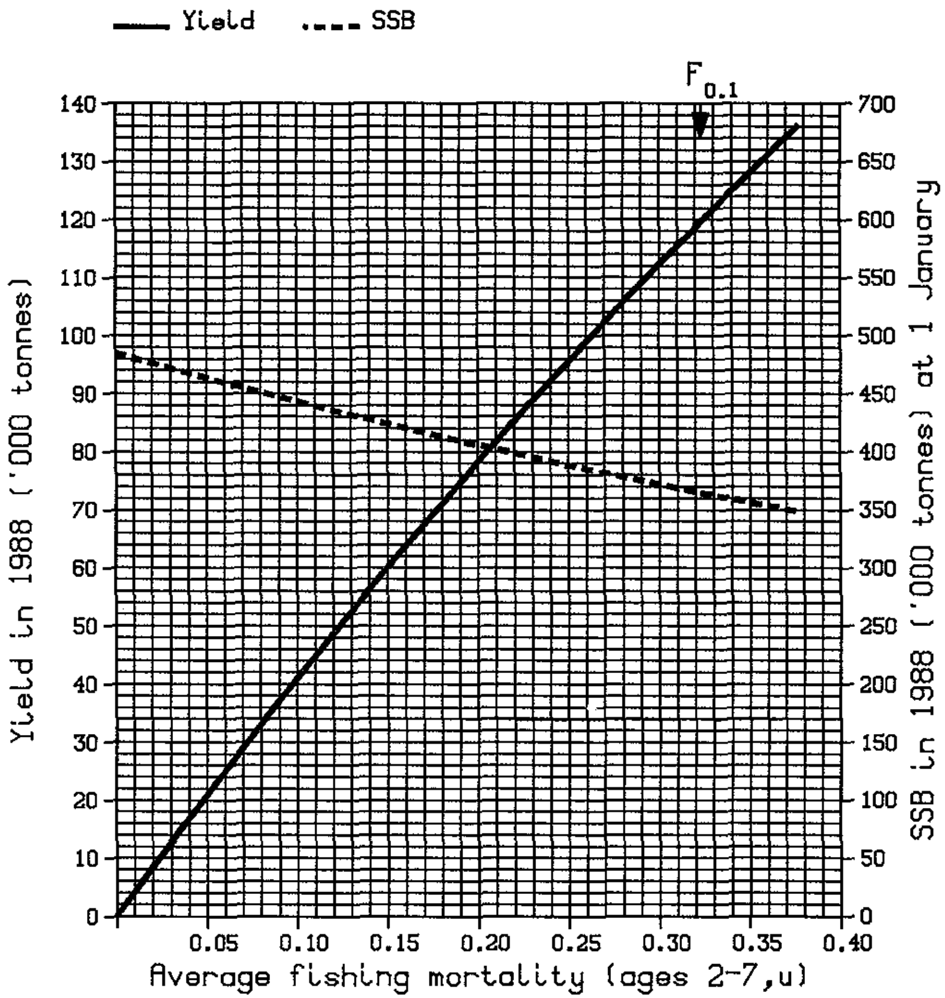
FISH STOCK SUMMARY
STOCK: Herring – 28 and 29S
23–04–1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



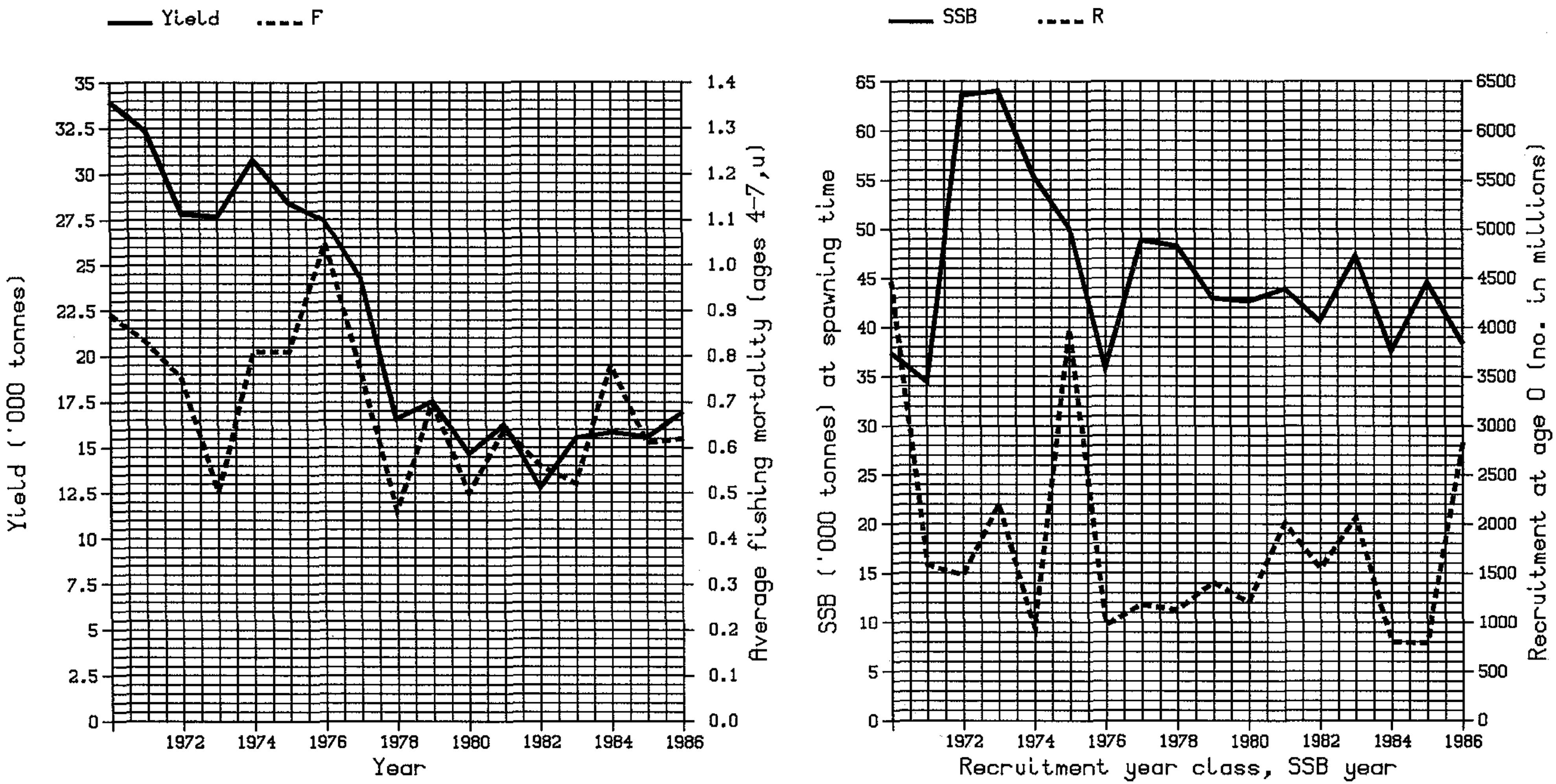
D

Figure 3.1.4

FISH STOCK SUMMARY
STOCK: Herring – Gulf of Riga
22–04–1987

Trends in yield and fishing mortality (F)

Trends in spawning stock biomass (SSB) and recruitment (R)



A

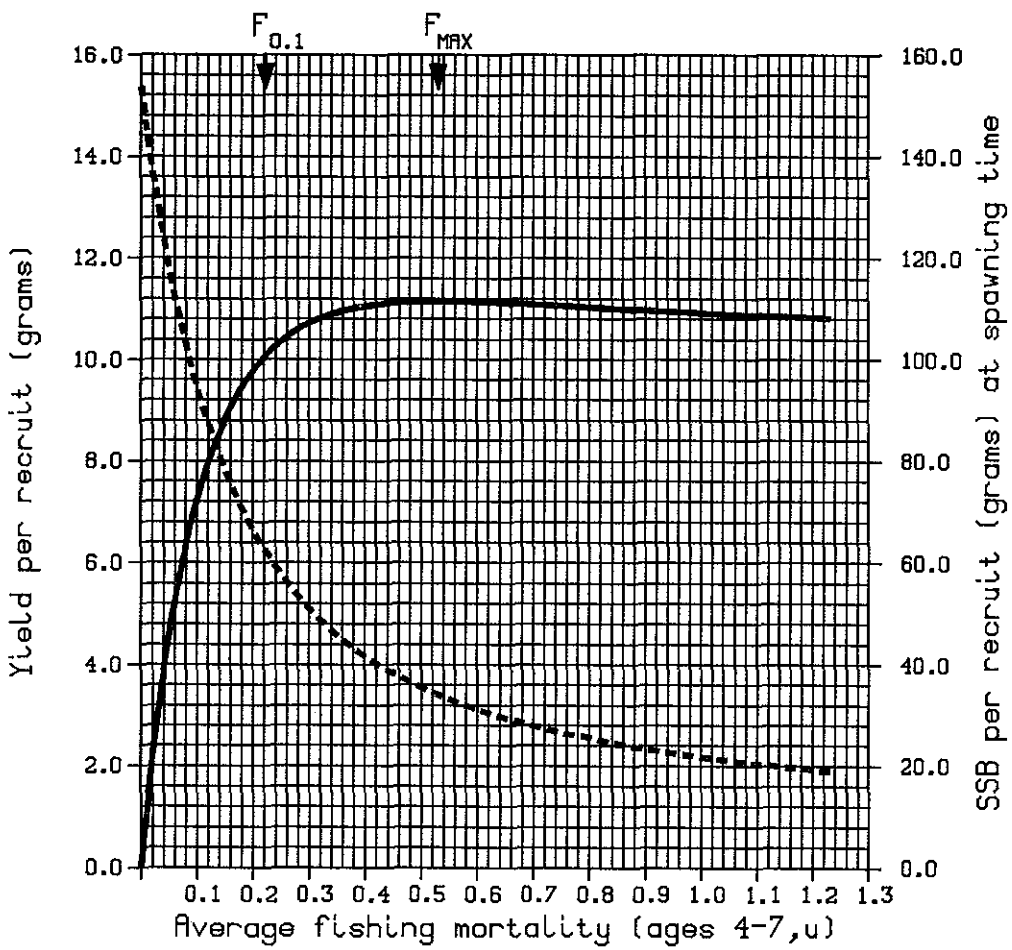
B

Cont'd.

Figure 3.1.4 (cont'd)

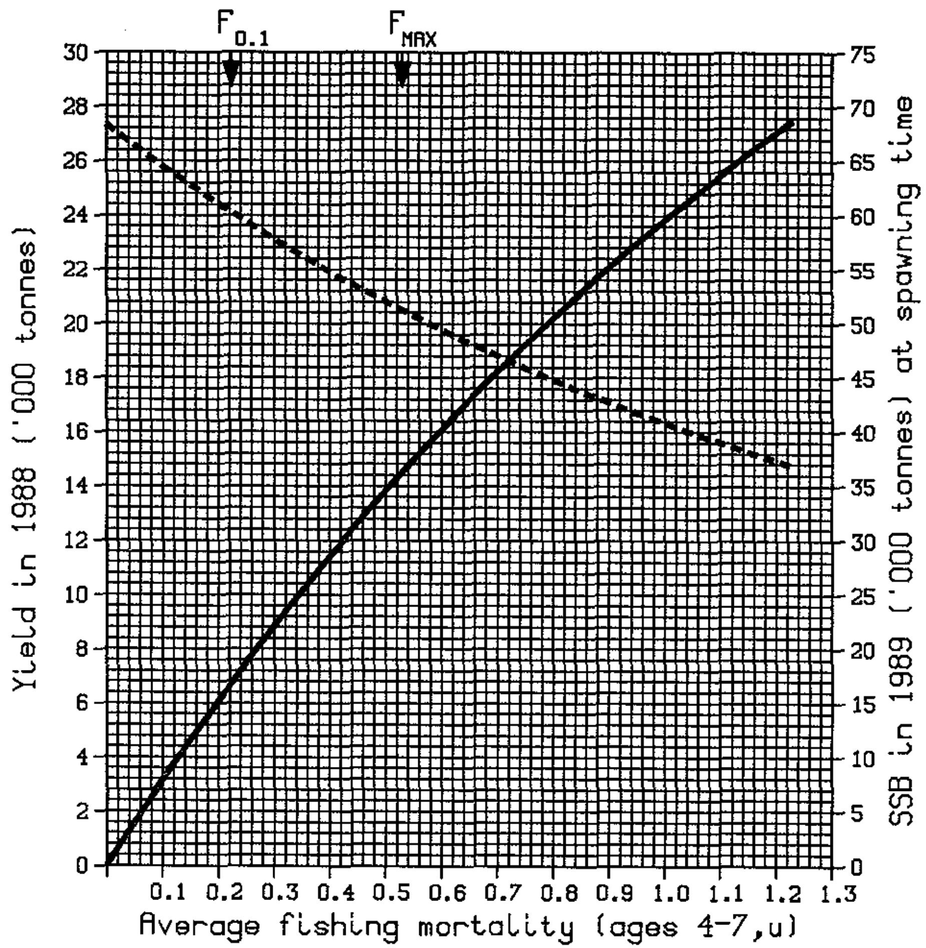
FISH STOCK SUMMARY
STOCK: Herring – Gulf of Riga
22–04–1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass

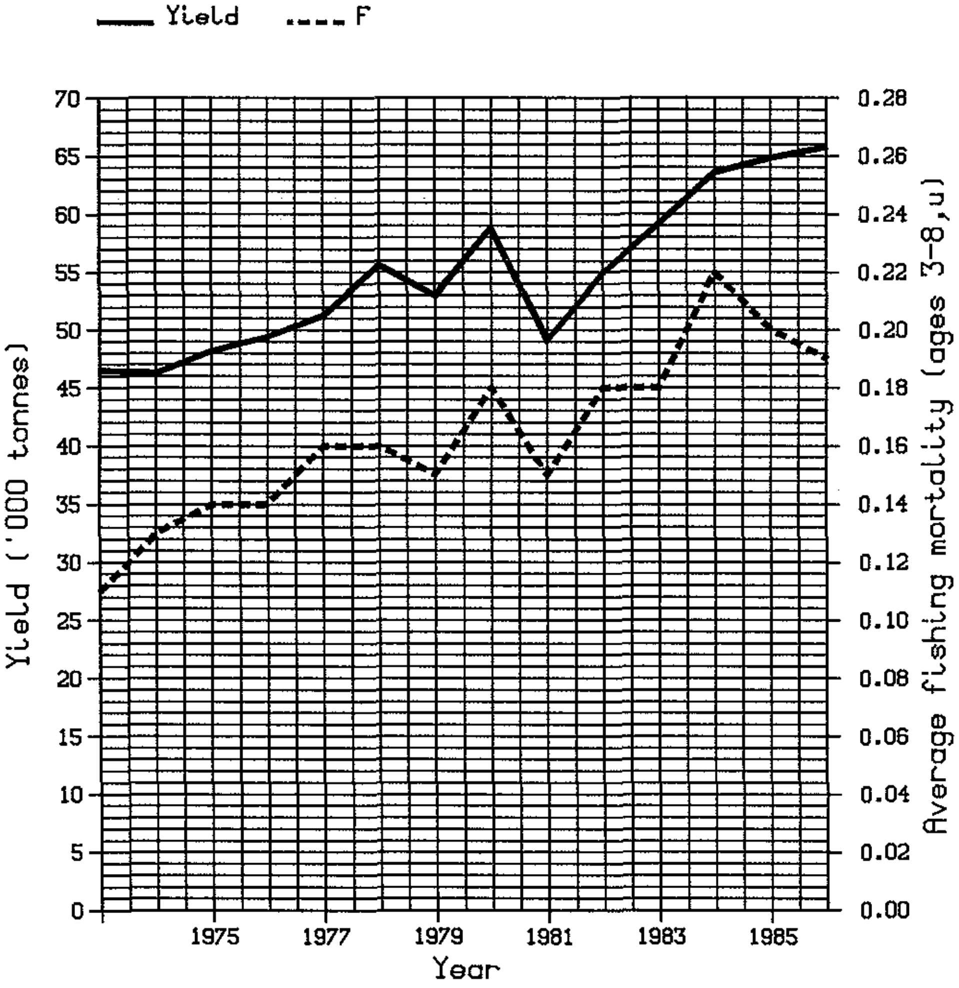


D

FISH STOCK SUMMARY
STOCK: Herring – 29NE and 30E
23–04–1987

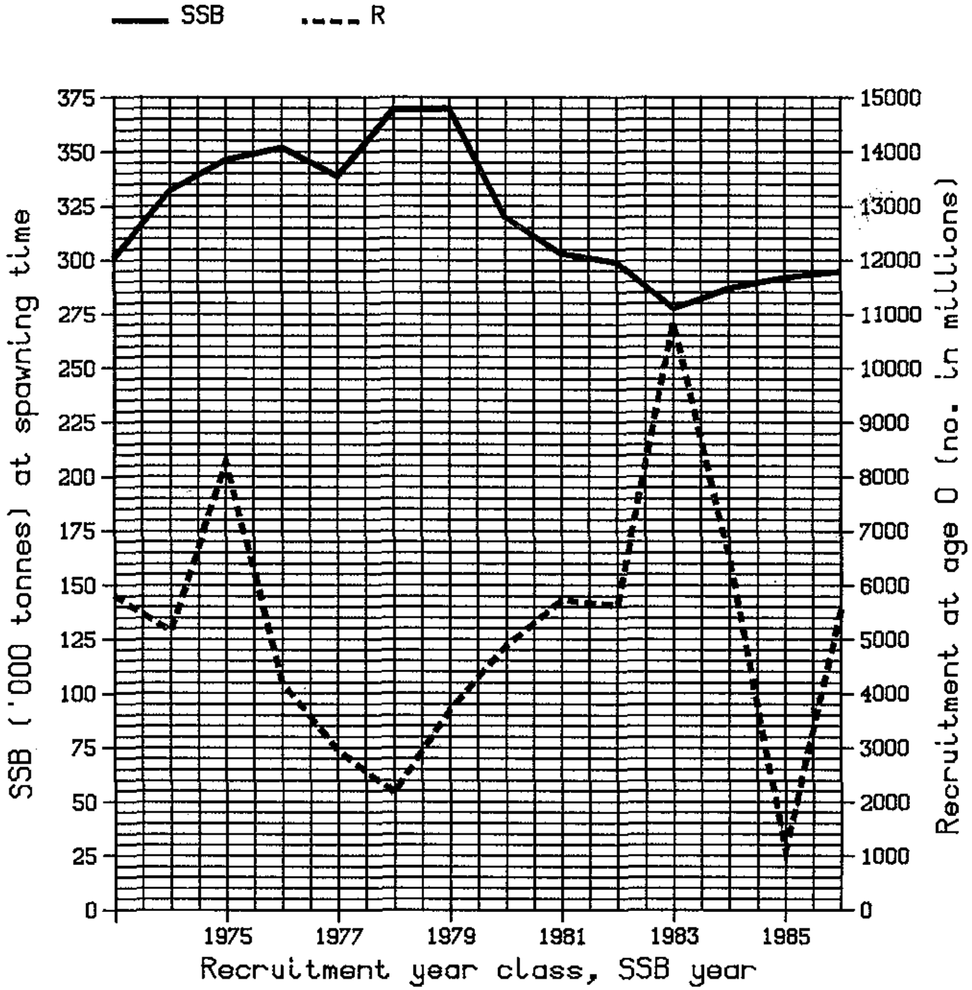
Figure 3.1.5

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

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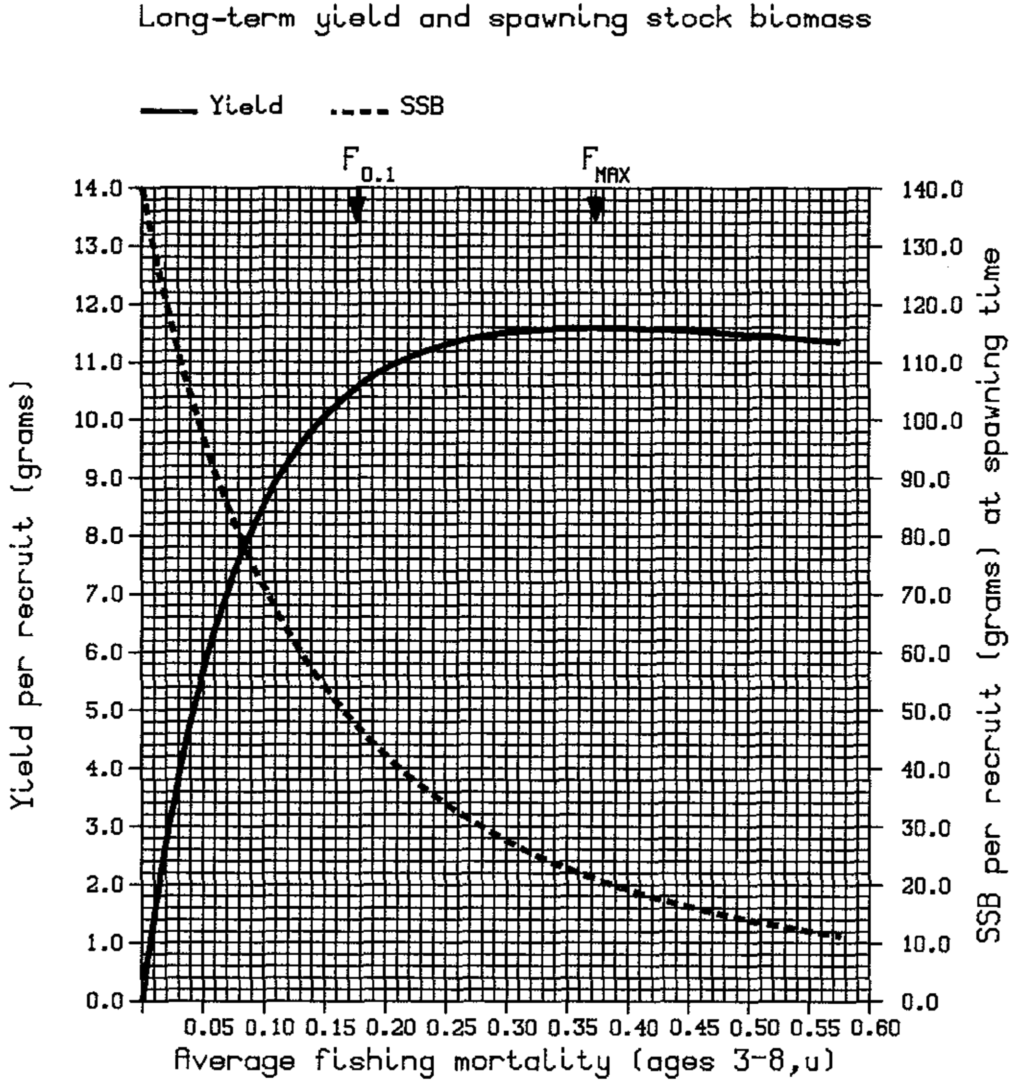
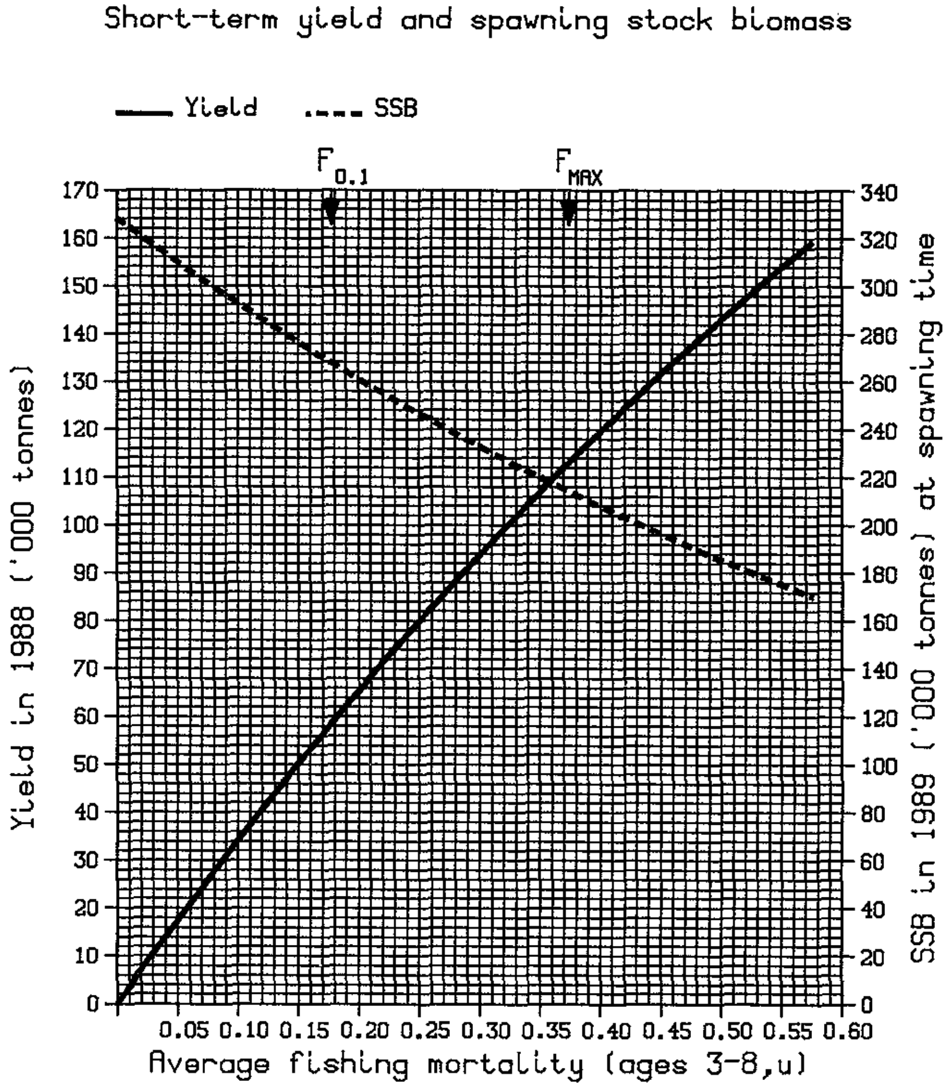
Figure 3.1.5 (cont'd)

FISH STOCK SUMMARY
STOCK: Herring – 29NE and 30E
23–04–1987



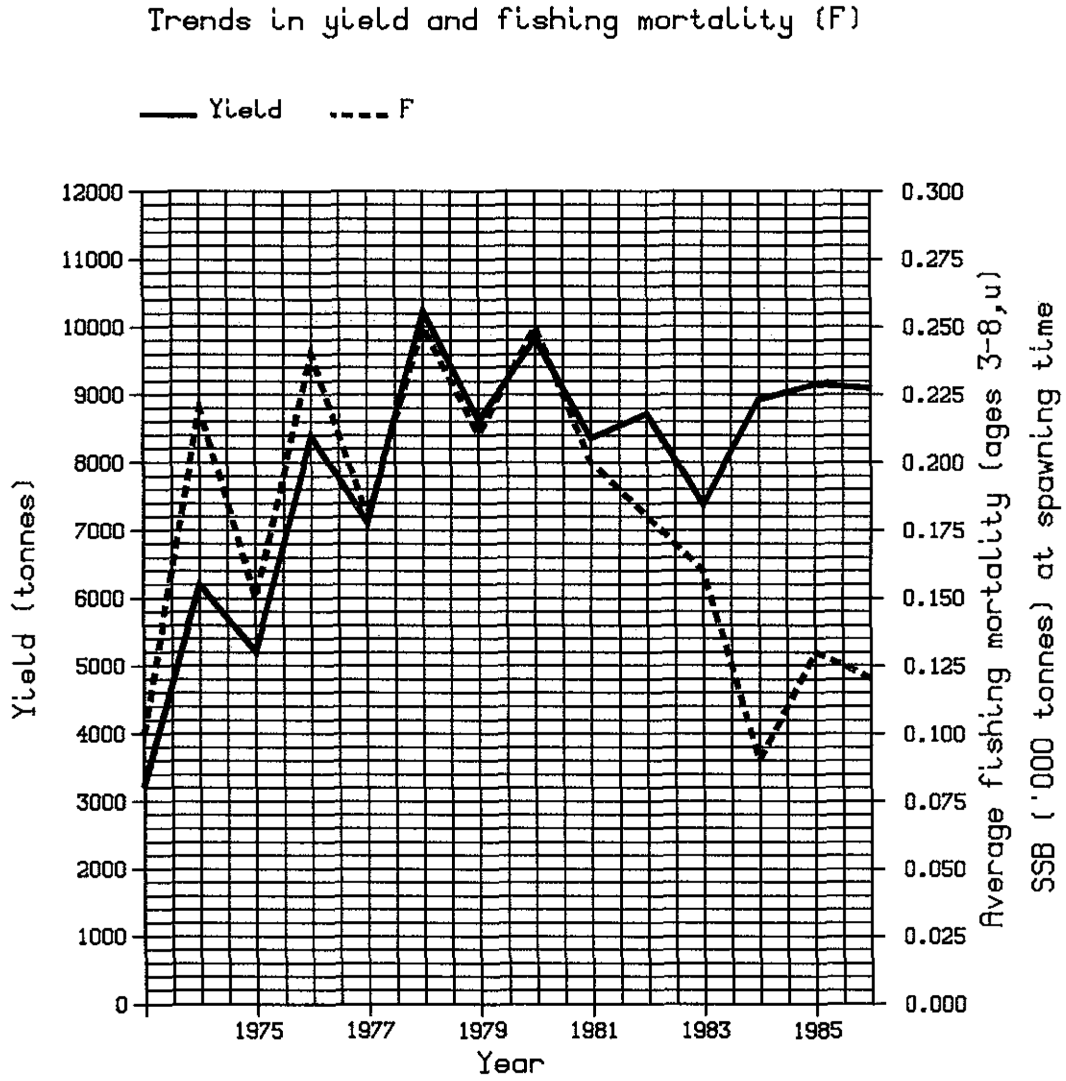
C



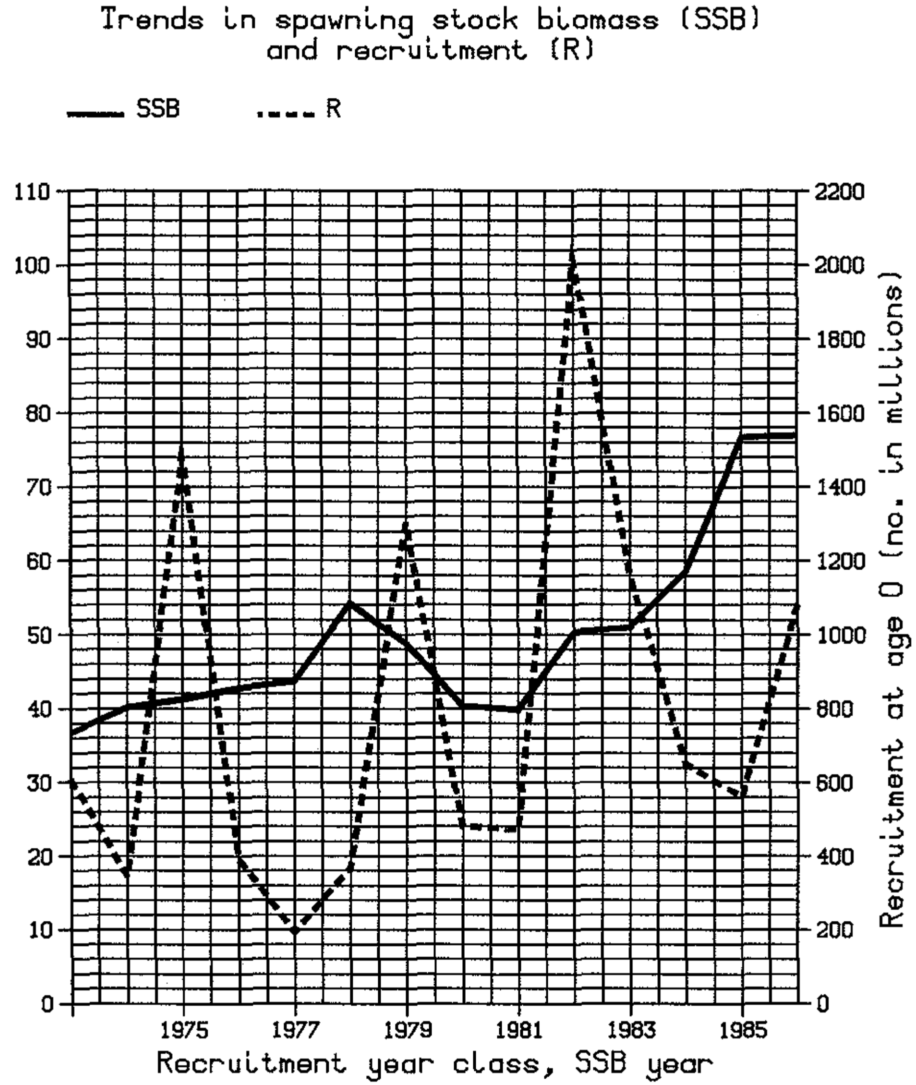
D

Figure 3.1.6

FISH STOCK SUMMARY
STOCK: Herring – 31E
23–04–1987



A



B

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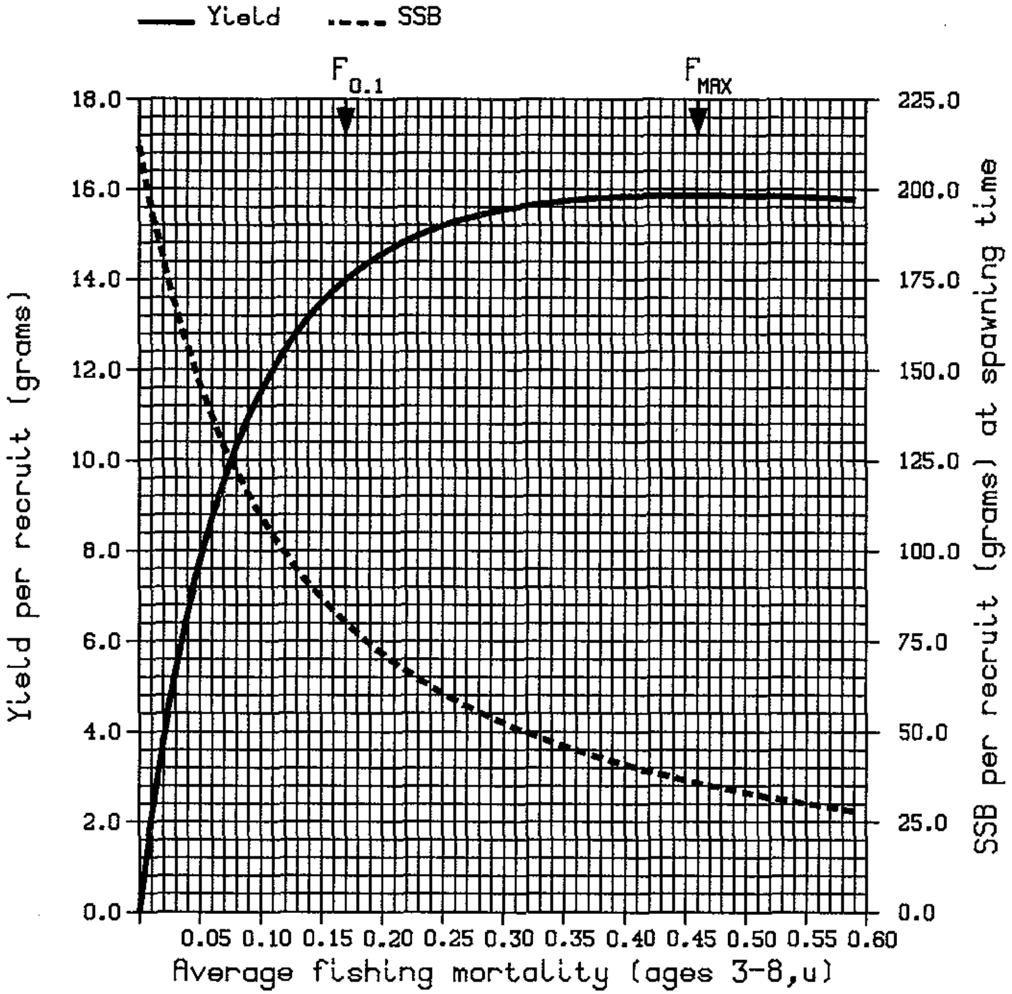
Figure 3.1.6 (cont'd)

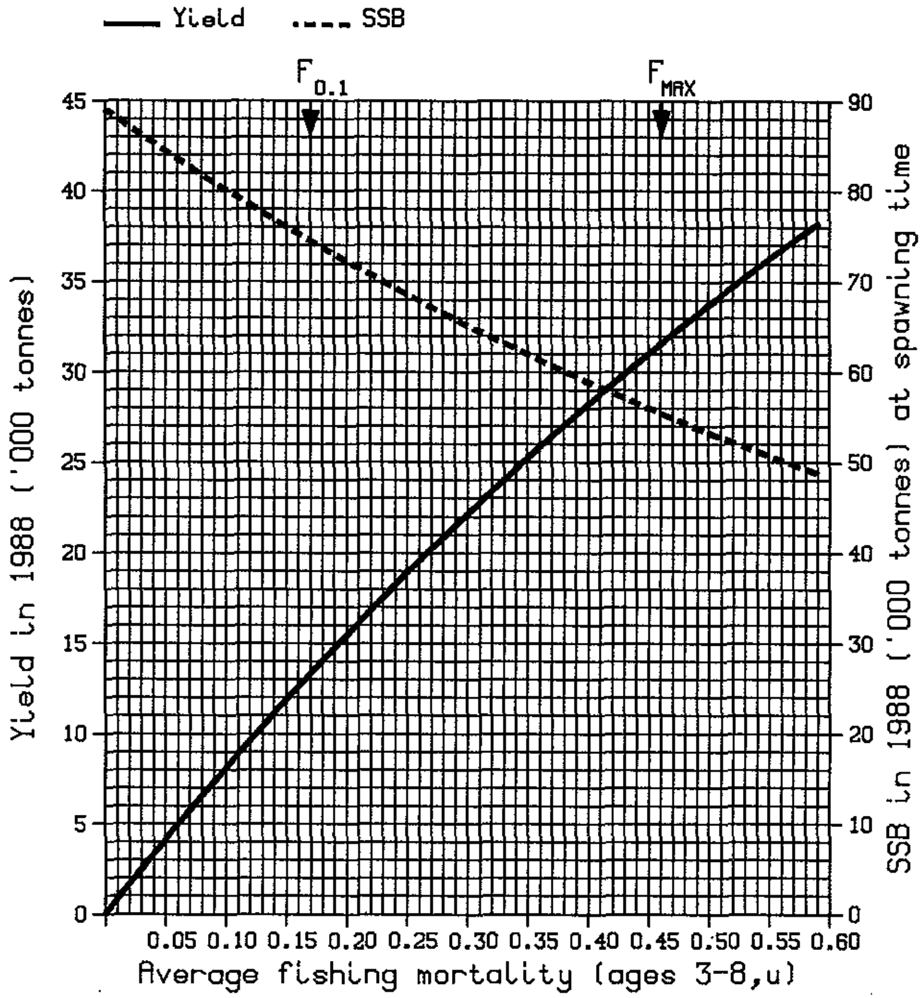
FISH STOCK SUMMARY
STOCK: Herring – 31E
23–04–1987

Long-term yield and spawning stock biomass



C

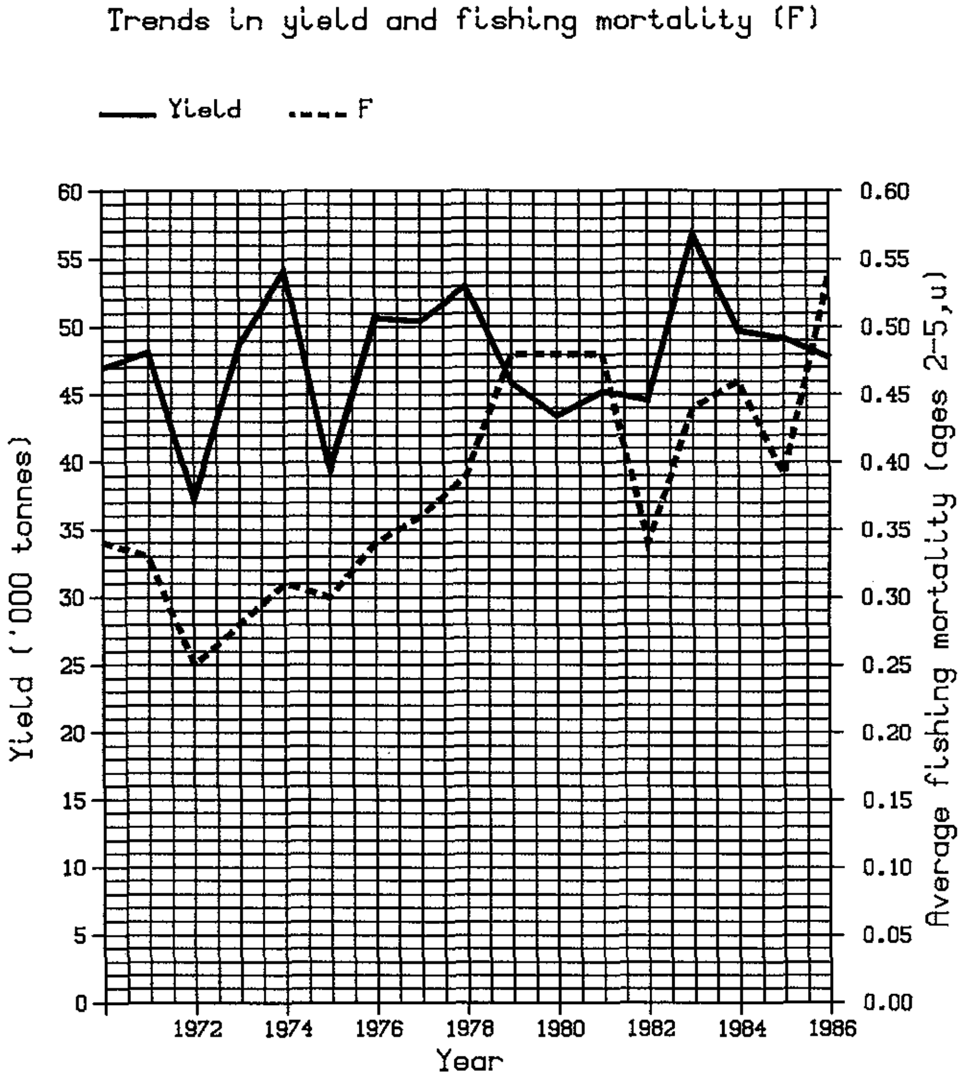
Short-term yield and spawning stock biomass



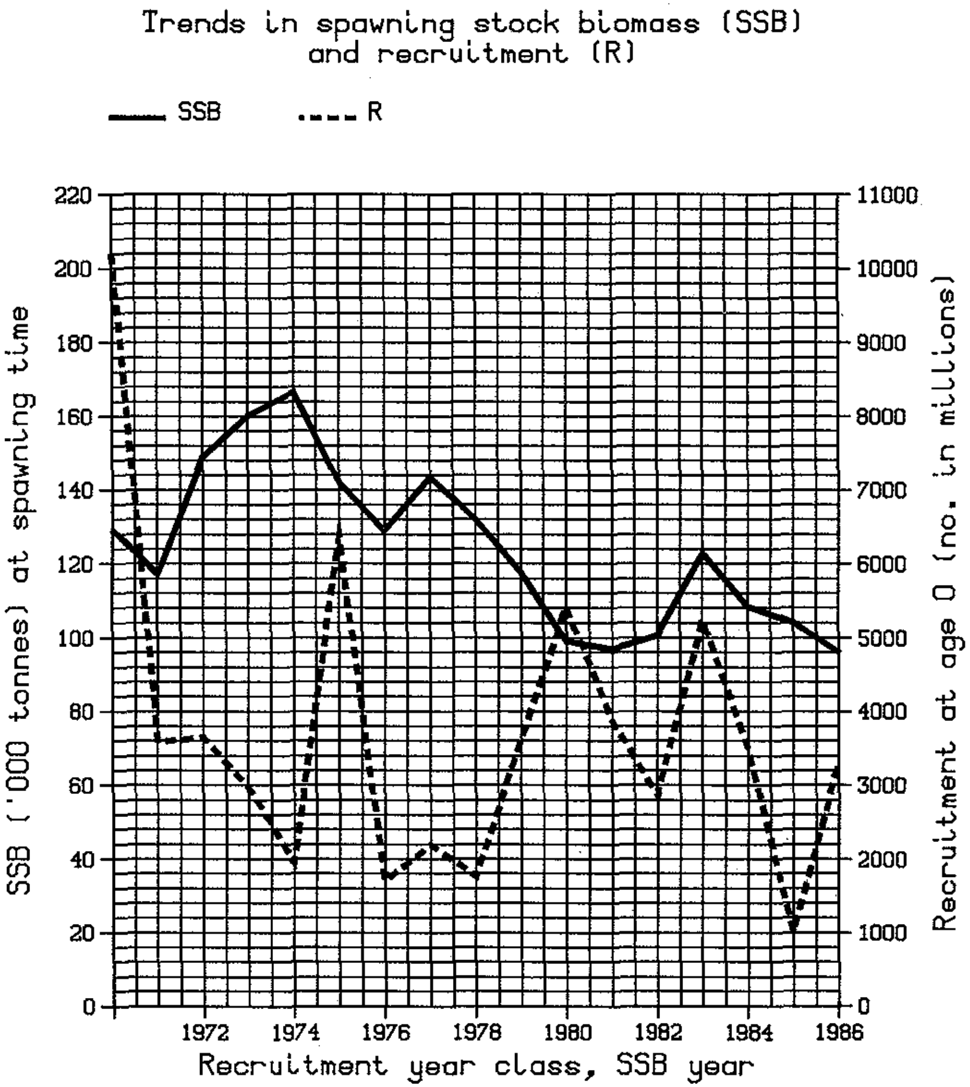
D

Figure 3.1.8

FISH STOCK SUMMARY
STOCK: Herring –Gulf of Finland
23–04–1987



A



B

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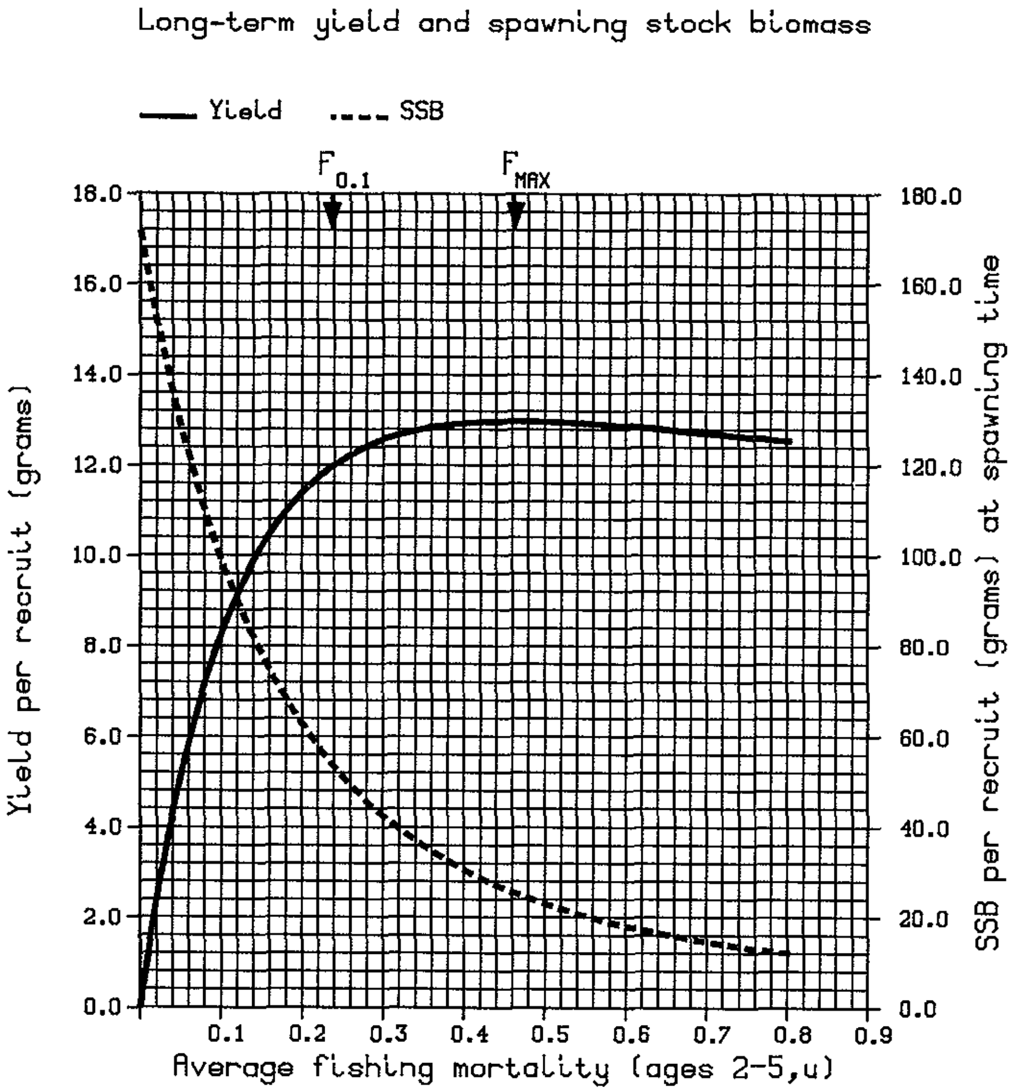
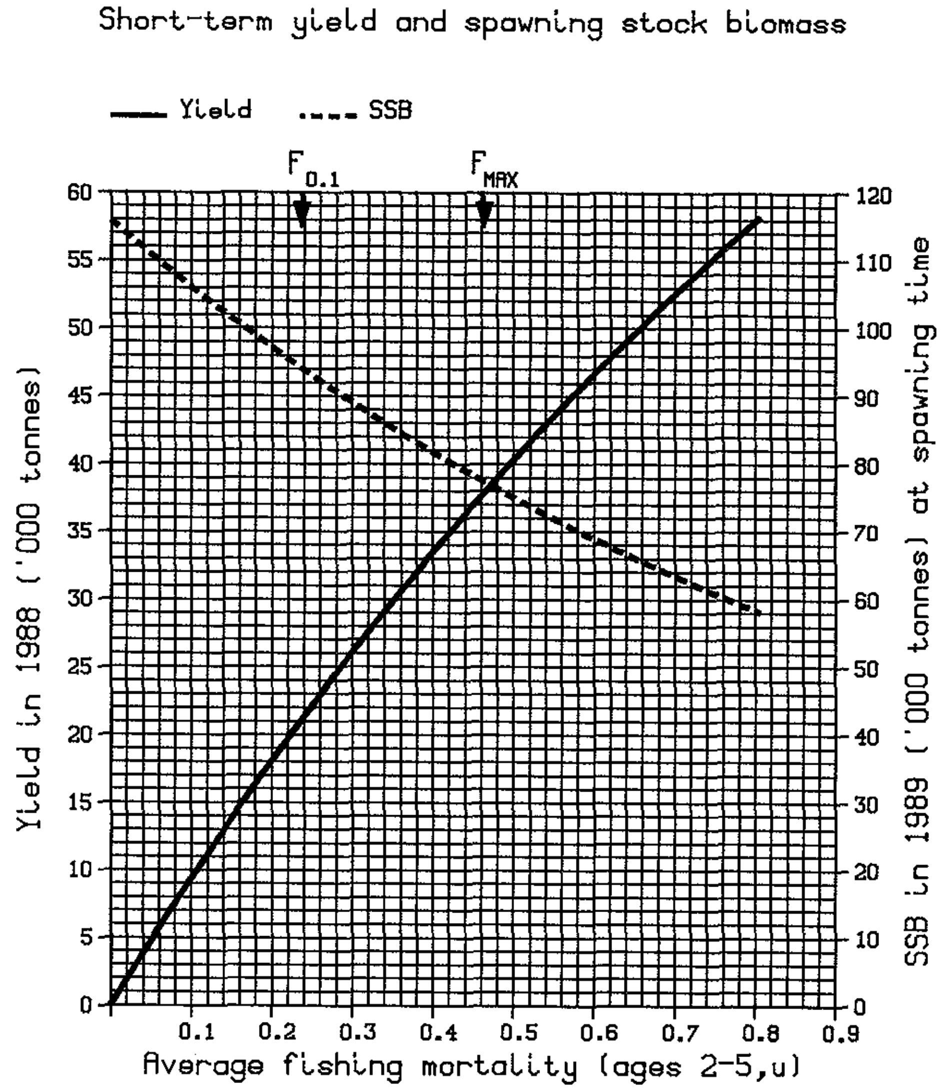
Figure 3.1.8 (cont'd)

FISH STOCK SUMMARY
STOCK: Herring –Gulf of Finland
23–04–1987



C

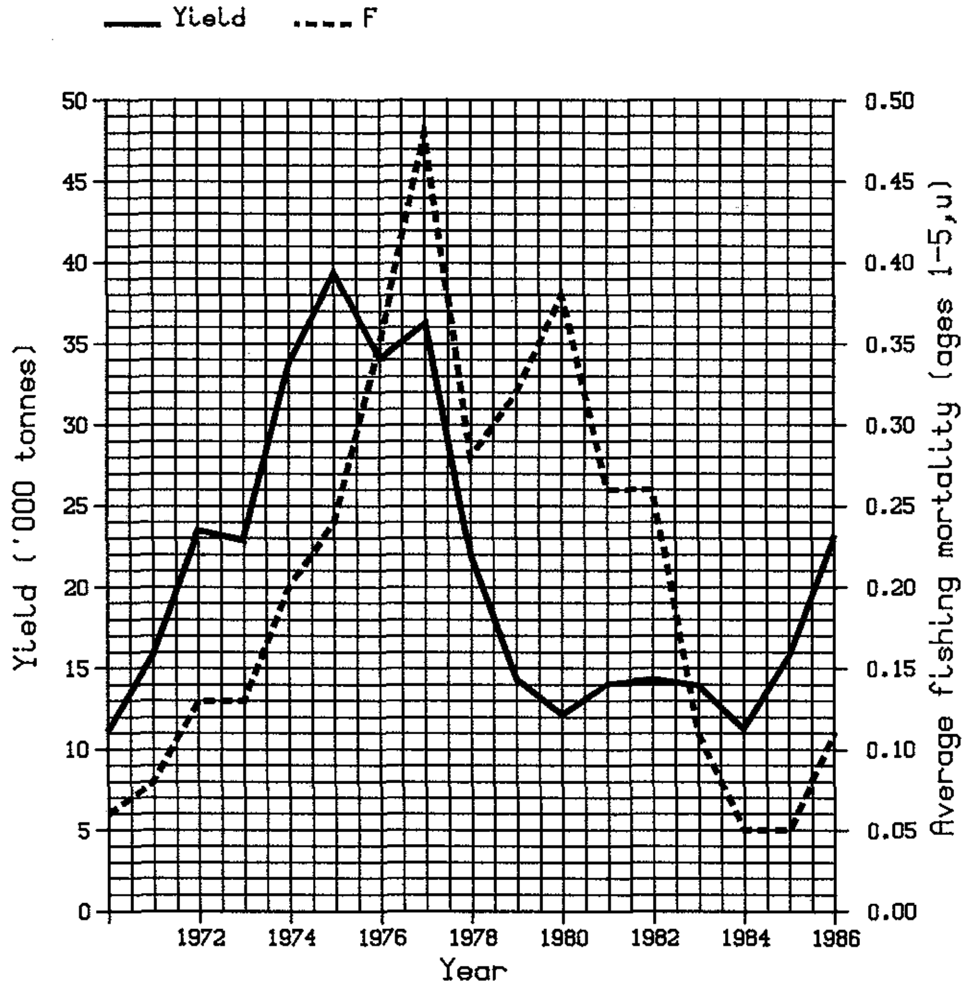


D

FISH STOCK SUMMARY
STOCK: Sprat – 22–25
23–04–1987

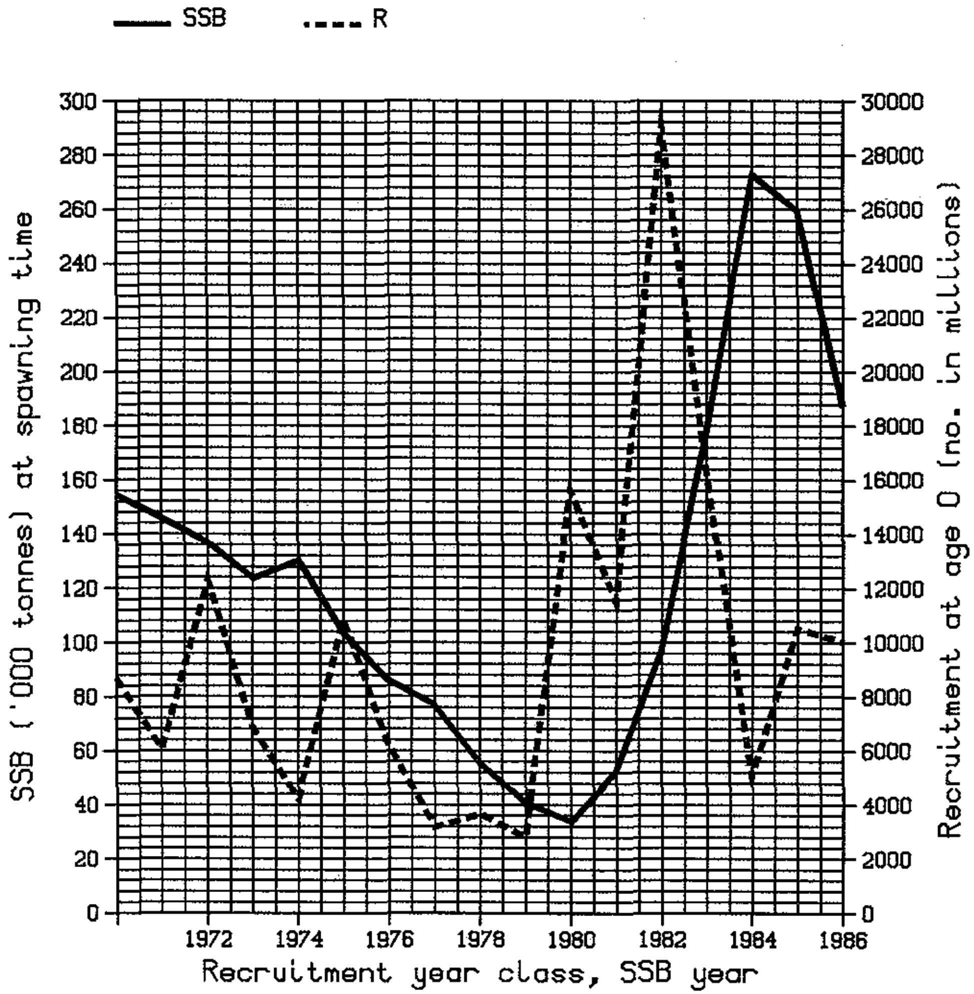
Figure 3.2.1

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB)
and recruitment (R)



B

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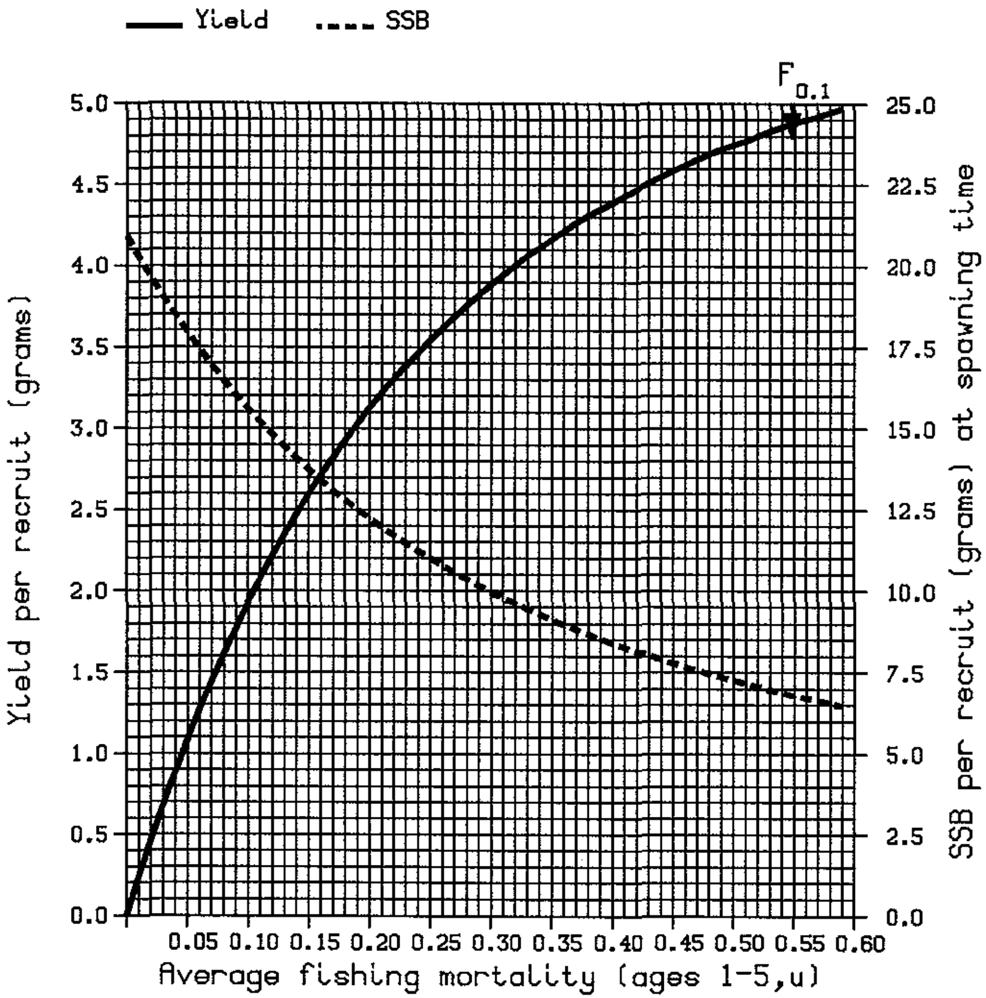
Figure 3.2.1 (cont'd)

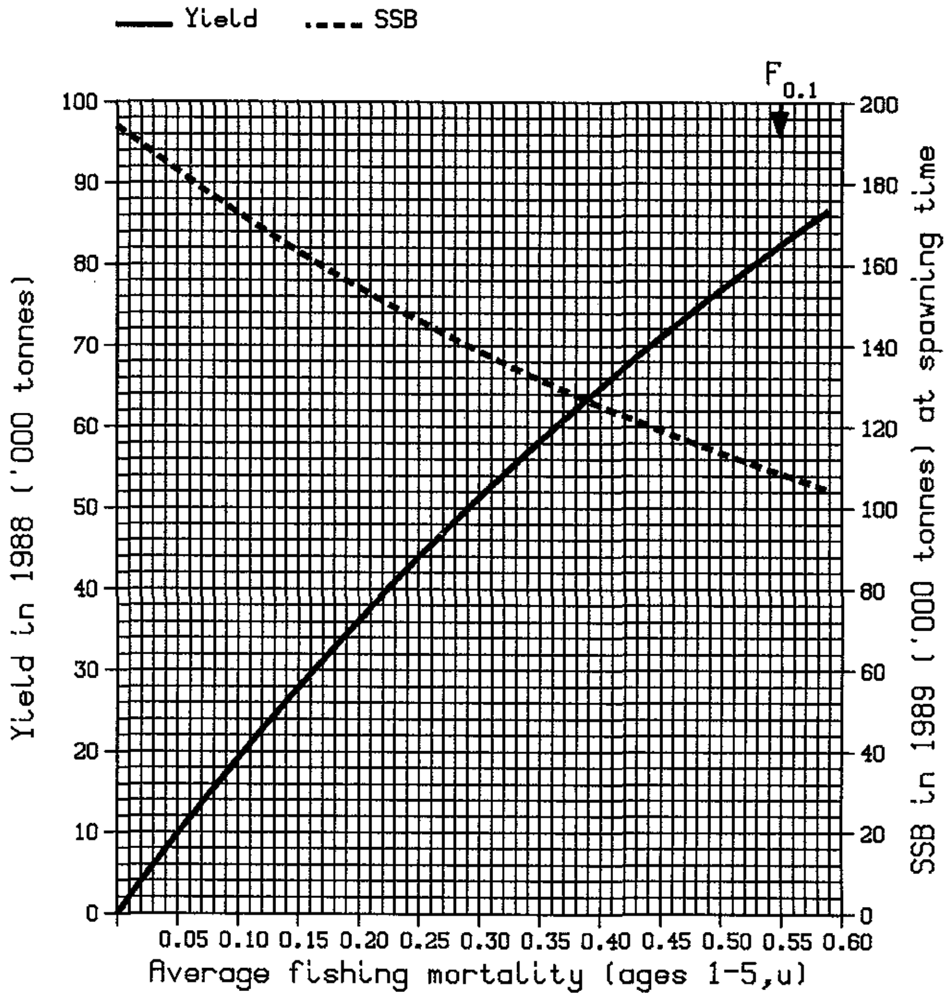
FISH STOCK SUMMARY
STOCK: Sprat – 22–25
23–04–1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass

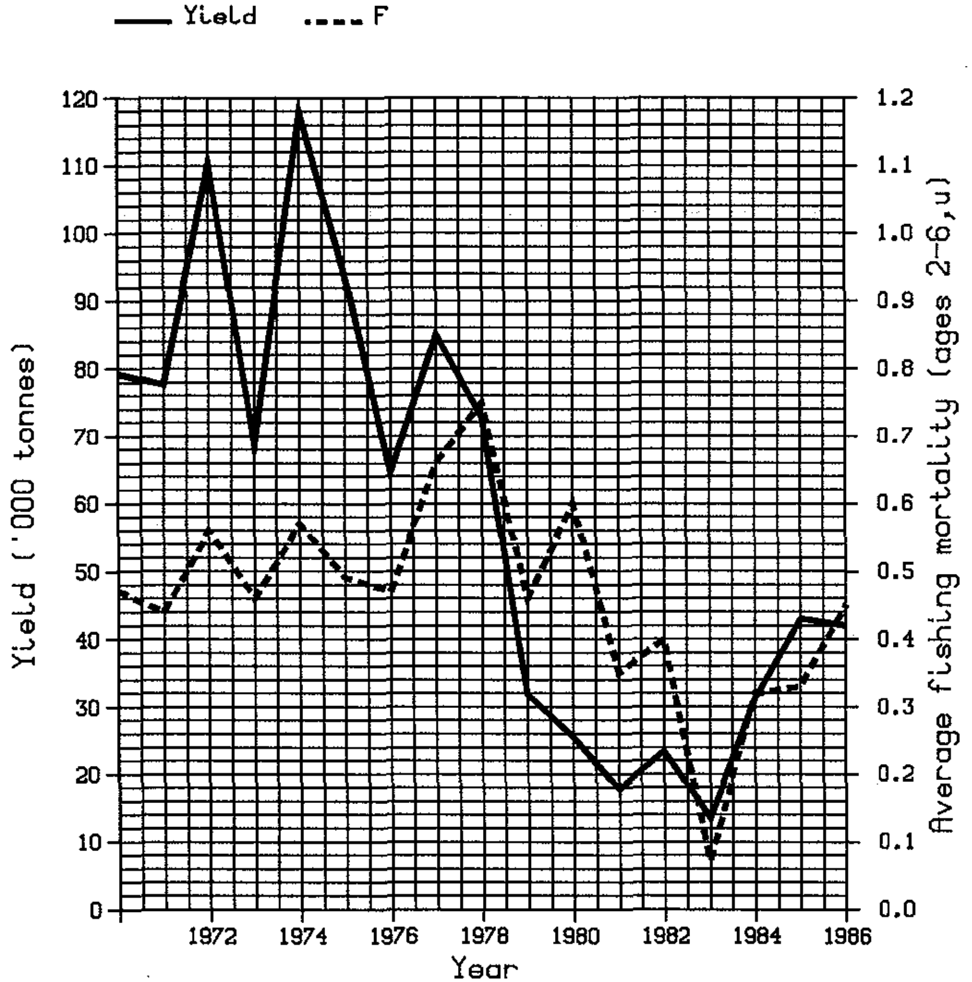


D

FISH STOCK SUMMARY
STOCK: Sprat – 26 and 28
23–04–1987

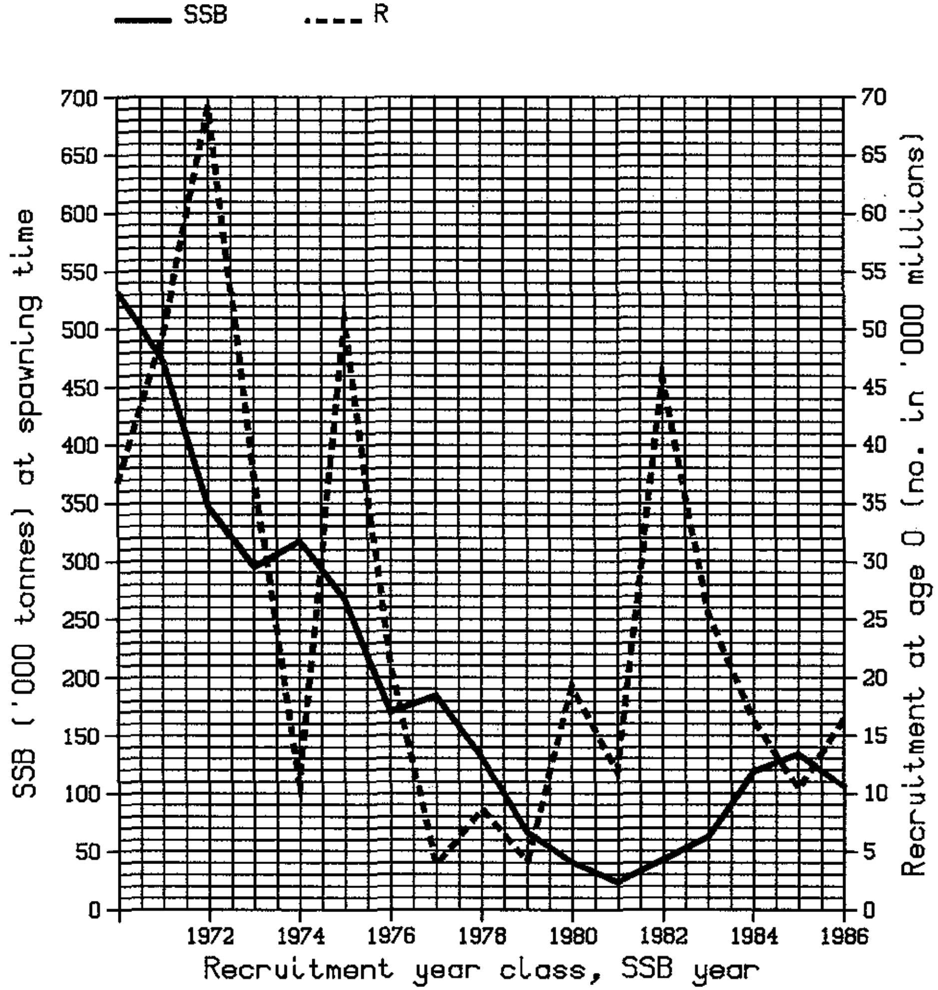
Figure 3.2.2

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB)
and recruitment (R)



B

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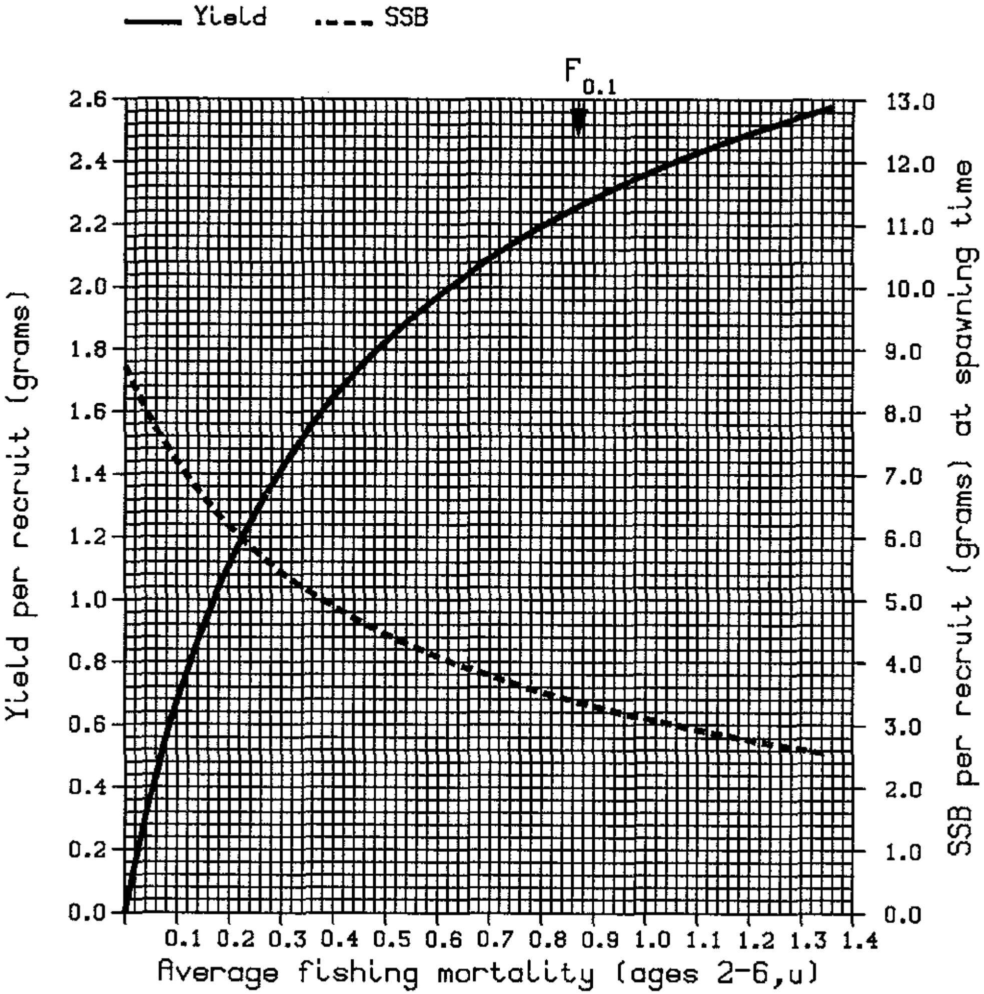
Figure 3.2.2 (cont'd)

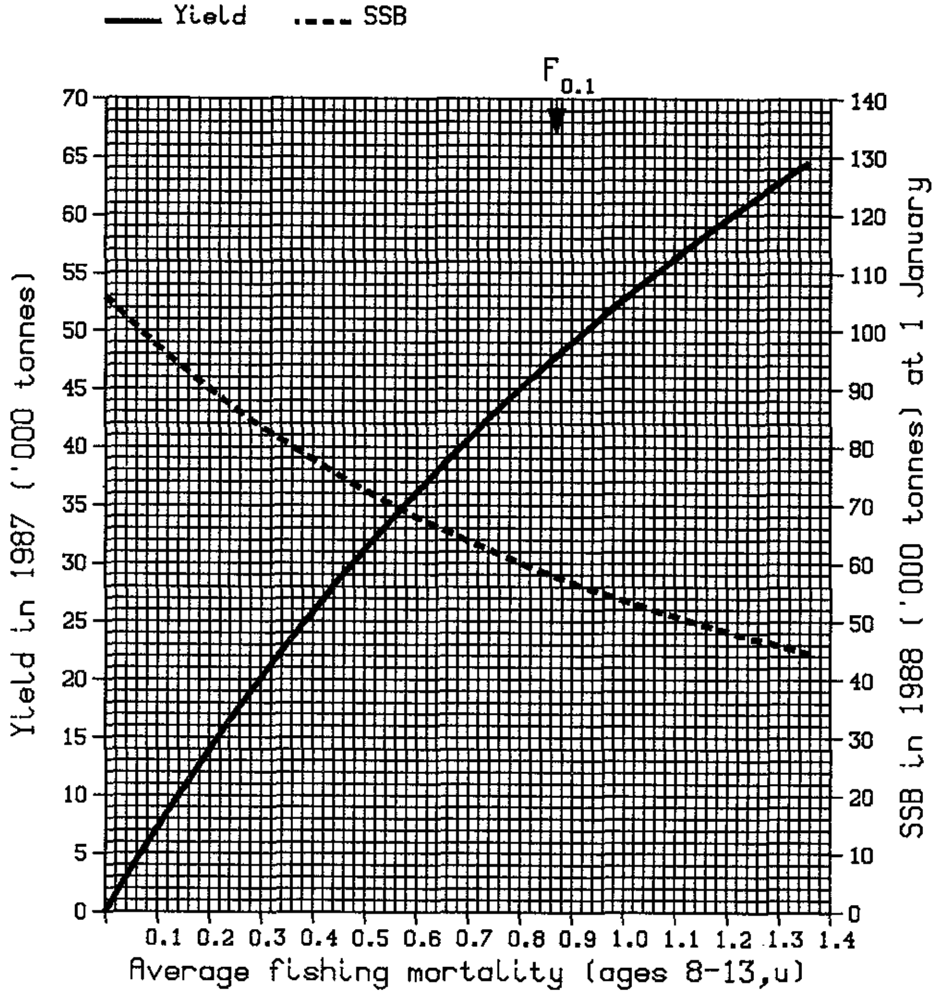
FISH STOCK SUMMARY
STOCK: Sprat – 26 and 28
23–04–1987

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass

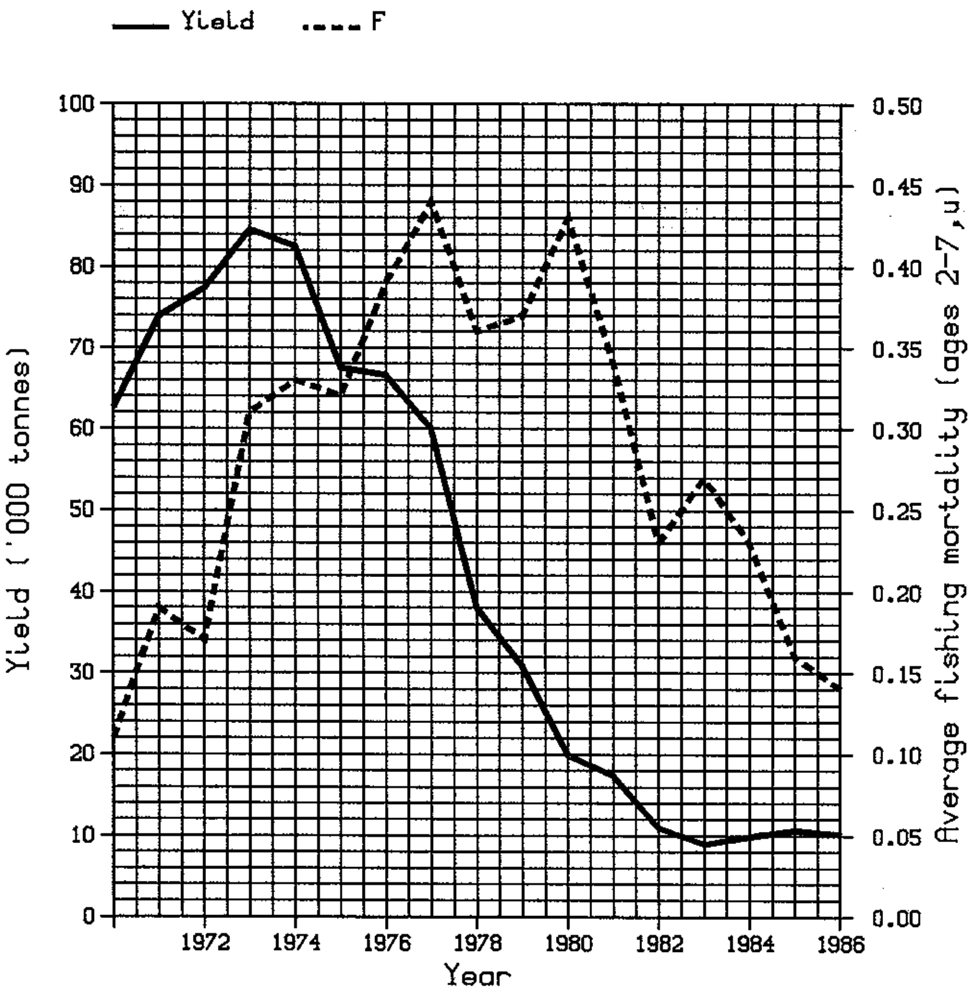


D

FISH STOCK SUMMARY
STOCK: Sprat: 27 and 29–32
23–04–1987

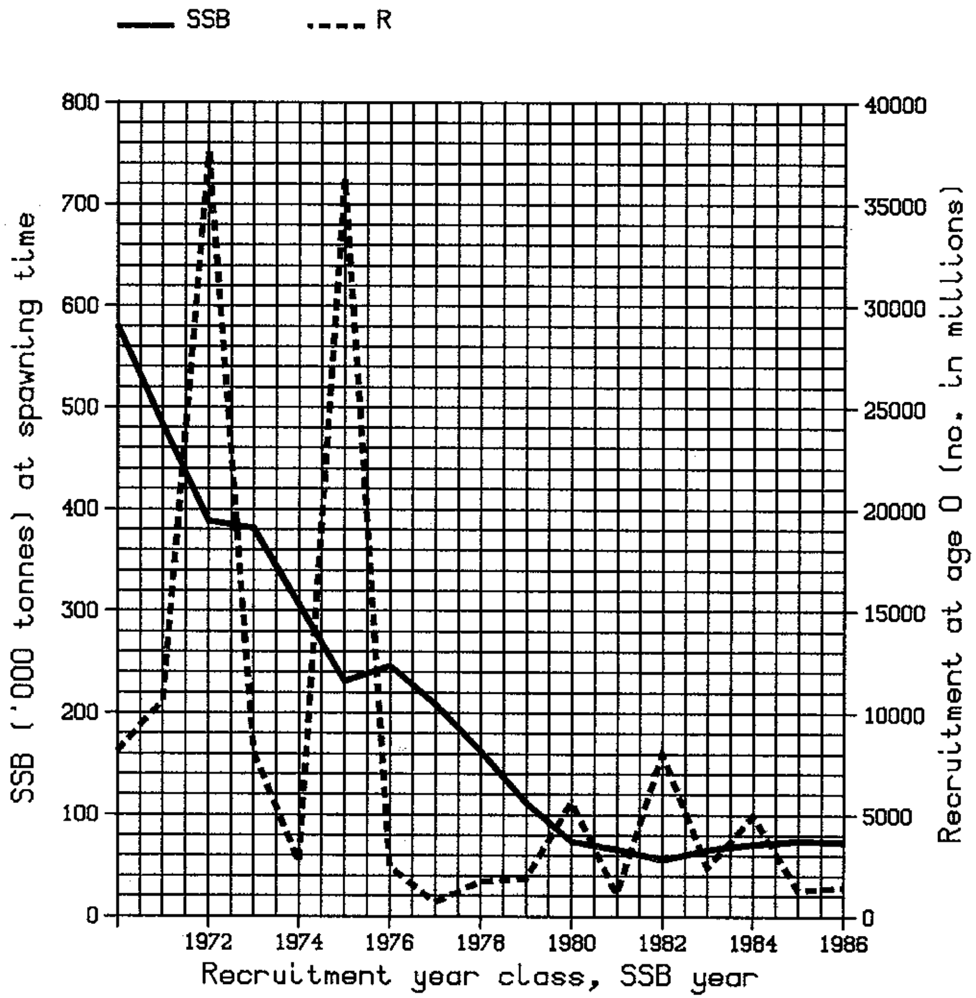
Figure 3.2.3

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

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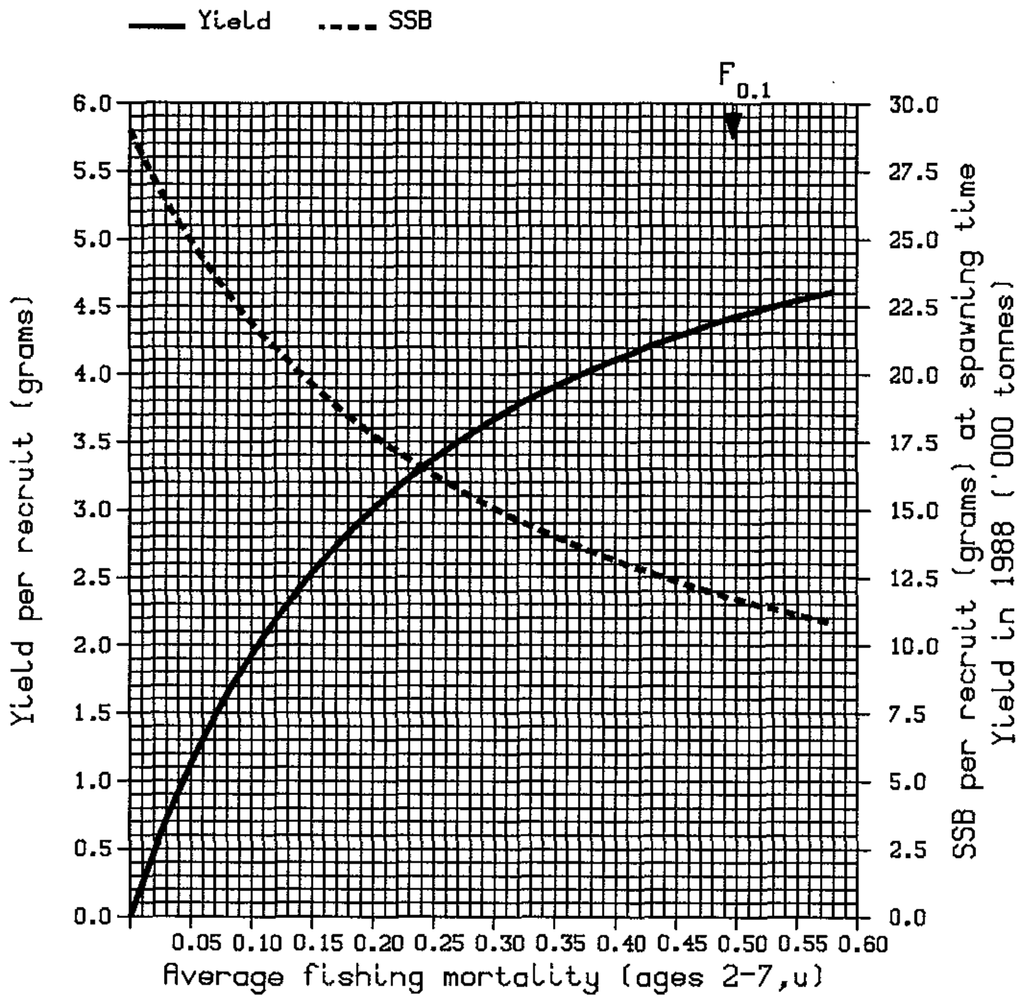
Figure 3.2.3 (cont'd)

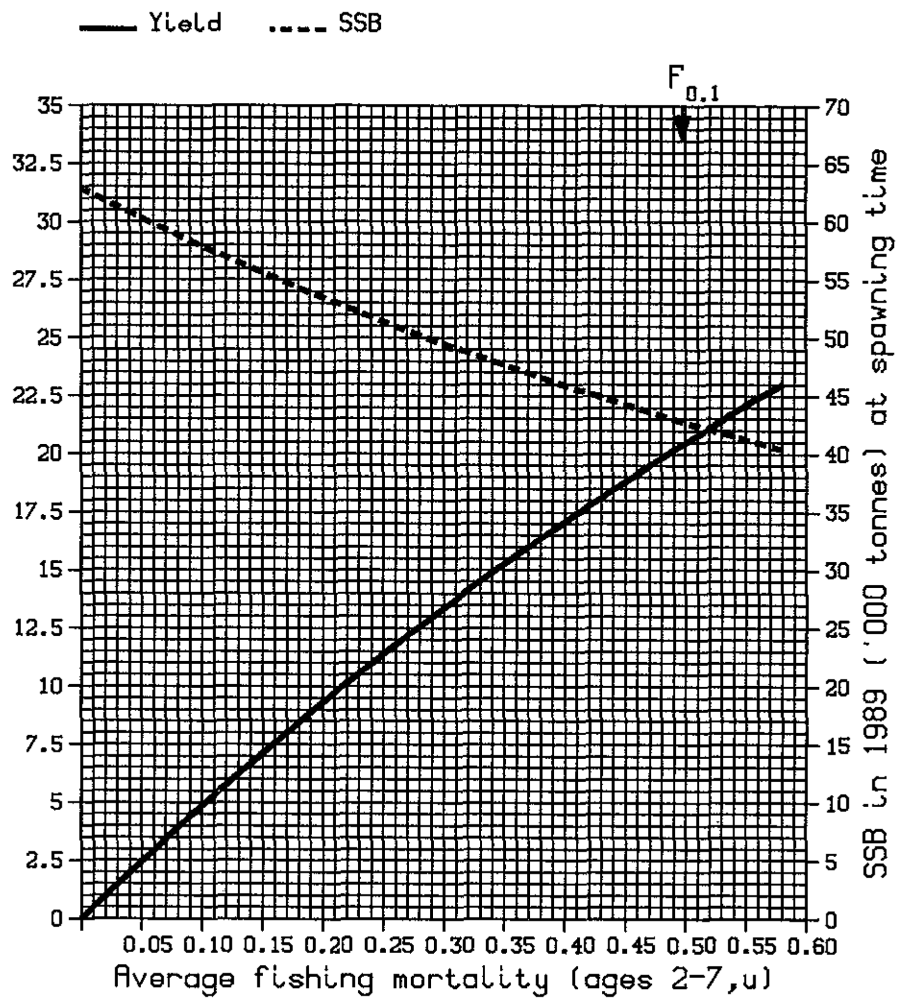
FISH STOCK SUMMARY
STOCK: Sprat: 27 and 29–32
23–04–1987

Long-term yield and spawning stock biomass



C

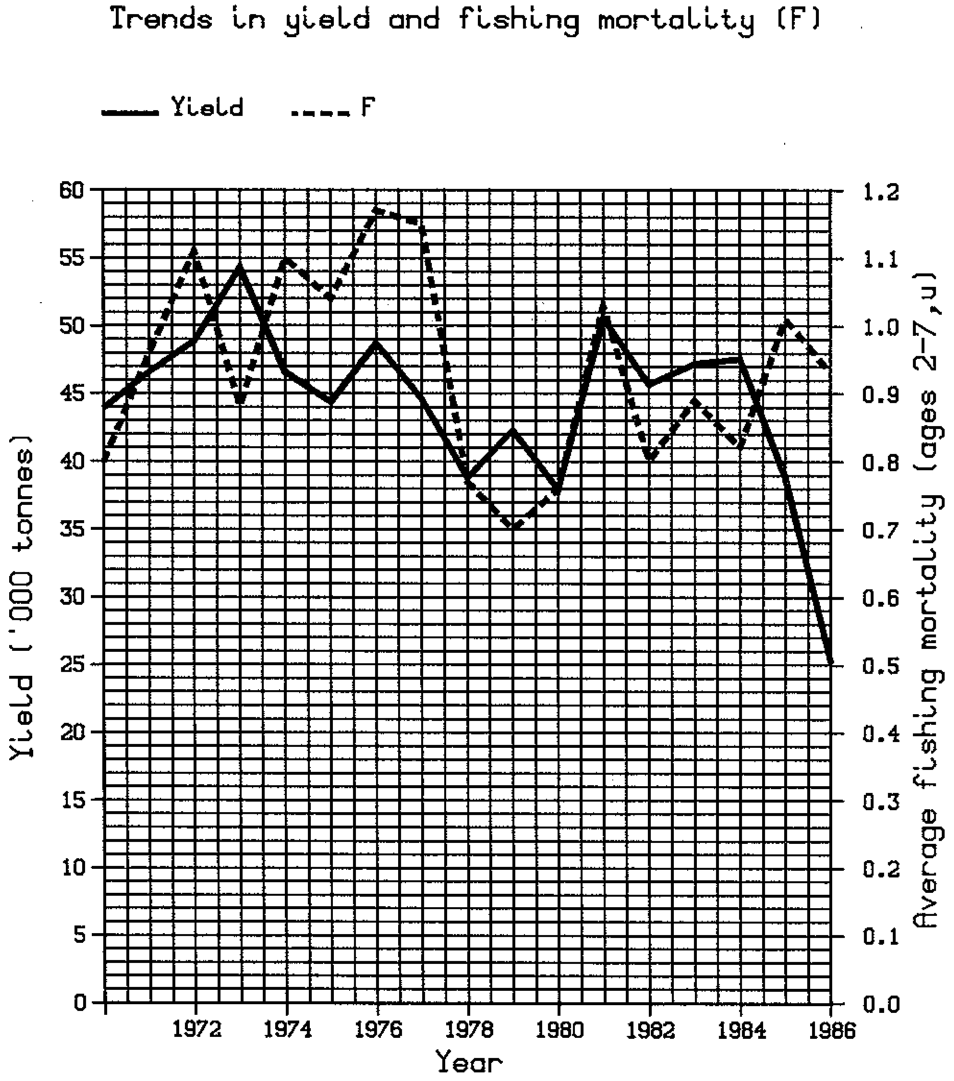
Short-term yield and spawning stock biomass



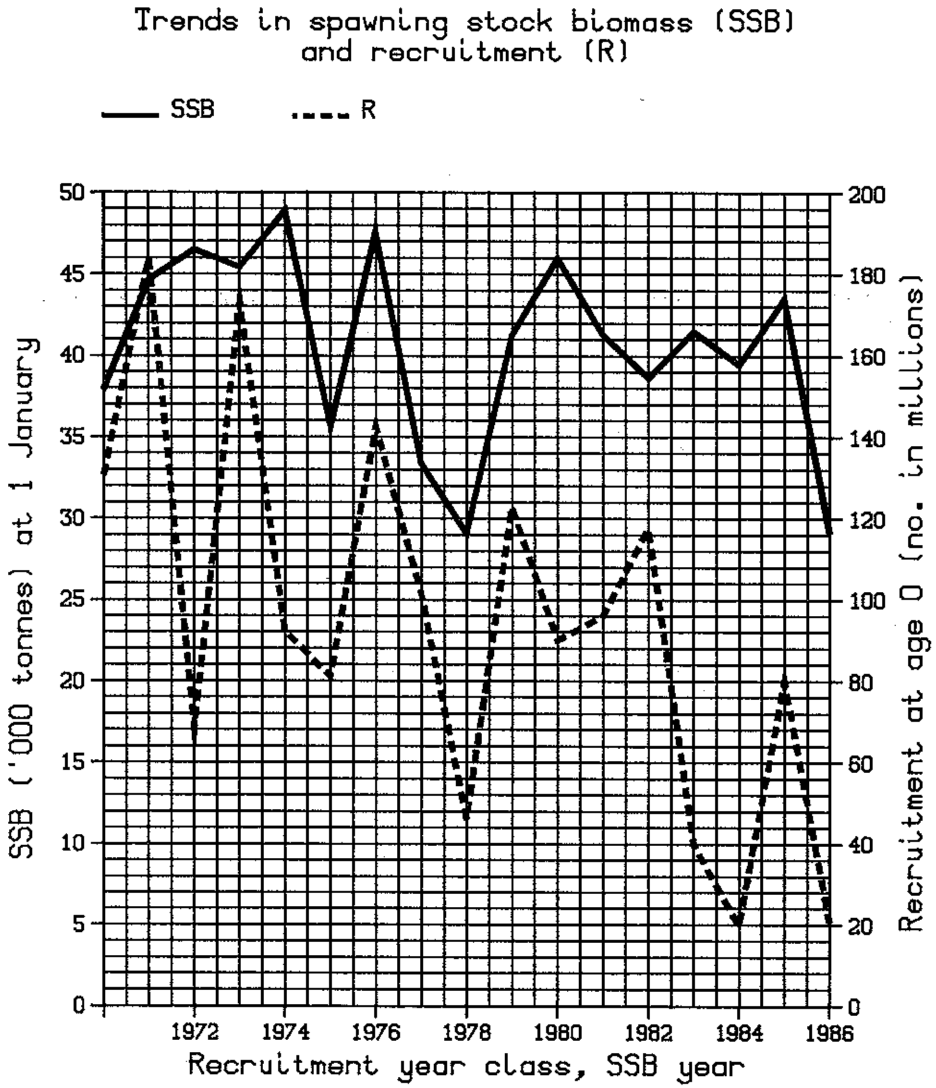
D

Figure 4.1.1

FISH STOCK SUMMARY
STOCK: Baltic Cod – 22 and 24
28–04–1987



A



B

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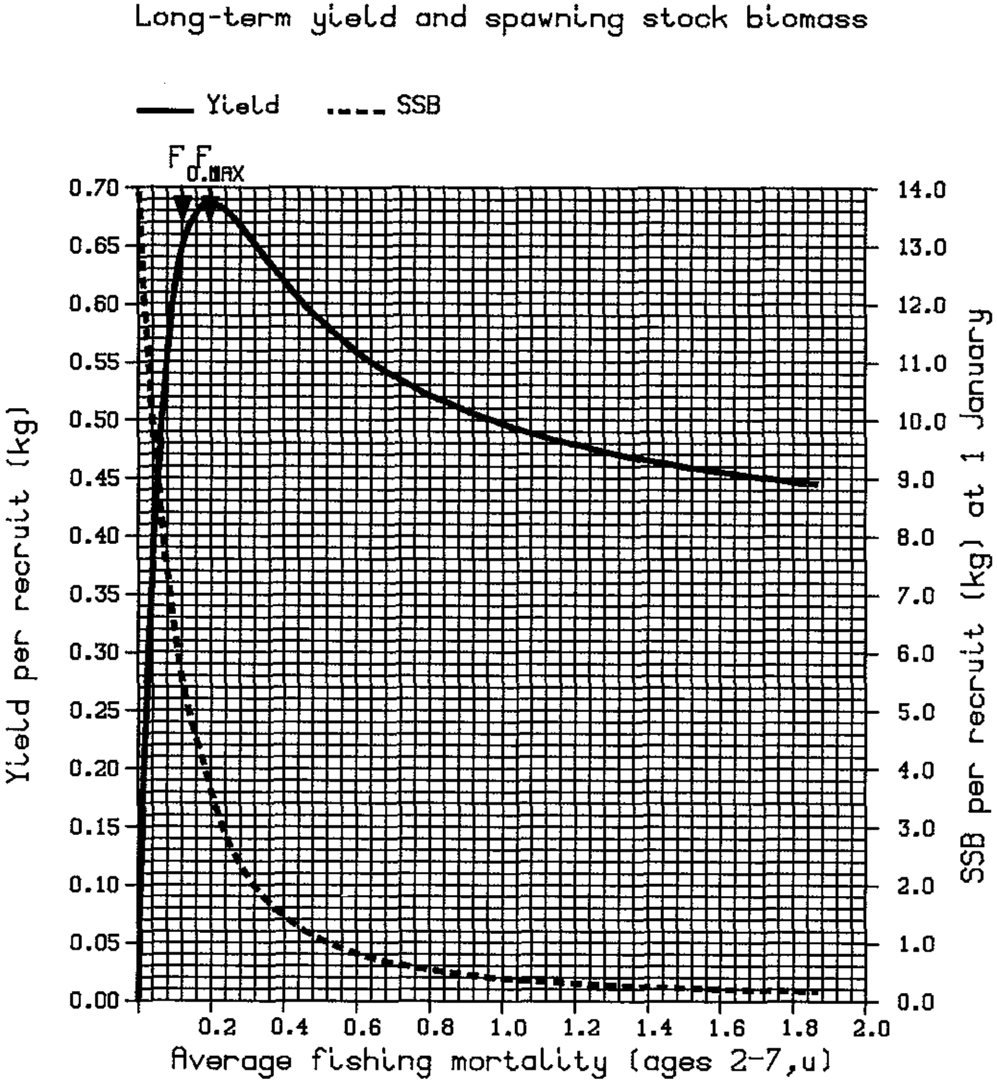
Figure 4.1.1 (cont'd)

FISH STOCK SUMMARY
STOCK: Baltic Cod – 22 and 24
28–04–1987



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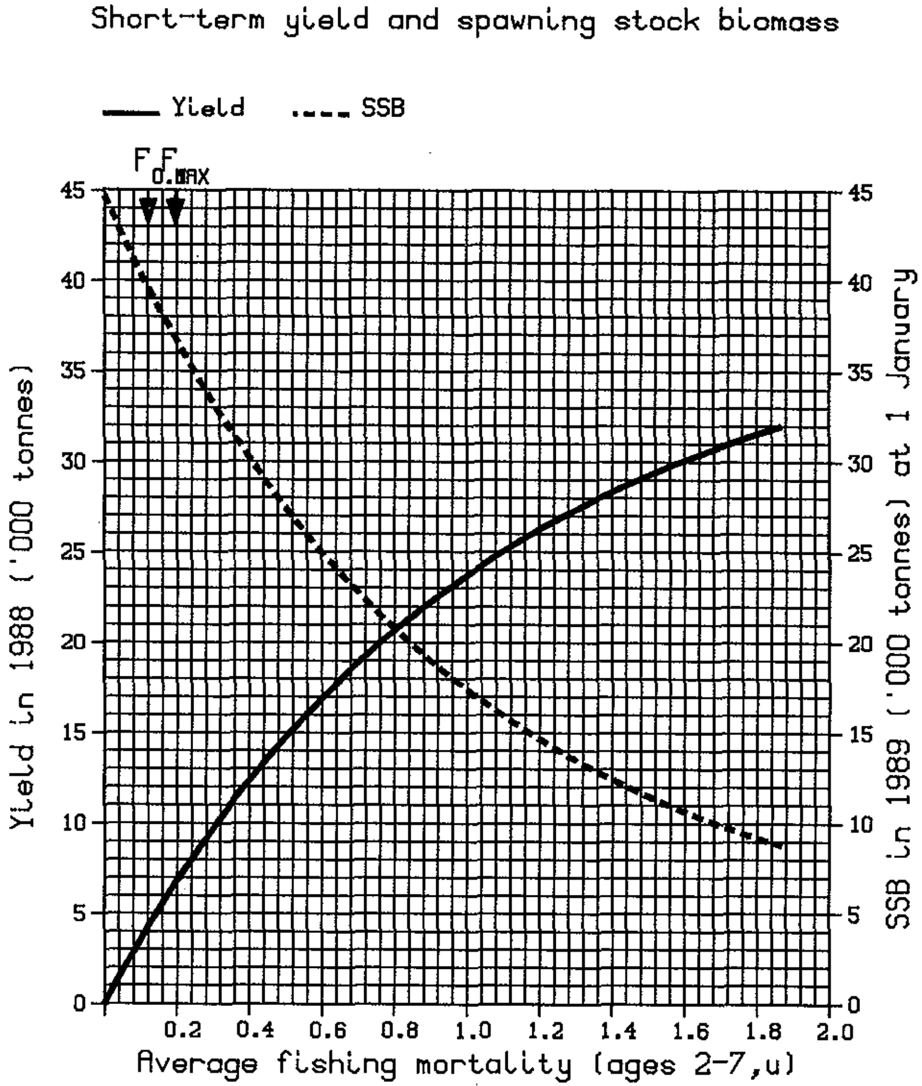
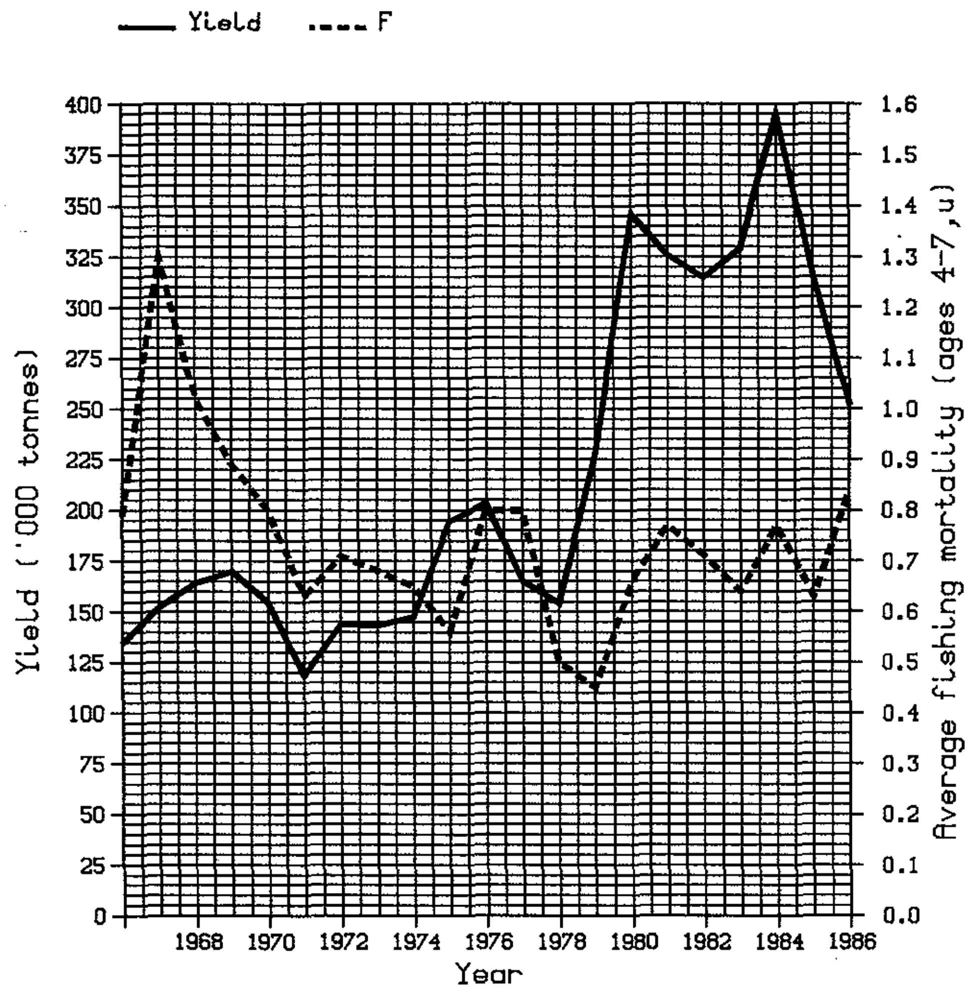


D

Figure 4.1.2

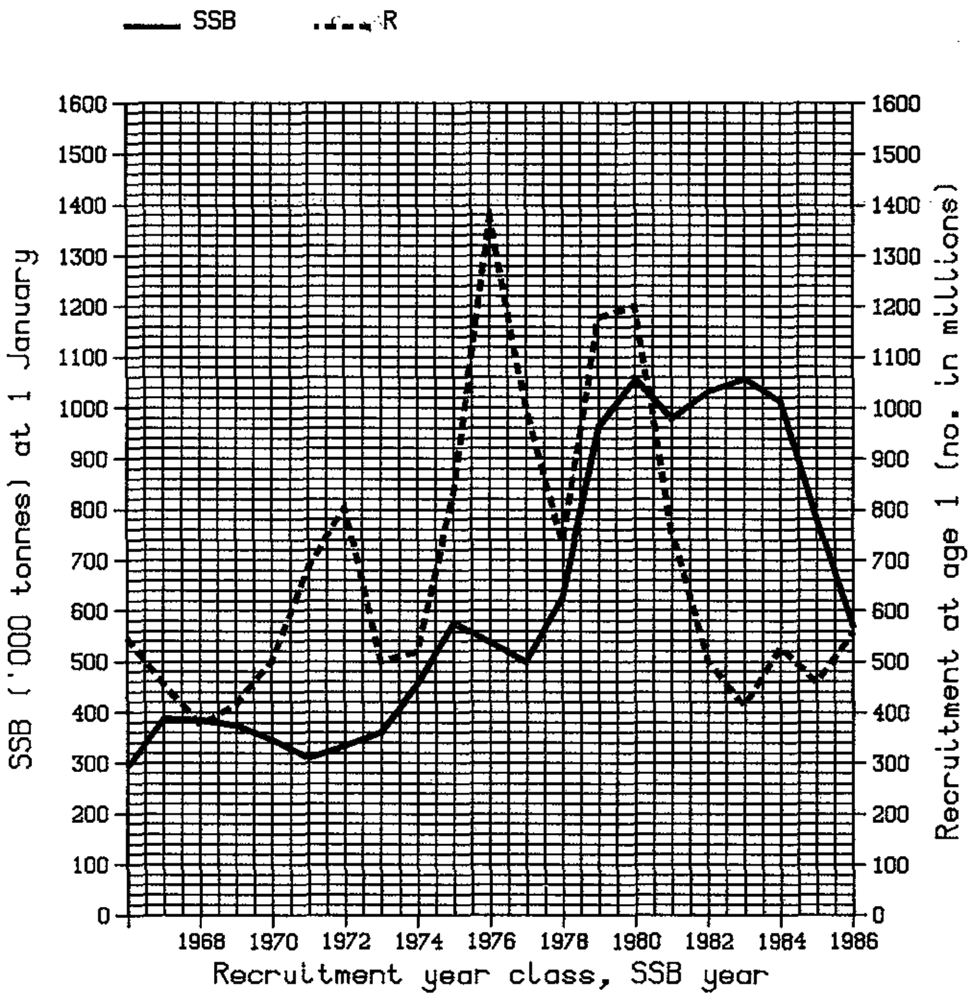
FISH STOCK SUMMARY
STOCK: Baltic Cod – 25 to 32
28–04–1987

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB)
and recruitment (R)



B

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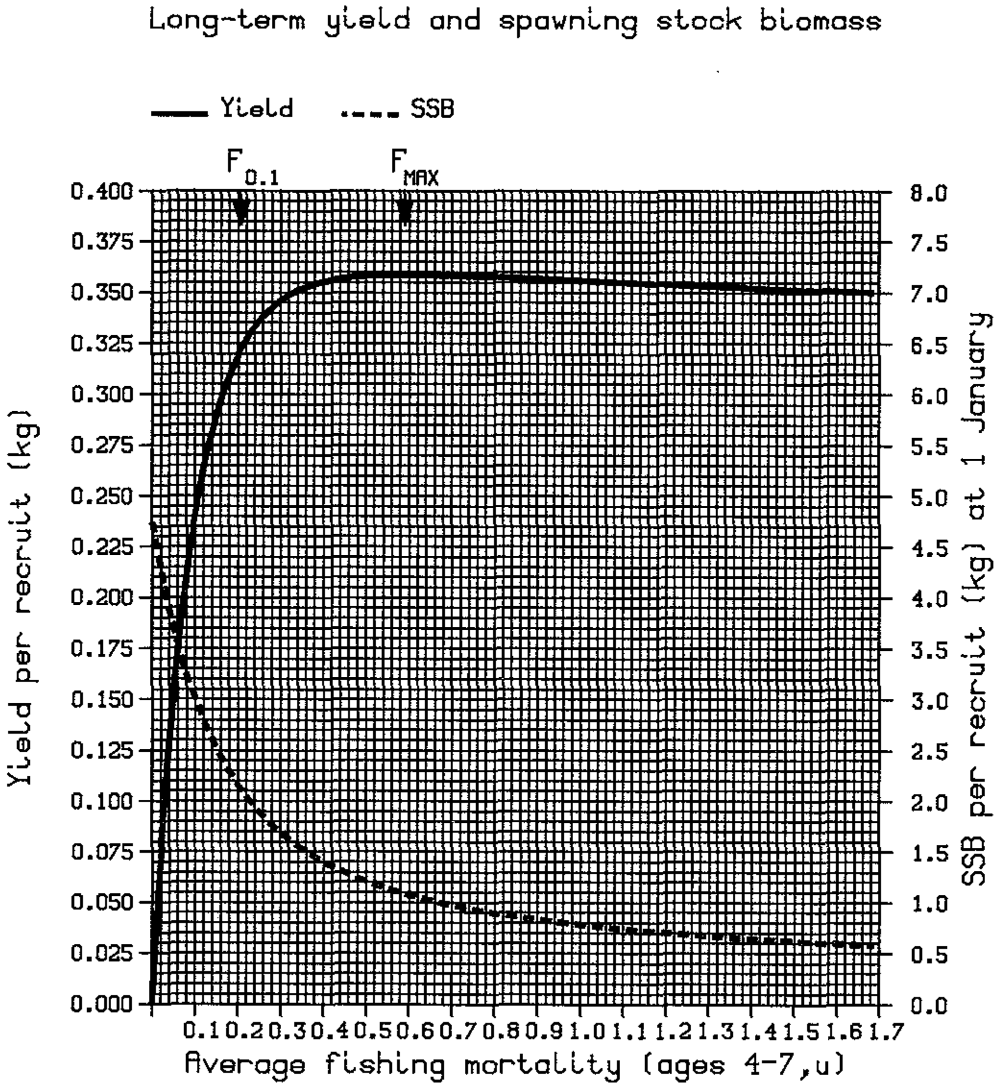
Figure 4.1.2 (cont'd)

FISH STOCK SUMMARY
STOCK: Baltic Cod – 25 to 32
28–04–1987



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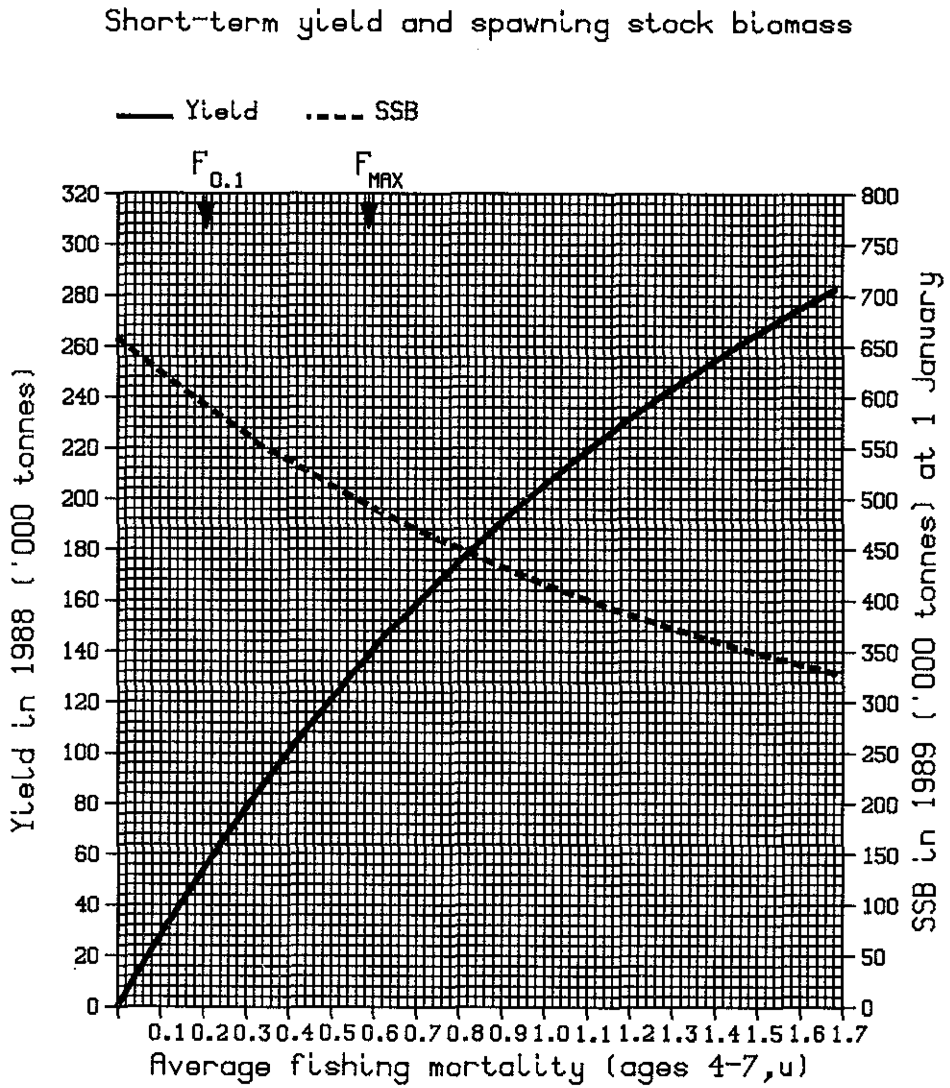


D

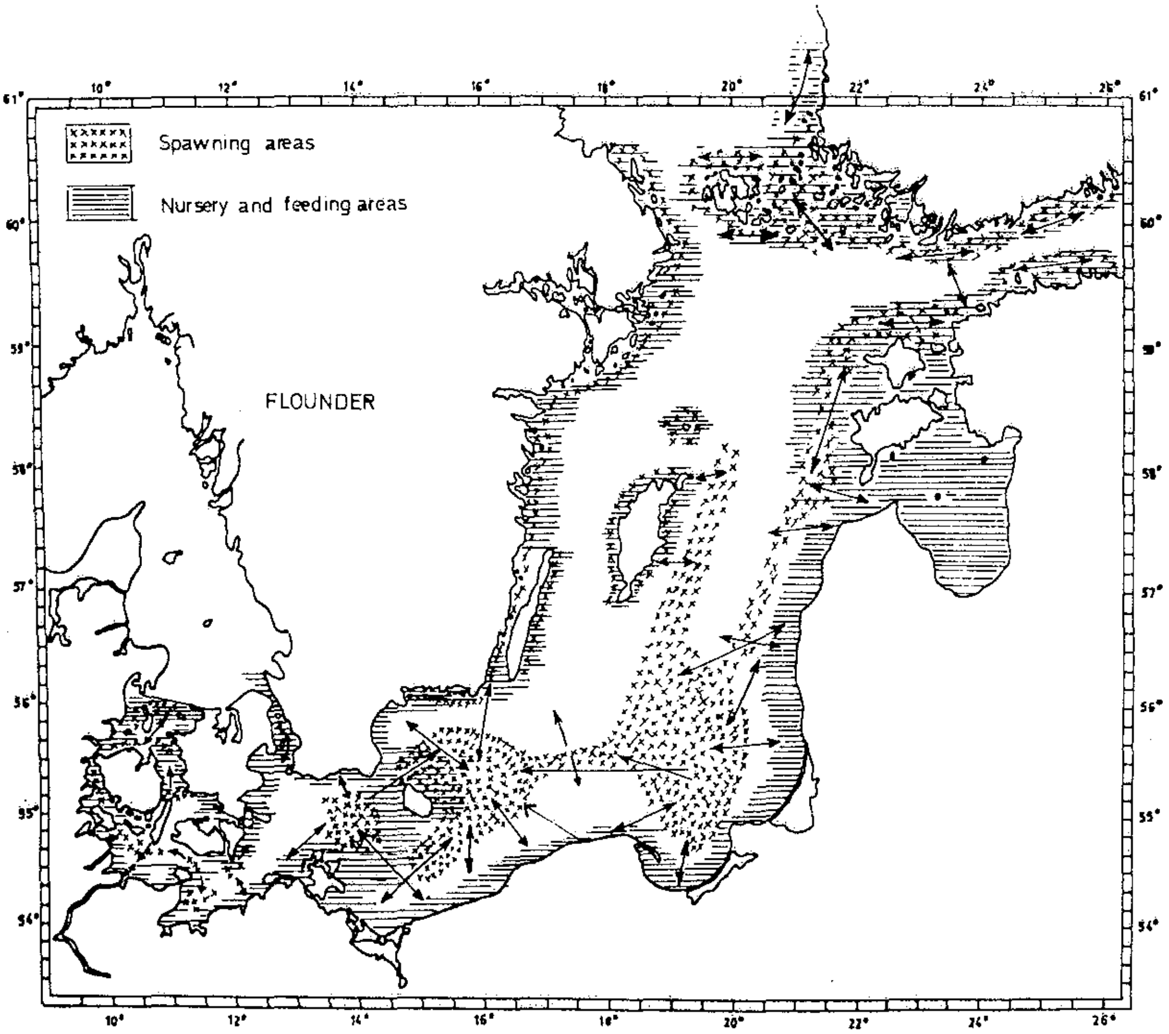


Figure 4.2 The spawning, nursery and feeding areas of flounder stocks in the Baltic.

Figure 5.2.1 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).

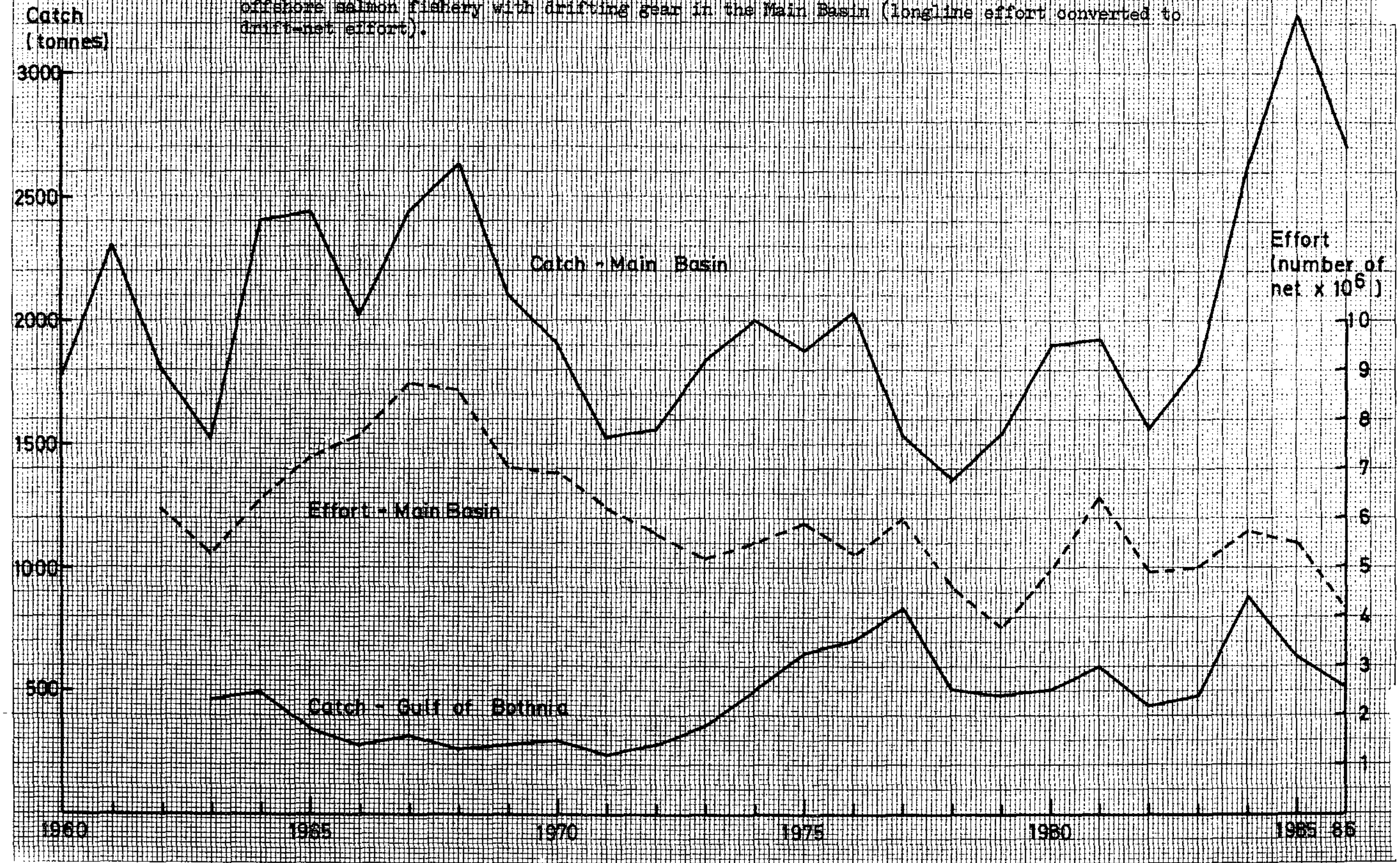


Figure 5.2.2 CPUE in the Baltic drift-net and the longline fisheries by Denmark, Finland, and the USSR in the Main Basin (Sub-divisions 26-29), in the Gulf of Bothnia (Sub-division 30), and in the Gulf of Finland (Sub-division 32) in the fishing seasons 1980/1981 - 1985/1986.

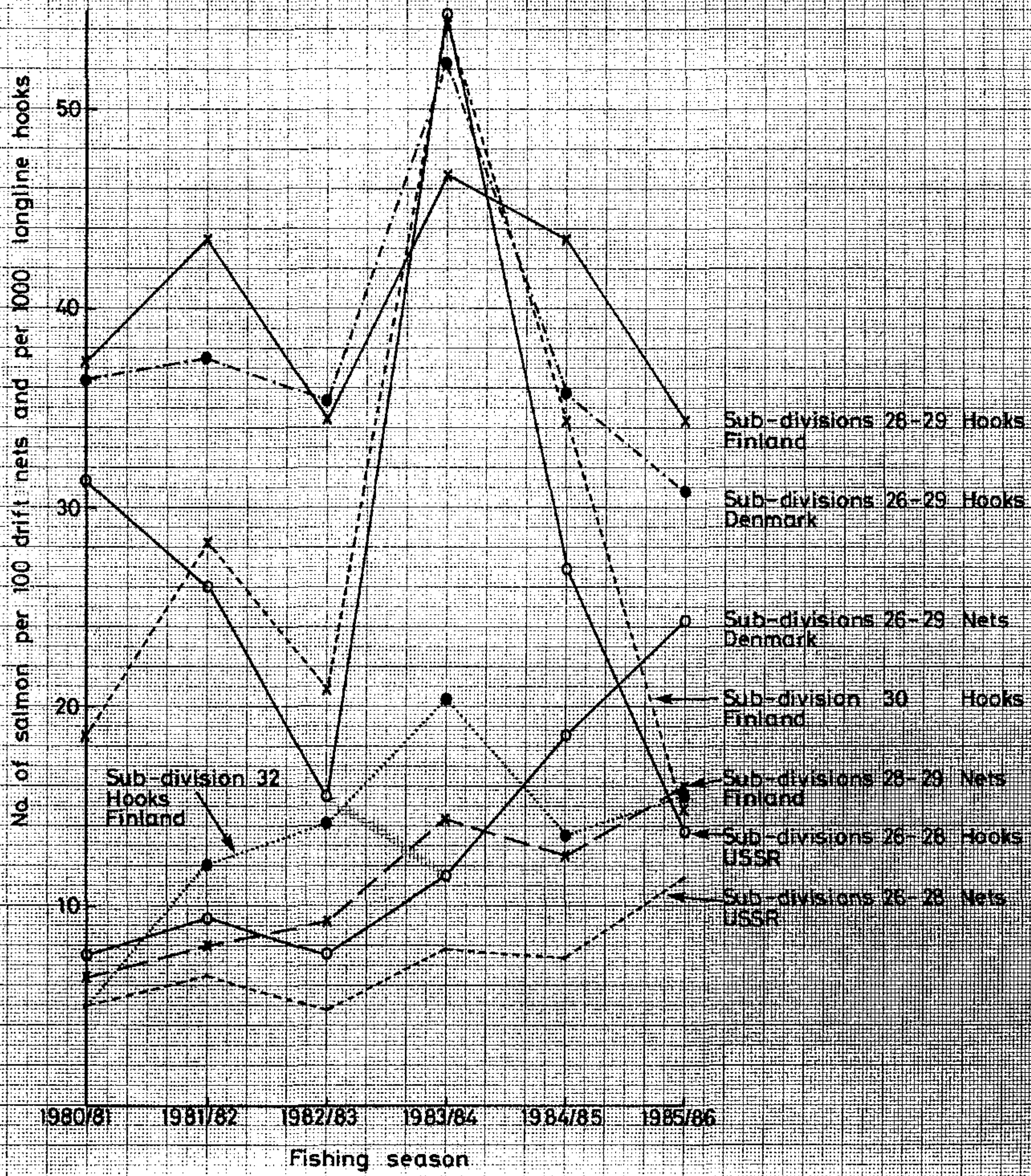


Figure 5.2.3 Salmon parr densities in the River Tornionjoki (Subdivision 31) based on electro-fishing surveys in the 1960s, mean parr densities were from 2.9 to 10.3 parr/100 m^2.

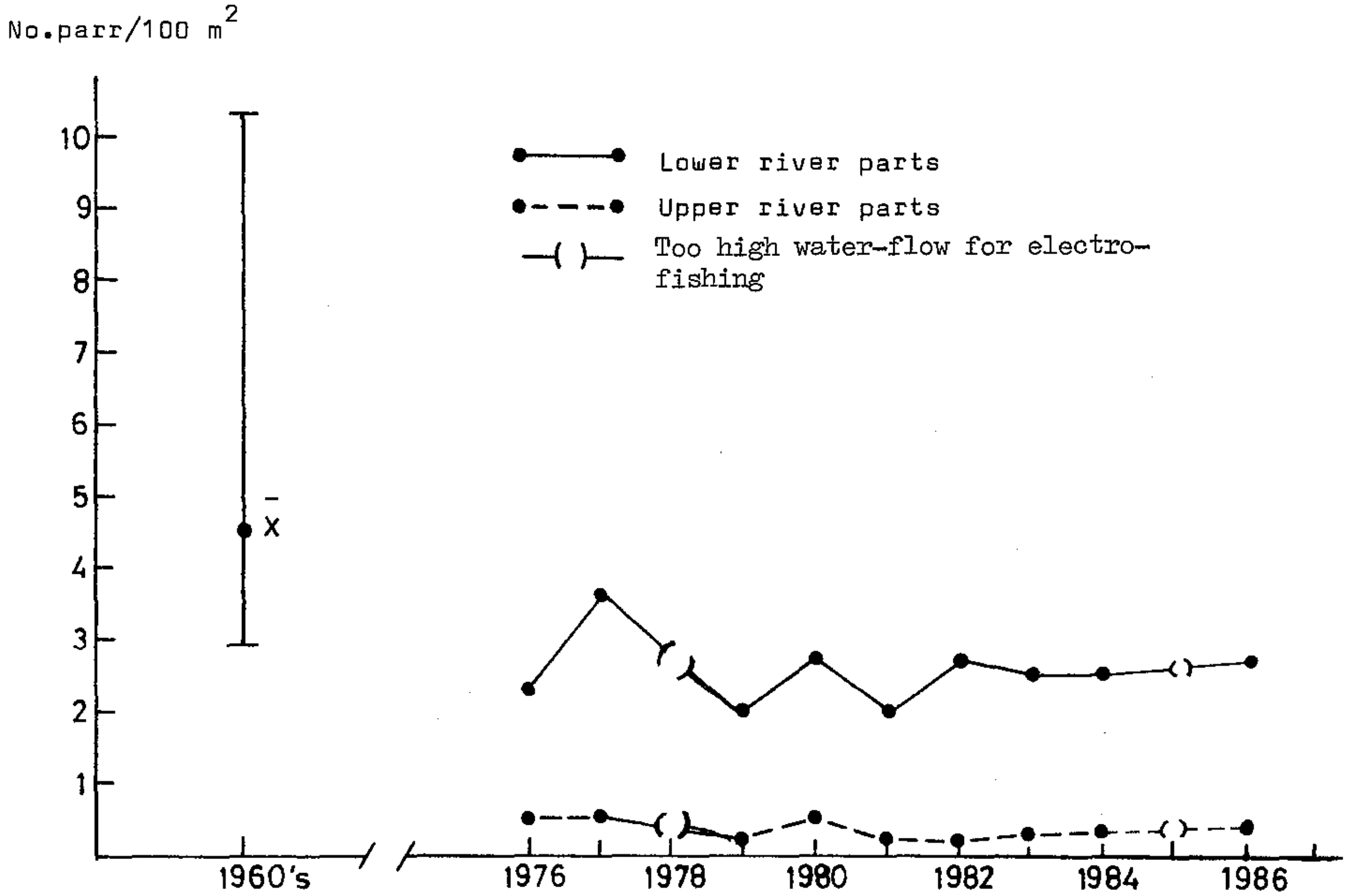


Figure 5.2.4 Salmon parr densities (no./100 m^2) in the River Simojoki (Sub-division 31) in 1972–1986 based on electro-fishing surveys.

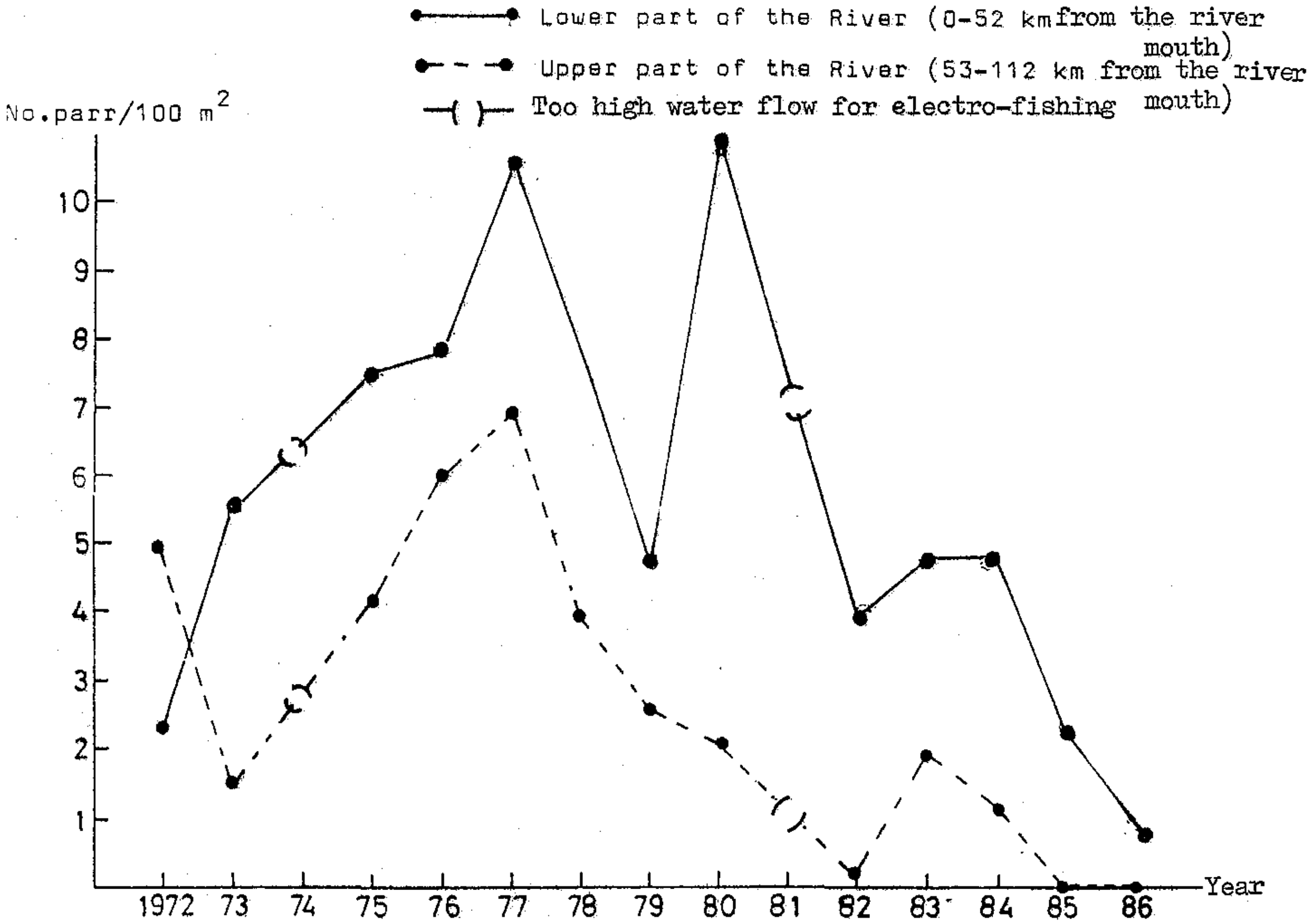
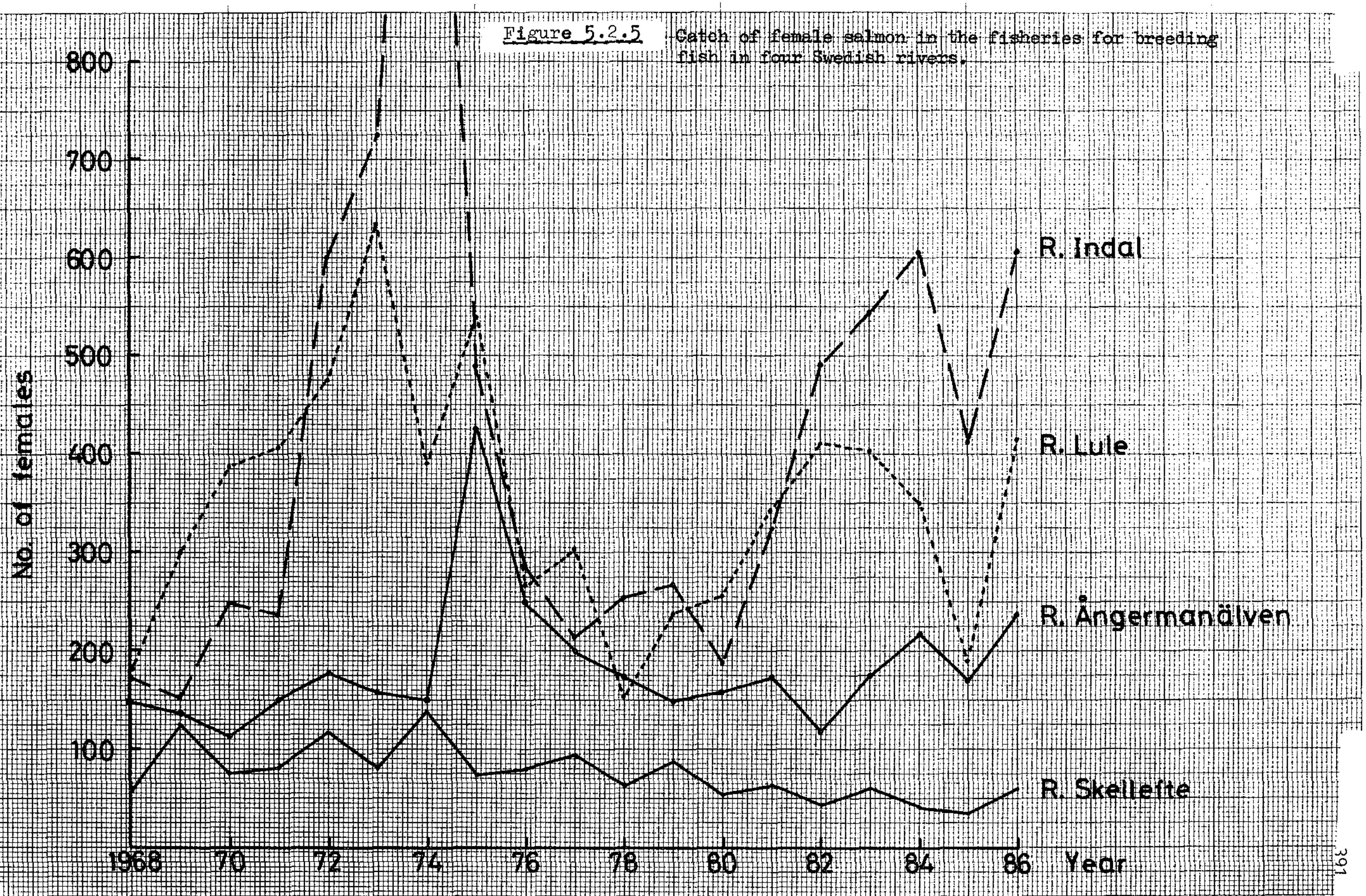
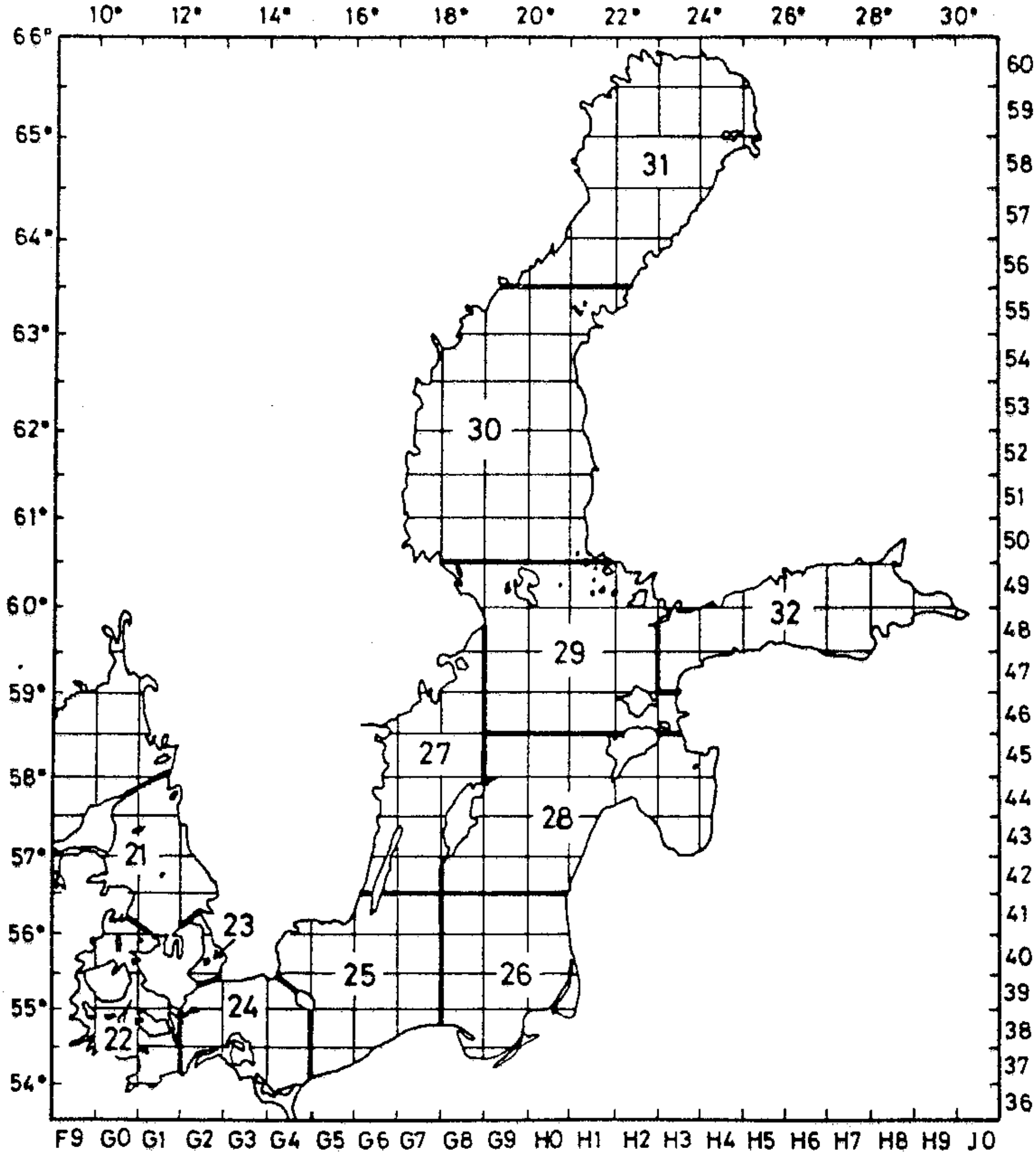


Figure 5.2.5 Catch of female salmon in the fisheries for breeding fish in four Swedish rivers.





ICES 27.3.03.00 (Baltic)

REPORT TO THE NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION COUNCIL

1. REQUEST FOR SCIENTIFIC ADVICE

The advice below and the report of the Working Group on North Atlantic Salmon (ICES, Doc. C.M.1987/Assess:12) respond to questions posed by ICES and the Council of the North Atlantic Salmon Conservation Organization (NASCO). ICES requested consideration of how to set catches within safe biological limits. NASCO posed questions with respect to its three Commission areas as presented in items 5-7 in Appendix 1 of the Working Group report. Every question posed is addressed below. Because the same or closely related questions were posed for more than one NASCO Commission area and because reordering the presentation allowed related questions to be answered together without repetition of background material, responses have been ordered by topic and not in the sequence of questions asked. The heading to each section lists the NASCO questions responded to in the section. All tables and numbered figures referred to are found in the Working Group report.

In recent years, demands for advice from ACFM have increased. ACFM has been able to provide advice by drawing on the extensive data bases of participating member countries. Although these data bases continue to expand, it has proved difficult to provide complete answers to increasingly complex questions posed by NASCO and ICES. Although ACFM is able to provide much descriptive information pertaining to the fisheries and salmon harvest, it has not been able to provide accurate estimates of non-reported catches and fishing effort, nor to designate origins beyond continent of origin in the sea fisheries. Advice has been provided in the form of ranges of estimated impacts of the mixed stock fisheries. Narrowing these ranges is dependent on new information regarding natural mortality, non-catch fishing mortality, and tag reporting rate, which seems attainable only through further extensive and costly research efforts.

In general, ACFM is able to answer questions pertaining to catches and the biology of the different stocks and provide general estimates of yield consequences relative to the mixed stock fisheries. It is not able, however, to advise on appropriate catch levels, nor is it likely to be able to do so without new and detailed information on salmon abundance in the fishing areas and major advances in stock forecasting capabilities. Both the development of appropriate methodologies and their required application will be costly.

2. FRAMEWORK FOR SCIENTIFIC ADVICE ON MANAGEMENT OF SALMON

ICES requested consideration of the concept of safe biological limits for the exploitation of Atlantic salmon in the North Atlantic in 1986 and again in 1987. The issue was explored in a preliminary way in ACFM's 1986 advice to NASCO. Further consideration of this issue confirmed that there exist formidable practical obstacles to conserving salmon stocks by controlling exploitation in relevant fisheries so as to achieve an adequate spawning biomass.

Despite the complicating factors of hundreds of stocks, many or most of which are vulnerable to multiple fisheries which exploit many stocks in unknown and varying proportions, the need for a systematic approach to conservation is evident. Given the complex nature of the problem, a special effort is required to address the framework for scientific advice on the management of North Atlantic salmon. Consequently, ACFM recommends that three days to one week be set aside in 1988 for examination of an appropriate framework for such advice, with thoroughly researched background papers and participation of Working Group members together with other experts. This could be carried out as part of the Working Group meeting or as a special meeting sponsored by ICES. The ability of the Working Group to consider this issue would be improved if a Study Group were established to prepare data relevant to the North American Commission of NASCO and if its workload were reduced in 1988.

3. NOMINAL CATCHES OF SALMON IN HOME WATERS

Nominal catches of salmon in home waters (in tonnes round fresh weight) for 1960-1985 are given in Table 1. Figures for 1986 are incomplete. The 1986 catches in home waters, apart from those reported by Finland, are higher than the corresponding 1985 values. ACFM is aware of unreported catches throughout the North Atlantic. Due to the lack of data from some countries, no precise estimates were obtained. However, ACFM considers the unreported catch to be of the order of 3,500 t for all countries.

4. CATCH IN NUMBERS BY SEA AGE FOR RECENT YEARS

Reported national salmon catches in numbers and weight for eleven countries are given in Table 2. As in Table 1, catches include both wild and reared salmon.

5. NATURAL MORTALITY IN THE SEA

5.1 The Effects of Predation on Natural Mortality (WG h, NE i)

Predators of salmon from the smolt stage onwards include terrestrial and marine mammals, birds, and fishes. Results of studies presented to the Working Group suggest that birds such as cormorants and fishes such as cod can exert high levels of mortality, particularly during the smolt and post-smolt stages.

5.2 Estimated Natural Mortality Rates (WG k, NE e)

Published estimates of the marine natural mortality of Atlantic and Pacific salmon were considered, together with some data relevant to the natural mortality of Icelandic ranched salmon. Since the natural mortality in the marine phase has not been precisely estimated, the importance of this factor in assessing the impacts of the West Greenland and Faroese fisheries on home-water stocks was illustrated by using monthly natural mortality rates of 0.01 and 0.02 subsequent to these fisheries.

Assuming a monthly natural mortality rate of 0.01 subsequent to the Faroese fishery, analysis of data for salmon from the Burrishoole River (Ireland) and River Imsa (Norway) gave estimates of 50-80% mortality from leaving fresh water until the mid-point of the Faroese fishery.

6. QUESTIONS OF INTEREST TO THE NORTH AMERICAN COMMISSION OF NASCO

6.1 Acid Rain

6.1.1 Freshwater habitats of Atlantic salmon and their vulnerability to acidification

ACFM adopted the Acid Rain Study Group's estimate that there is approximately 1,000 km^2 of riverine Atlantic salmon habitat accessible to anadromous Atlantic salmon in North America. A minimum estimate of areas vulnerable to acidification was provided by those areas where mean volume-weighted alkalinity is known to be less than 50 µeq/l. A habitat was determined to be lost to salmon productivity when it had a mean annual volume-weighted pH of less than 5.0 and no longer had juvenile salmon present, as detected by electrofishing. Approximately 50 km^2 of this habitat is classed as vulnerable, and about 10 km^2 does not produce wild Atlantic salmon, mainly as a result of acidification. This area is in the Canadian Province of Nova Scotia.

6.1.2 Trends in acidification of freshwater habitat of Atlantic salmon

Very little historical data were available upon which to base estimates of trends in acidification or salmon production. Water chemistry data for two Maine rivers since 1969 showed no apparent change in acidity since that time; no historical data were available for the smaller tributary streams which were classed as vulnerable to acidification. No historical data were available for vulnerable areas in Newfoundland and Quebec. Historical water chemistry data were available for 1953-1955 for five Nova Scotia rivers. Four of these rivers (Roseway, Medway, Mersey, and La Have) show a significant decline in pH over a 26 year period to 1980-1981. For the Medway River, the pH declined linearly from about 5.8 in 1955 to about 5.2 in 1978.

Angling catch records for ten Nova Scotia rivers where the current mean annual pH is less than 5.1 were used as an index of Atlantic salmon production since 1936. Atlantic salmon harvests declined in those rivers that have been acidified and, in several rivers, have disappeared. The decline seems to have begun about 1955, but earlier declines are possible.

Watt (1987) estimated that Atlantic salmon production loss attributable to the acidification of Nova Scotian rivers is in the vicinity of 23,000 adult fish per year. ACFM noted that this estimate involved two main assumptions: that all habitat in the Southern Upland Zone of Nova Scotia was equally productive per unit rearing area prior to acidification, and that the rearing area in rivers below pH 4.7 had been underestimated. ACFM recommended examination of an alternative method of calculation involving comparison of the historical catch rates of angling harvest per unit area of the rivers classed as "vulnerable" to those not considered vulnerable. This comparison would address the question of equivalence of rearing habitat. It would be necessary to assume that anglers harvested the same proportion of the total stock from each river in the years of earliest catch record. Data were not available to ACFM to complete this calculation.

ACFM noted that, while information was presented on trends in acidification over years between rivers, no information was available in the Study Group report on trends in pH within a year for any river.

6.1.3 Influence of acidification of freshwater habitat on growth and survival of Atlantic salmon

ACFM concluded that low pH can lead to mortality in several stages of the salmon life cycle; particularly vulnerable are hatching and transition to first feeding in alevins, while the water-hardened egg is relatively resistant to low pH. Mortality can also occur in parr and smolt, particularly if the pH is rapidly reduced as occurs during snow-melt in some areas.

In assessing the effect on smolt production, ACFM noted that low pH seems not to adversely affect growth rates of surviving fish. However, due to mortalities from pH stress, parr densities, parr production, and smolt densities have all been shown to be significantly depressed.

6.1.4 Effectiveness of mitigation measures

Liming is in the experimental stage in North America (Nova Scotia) but is in large scale current practice in Scandinavia where it has been shown to be cost effective in terms of the added value of salmon landed. Experimental-scale liming in Nova Scotia is used to create de-acidified refuges in small tributary streams which currently have remnant salmon populations.

The main mitigative measure related to acidification used in North America is stocking of hatchery-reared salmon smolts and parr which is currently taking place only in Nova Scotia. ACFM noted that both liming and stocking are palliative measures and agreed with the Study Group's conclusion that a definitive solution to the problem of acidification of Atlantic salmon rivers can be achieved only by reduction of acid-precursor emissions at their sources.

The Working Group was not able to complete its work on the estimate of loss of Atlantic salmon due to acid rain. If the Study Group does not reconvene, the Working Group should be prepared to consider this question at its next meeting.

6.2 Description of Fisheries

6.2.1 Fisheries catching salmon originating in another country (NA b)

Canadian fisheries harvesting USA-origin salmon have been described in ACFM advice in 1984 and 1985. In 1986, the commercial salmon fishing season was 5 June to 15 October for Statistical Areas A to I and M to O; 5 June to 10 July for Statistical Areas J1, K, and L; and there was no open season in Statistical Area J2. The commercial salmon fishery was closed in Nova Scotia, New Brunswick, Gaspé, and parts of the north shore of the Gulf of St. Lawrence. In Newfoundland and Labrador, there were about 3,400 fishermen licensed to fish 13,000 50-fathom gear units. Canadian commercial catches for 1985 and 1986 are given in Table 3 and Newfoundland and Labrador catches and fishing effort for 1971-1986 are given in Table 4. Catches increased by 36% from 1985 to 1986 and licensed effort declined by 6%. The higher catches were at least partly due to increased abundance of Canadian salmon stocks.

6.2.2 Sport fisheries for Atlantic salmon in Maine (NA h)

Maine rivers with sport salmon fisheries are shown in Figure 1. Seven small rivers have self-sustaining salmon populations and sport fisheries based primarily on wild salmon. The Penobscot and St. Croix Rivers have restoration programmes underway and have sport fisheries based on stocked salmon. Remaining rivers shown have minimal sport fisheries and are scheduled for restoration.

Peak angling effort occurs in May and June although the angling season extends from May to 15 September (15 October for the lower reaches of some rivers). The total Maine catch of salmon varied from 350 to 1,350 (1.3-6.4 t) annually in recent years. The Penobscot River frequently contributes more than half of the total catch.

Catch reporting is voluntary and is considered 80% complete. About 2,500 to 3,000 anglers fish for salmon in Maine and 80% of these are Maine residents. Estimated exploitation rates for the Machias River varied from 14% to 25% from 1960-1972 and for the Narraguagus, from 10% to 37% from 1962-1974. The average exploitation rate for these rivers was about 20%. From 1977-1984 the exploitation rate for the Penobscot varied from 15% to 29%. In 1985, new regulations reduced the latter rate to 10%.

More than 95% of the catch consists of maiden, 2SW salmon.

6.3 Historical Catches of Salmon Originating in Rivers or Artificial Production Facilities of Another Country (NA a)

ACFM considered that revised estimates of returns to home waters and of model parameters, together with the availability of a computerized tag data base for the first time, justified a complete re-analysis of data presented last year. The basis for calculation is explained in the Working Group report.

Tag recoveries and harvest estimates for Newfoundland and Labrador fisheries are summarized by standard week in Tables 7 and 8 and harvest estimates by standard month are given in Table 9 and by year in Table 10. The revised analysis led to a 6% overall increase in estimated catches. Previous and revised estimated annual catches are compared in Table 11.

Estimated Newfoundland-Labrador catches of Maine-origin salmon varied from 117 in 1972 to 4,956 in 1980 and were less than 1,000 before 1974. From 1981 to 1985, harvest estimates averaged about 1,700 fish and corresponding run sizes averaged about 3,800 fish.

Using a similar calculation, an estimate of 649 Connecticut River origin salmon harvested in Newfoundland-Labrador in 1985 was obtained.

6.4 Impact of Management Measures Taken by Canada in 1984 and 1985 and Expected Impact for 1986 in Reducing the Harvest of USA-Origin Salmon (NA e)

Further restrictive management measures were enacted in the Canadian salmon fishery in 1986. Measures which could reduce the harvest of USA-origin salmon included closure of the commercial salmon fishery in Newfoundland on 15 October, mandatory tagging of legally commercially caught salmon, and a further reduction in licensed fishing effort.

As no new analysis was presented relating licensed fishing effort to fishing mortality, ACFM reiterated its previous advice that the reduction in total catch and in the harvest of USA-origin salmon attributed to reduced licensed effort (1984 and 1985 reductions) was expected to be less than 31% and could not be quantified. It was also not possible to quantify the impact of mandatory tagging of legally harvested salmon in the commercial fishery.

To assess the combined effect of all measures taken by Canada for 1984 and 1985, the estimated harvest of 1SW Maine-origin salmon in Newfoundland-Labrador was compared to the Maine run size of 2SW salmon the following year. For the years 1967-1983, the ratio of estimated Newfoundland-Labrador harvest to home-water returns averaged 0.53 and the values for 1984 and 1985 were 0.32 and 0.48, respectively. Both harvest levels in 1985 and corresponding run size increased from 1984. The increase in the harvest between 1984 and 1985 (923 fish) was associated with an increased harvest of 1,113 fish after 15 October. The Newfoundland autumn fishery took 16 t in 1985 compared to a long-term average of about 4 t.

The declines in proportions from 1983 to 1984 and 1985 were consistent with management measures adopted by Canada. ACFM, however, could not confirm that the changes observed were caused by these management measures as there have been wide fluctuations in the proportions in previous years.

ACFM noted last year that area closures and season reductions for 1984 and 1985 should have resulted in an 11% reduction in harvest of Maine-origin salmon. The closure of the autumn fishery on 15 October would account for a further 29% of 1SW Maine-origin salmon caught in Newfoundland-Labrador fisheries. The rates are not additive, however.

6.5 Tagging of Salmon

6.5.1 Salmon tags captured but not reported (NA c)

ACFM suggested three experimental methods to assess the proportion of external salmon tags captured but not reported:

- comparison of recapture rates from two methods of tagging;
- comparison of recapture rates for vessels with and without observers;
- community surveys.

6.5.2 Tag recovery reward system

Tag rewards varied by a factor of 5 between countries. ACFM considered that uniformity of tag rewards within a country and between adjacent countries was more important than uniformity across the entire NASCO area. There was scepticism about the validity of assuming that there would be substantial increases in return rates from modest increases in rewards. Substantial increases in rewards, however, carry the danger that spurious returns could result. Tags taken from smolts or from bird colonies, for example, could be held over and returned later to obtain rewards. ACFM considered that one of the most important factors in setting reward payments was the attitude of the local fishermen with respect to tag returns in general.

National clearing houses were working well and tag returns by countries where they were recovered were satisfactory. Programmes involving more than one country in detection of microtags were all operating and reporting satisfactorily.

6.6 Stock Identification Methods (NA g)

ACFM considered stock discrimination methods based on image analysis of salmon scales and otoliths. Scale shape, texture, and circuli spacing were considered to have potential as high resolution discriminators for separation of salmon stocks to continent, country, and possibly fish farm or hatchery of origin. Shape analysis of salmon otoliths was also considered as a possible inter-annual calibration technique for scale-based stock discrimination in the West Greenland fishery. ACFM was optimistic about the practical potential of these techniques, since needed material can be routinely collected in sampling catches. The methods require additional study, however.

6.7 Non-Catch Fishing Mortalities (NA i)

Non-catch fishing mortality is mortality generated directly or indirectly by fishing but which is not included in the reported catch. Six types were identified: predation mortality, drop-out mortality, haul-back mortality, escapement mortality, discard mortality, and other mortality such as direct consumption by fishermen or unreported local sales. These terms are explained in the Working Group report.

ACFM noted that it is usually not possible to make separate estimates of predation, drop-out, and haul-back mortalities, but their sum can be estimated by direct observation. Nets can be patrolled and the locations of observed fish can be marked. This has been done in the United Kingdom and Norway. Frequent boat patrols along salmon nets might bias the observations by causing salmon to mesh more firmly.

Escapement mortality is difficult to estimate accurately. Gillnet selectivity curves can be used to determine the proportion of salmon encountering the gear but escaping. The mortality rate of escapees is difficult to determine. Estimates have been obtained in Norway by experimentation in controlled enclosures and fish with net marks have been held in water of differing salinity to determine mortality rates. ACFM concluded that, although precise estimates were difficult to obtain, some of the available methods can provide rough estimates.

Numbers of fish dead when discarded can be estimated by direct observation. Salmon may also be released alive and die subsequently. This portion of discard mortality must be inferred by methods similar to estimation of escapement mortality.

7. QUESTIONS OF INTEREST TO THE WEST GREENLAND COMMISSION OF NASCO

7.1 The West Greenland Fishery, 1986 (WG a)

Nominal catches for the West Greenland salmon fishery from 1960 to 1986 are given in Table 14. In 1986, the fishery opened on 15 August and ended on 1 December. The total catch was 960 t, 51 t more than the TAC of 909 t. The 909 t TAC and 15 August opening date corresponded to the agreed TAC of 850 t for an opening date of 1 August. There was a "free quota" of 649 t available to all licensed fishermen and a "small boat quota" of 260 t which was allocated to districts and restricted to boats less than 30 feet. In total, 670 t were taken by small boats and 290 t by boats over 30 feet. The free quota was taken in 10 days and was exceeded by 51 t when it was closed.

The 1986 geographical distribution differed from previous years (Table 15). The biggest divisional catch was from Division 1F in 1986, while it had been from Divisions 1B to 1E in the past. Catches decreased from south to north.

Catch rate data were available from 17 vessels. Catch rates in Divisions 1D and 1E were higher than in 1C and 1F. Catch rates in 1986 were higher than those observed in 1970-1975 (Table 16). Larger, non-Greenlandic vessels had lower catch rates in 1970-1975 than did smaller, Greenlandic vessels in 1975 and 1986, due to different fishing patterns and locations and ways of operating the fishing gear.

The very high catch rates in 1986 and the highest observed catch taken in the first two weeks in 1986 could indicate a higher abundance or availability of salmon to the gear than in previous years.

7.1.1 Origin of salmon at West Greenland

A discriminant analysis of scale characters from salmon sampled in the West Greenland fishery in 1986 was developed and tested using 319 fish caught at West Greenland whose origin was known from tags or protein electrophoresis. The discriminant function had a mis-classification rate of 19.5% and an error rate of ±2.5%. Applying this function to catch samples gave an estimated proportion of North American salmon of 54% in 1986 (Table 18). The estimated proportion varied from 63% in Division 1E to 44% in Division 1F.

Using Carlin tag recoveries and a model similar to that of Section 6.3, ACFM estimated the number of Maine-origin salmon caught at West Greenland from 1967 to 1985 (Table 20). The estimated total catch ranged from 230 in 1967 to 2,875 fish in 1974. From 1970 to 1975, catches averaged about 1,600 fish. Since 1976, it has averaged about 1,300 fish. During this period, there was an increasing number of MSW salmon returning to Maine rivers, partly due to increased stocking of smolts.

An independent estimate of numbers of Maine-origin salmon caught at West Greenland for 1976 to 1985 was obtained using the estimated proportion of North American hatchery-origin fish in the catch from scale analysis. Estimates were about four times higher than those obtained by the Carlin tag method and the correlation between the two series was 0.84. ACFM concluded that possible mis-classification of river age and possible biases in sub-sampling of catches should be investigated further.

7.1.2 Biological characteristics

Alternative estimates of the proportionate composition of the catch by continent of origin for 1982 to 1986, obtained by weighting samples from a division by the catch in that division, are presented in the Working Group report. These differ by up to 5% from those shown in Table 18. The weighted 1986 proportion of 56% North American origin corresponds to a catch of 513 t or 179,800 salmon from North America and 447 t or 140,300 salmon from Europe.

Fish length, weight, and age data were compared for the two continents of origin in Table 21. As previously, North American origin salmon were shorter and lighter than those from Europe. Sea and smolt age compositions are presented in Tables 22 and 23. The mean smolt age of North American origin salmon increased from that observed in the previous three years but remained below the 1968-1981 average. There were no corresponding changes in smolt age in European-origin salmon.

The estimated sea age composition for 1986 of 96.2% 1SW, 3.0% 2SW, and 0.8% previous spawners showed a lower proportion of 2SW fish and previous spawners than in the previous three years.

7.2 Salmon Stock Abundance in the West Greenland Fishery (WG b)

ACFM provided rough estimates of salmon stock abundance in the West Greenland fishery using tag recoveries of Maine-origin salmon and assuming that all Maine-origin 1SW salmon extant at the time of the West Greenland fishery were present in the fishery and that all salmon present at West Greenland were subject to the same exploitation rate.

The analysis provided estimates of salmon abundance between 1969 and 1985 ranging from 1 to 2 million fish of all sea ages (Table 25). The lowest estimates of abundance occurred in 1978, 1983, and 1984 when the quota was not taken. Estimated abundance was also low in 1976 and 1982.

A comparison of abundance estimates and catches suggested that the exploitation rate at West Greenland ranged from 33% to 54% during the pre-quota years (1969-1975) and from 11% to 37% since then (Table 25). The rates declined considerably in 1983-1985 to an average of 14%. ACFM noted that these estimates are very sensitive to the tag reporting rate. Although they appear reasonable, they should be viewed as preliminary.

7.3 Effects of Varying Levels of Harvest at Greenland on Subsequent Returns of Large Salmon to Home Waters (WG c)

ACFM reviewed the 1980 assessment of the effects of the West Greenland salmon fishery on subsequent stocks and yields in home waters. Subsequent assessments examined equivalent TACs for differing opening dates. Although parameter values used in the calculations are known to vary from year to year and some parameters are not precisely estimated, there were not sufficient changes or trends to warrant a new assessment. For reasons discussed in Section 5.2, calculations were carried out using monthly natural mortality rates of 0.01 and 0.02 for the period following the Greenland fishery.

ACFM estimated that, on the average, for each tonne of European-origin salmon in the reported catch at West Greenland, 1.22 to 1.69 t would be lost to home-water returns in Europe, and for each tonne of North American origin salmon, 1.45 to 2.02 t would be lost to home-water returns in North America. These ranges reflect the range of parameter values used in the calculations and should not be interpreted as confidence limits.

Applying these figures to the 1986 West Greenland catch of about 447 t of European-origin salmon and 513 t of North American origin salmon, total losses to home waters were estimated to be 545-755 t for European stocks and 744-1,036 t for North American stocks. The combined total losses are estimated to be from 1,287 to 1,791 t.

7.4 Effects of Opening Date and Quota on Number of Salmon Caught at West Greenland (WG m)

ACFM reviewed the analysis on which it had based its advice on this question in 1982 and considered a new analysis using relative frequencies of weight classes by month in West Greenland salmon catches.

ACFM concluded that the new analysis generally confirmed its earlier conclusion, which was based on a more detailed model, that the catch level corresponding to various opening dates giving the same impact on stocks is:

$$\hat{Y} = 1183.79 + 5.4398x - 0.00710x^2$$

where x is the opening date with 9 August = 0 and 1184 is the catch for that opening date.

7.5 Historical Catches and Sustainable Yield (WG l)

ACFM reviewed historical catches of North American origin salmon and considered catch 1910 to 1985 and estimated catches of North American origin salmon at West Greenland from 1960 to 1985. ACFM expressed concern regarding the reliability of all catch figures prior to 1970.

Sustainable yield was defined as any level of harvest that could be maintained on a continuing basis. In the context of historical catches and also considering the complexity of the fisheries involved, ACFM noted several concerns with the application of this concept to manage the North American Atlantic salmon resource. Large variation in annual productivity is evident in the historical catch statistics. The sea fisheries harvest a mixture of stocks of considerably varying productivity. Catches of salmon at differing sea ages are not equivalent in their impact on home-water returns and spawning escapements. Setting a single catch level for all North American-origin salmon would include assigning a level of catch to the Greenland fishery, thereby affecting European stocks also caught there. Finally, it was noted that application of a management system based on maintaining a sustainable yield constitutes a major change in the present system whereby stocks are managed on the basis of satisfying stock conservation requirements.

ACFM considered a proposal to set a TAC of 2,650 t for North American-origin salmon, equal to the mean of historical catches from 1948 to 1985. This level was not proposed as a sustainable yield but as a ceiling subject to downward adjustments. The TAC at West Greenland under such a procedure would depend on the division of this catch between Canada and West Greenland as agreed by NASCO. The 1986 catch at West Greenland and in Canada relates to a North American catch of 2,346 t (840 + 1,506). This is based on the 960 t catch at West Greenland assuming half is of North American origin which, if taken in North American home waters, would equal 840 t. ACFM noted that the concerns expressed in the previous paragraph applied in varying degrees to all levels of TAC.

7.6 Home-Water Fisheries and Stocks

7.6.1 Impact of management measures taken and proposed by states of origin on home-water catches and spawning escapements of salmon (WG d)

Management measures of European states of origin are discussed in Section 8. Existing management measures in North America, as described in last year's report, remain in effect.

New conservation measures for 1986 in the Newfoundland-Labrador fishery are:

- closure of the commercial salmon fishery on 15 October;
- a limit of 15 fish per season for recreational fishermen;
- a requirement that all commercially caught salmon be tagged with market tags;

A mandatory registration system to monitor catches for all MSW salmon taken by angling in Maine will take effect in 1987.

Based on average historical catches, the reduction in landings associated with area closures of Canadian salmon fisheries in some areas was 22% for MSW (212 t) and 3% for 1SW (16 t) salmon in 1986. Similarly, delayed seasons were expected to give a reduced catch of 74 t of MSW salmon and 6 t of 1SW salmon, some of which might be subject to mortality in later fisheries. Closure of the Newfoundland-Labrador salmon fishery on 15 October would reduce the catch by an average of 7 t of MSW and immature 1SW salmon.

Returns to Canadian rivers in 1984 to 1986 were higher than predicted, with the exception of the Saint John River. ACFM confirmed that the increased returns to rivers were consistent with management measures adopted in 1984 to 1986 and that these measures had reduced the harvest of salmon in other Canadian fisheries, particularly of MSW salmon.

Additional regulations placed on recreational fishermen in the Penobscot River of Maine beginning in 1985 reduced the exploitation rate to 10% as compared with previous estimates of 22-27%.

7.6.2 Spawning escapements and target spawning biomass for salmon stocks occurring in the West Greenland Commission area (WG f)

Target spawning escapements and 1986 spawning escapements were provided for six Canadian rivers and three USA rivers. Targets were exceeded in four Canadian rivers; in the remainder, they were not met. Spawning escapements were presented for four European rivers.

7.6.3 Exploitation rates in home waters for salmon stocks occurring in the West Greenland Commission area (WG j)

Exploitation rates for European rivers are discussed in Section 8. Within Canada, the Conne River salmon fishery in Newfoundland had an exploitation rate of 28% in 1986 and the Saint John River had exploitation rates from 25% to 40% for 1SW and 29% to 62% for MSW salmon during 1983-1986.

Estimated exploitation rates for the Penobscot River, Maine varied from 5% to 15% for 1SW and 12% to 35% for MSW salmon from 1982 to 1986.

7.7 Tagging of Salmon (WG i)

In 1985, 5% of the West Greenland catch was screened for microtags and 34 microtags were recovered from the 14,319 fish examined (tags were detected but not recovered in two fish). In 1986, 10% of the catch was examined and microtags were recovered from 70 of 30,360 fish examined. In 1985, 90% of the 34 tags read were from Ireland. In 1986, 31% were from England and Wales, 27% from Canada, 26% from Ireland, 10% from the USA, and 3% each from Iceland and Scotland.

ACFM noted that analysis of external tag recoveries from Greenland was proceeding and discrepancies in numbers of tags sent and received had been resolved. Additional written feedback to laboratories forwarding tags was recommended. Completeness of data accompanying tag returns has varied. Trends in completeness, however, of reported data paralleled estimated trends in tag reporting rates.

Tag rewards in Greenland increased to 100 D.Kr. in 1986. This increase in reward and improved publication of the programme led to increased recovery of tags, some of which had been held by fishermen for several years.

External tags from Canada (54), the USA (58), Scotland, Norway, and Sweden were recovered in 1986.

Tag reporting rates for external tags recovered at West Greenland were estimated using variations in the proportion of tags recovered from two North American rivers. Relative rates were calibrated against the value of 0.8 calculated from a 1972 experiment. The results are presented in Table 36. There is a decline in the estimates from about 80% in the early 1970s to 40% at the end of the decade, followed by an increase to about 80% in the mid 1980s.

Microtagging programs were discussed. Many purposes exist for such programs. The ANACAT Committee of ICES compiles an annual listing of tags and finclips applied. ACFM noted that some countries were not reporting and the delay of a year or more in publishing the list posed problems in the case of Atlantic salmon. The Working Group provided an updated table of 1985 releases and a preliminary draft of a 1986 table (Table 33). More than 600,000 microtags were applied in 1985 and preliminary listings for 1986 exceed 875,000. In all known 1986 microtag applications, the adipose fin was clipped.

7.8 Accuracy of Classification by Continent of Origin and Accuracy of Age Composition Estimates (WG g)

The accuracy of classification by continent of origin was discussed in Section 7.1. The accuracy of river age composition by continent of origin is also important. It was calculated that the random sample size taken in 1986 would allow estimation of the proportion of river age 1 salmon from North America to about ± 20% of its value. However, other sources of error of comparable magnitude may exist, such as biases due to the way the catch was sub-sampled and biased determination of river age. ACFM recommended that these possibilities be examined further.

8. QUESTIONS OF INTEREST TO THE NORTH-EAST ATLANTIC COMMISSION OF NASCO

8.1 Faroese Salmon Fishery

8.1.1 Composition of catches in the Faroese salmon fishery (NE b,c)

Table 37 gives the catch by calendar year and by fishing season for the Faroese salmon fishery. The 1986 catch was 628 t and the 1985/1986 catch was 625 t.

The catch in number by age group and month in the 1985/1986 Faroese salmon fishery is given in Table 38. Discards were estimated to be 1.9% of the catch in numbers.

8.1.2 Distribution of catches by season and area in the Faroese salmon fishery in relation to country of origin (NE f)

No new data on recoveries of external tags from the Faroese fishery were available since 1985. Previous information on external tag recoveries was presented by ACFM in 1986. It was previously observed that there was no significant difference between centres of distribution of recoveries of tags originating in Norway, Sweden, and the United Kingdom. However, recapture rates for salmon tagged in Norway and Sweden were greater than those from smolts released in the United Kingdom and Ireland which, in turn, were greater than those from smolts released in Iceland.

8.1.3 Contribution of hatchery-reared salmon and fish farm escapees to the Faroese salmon fishery (NE d)

ACFM considered four general approaches to distinguishing reared salmon and fish farm escapees in salmon catches: direct observation, morphometric methods, scale analyses, and biochemical methods. Problems previously identified with the first three approaches were considered not to have been solved. To be effective, a method must distinguish fish which have escaped from fish farms after the smolt stage from reared fish released at or before the smolt stage for river enhancement purposes. This criterion is presently met only by the biochemical approach, and only in a preliminary way. It is known, for example, that eroded or deformed fins occur in salmon released at the smolt stage for stock enhancement purposes. Biochemical analysis of a sample of 219 fish in the Faroese fishery found that at least 3% were of farmed origin. Direct observation suggested that 13% were reared and scale reading suggested 7%.

8.1.4 Minimum size regulations and discards (NE g,k)

Estimated discard rates in the Faroese fishery were 13.5% in 1984/1985 and 1.9% in 1985/1986. The former value is considered to be near the top of the probable range while the latter shows that discards can fall to insignificant levels in some years. It is estimated that 15-20% of discarded fish survive. Consequently, of about 25,000 discarded salmon in 1984/1985, 3,750 - 5,000 would survive, and of about 3,500 discarded in 1985/1986, 525-700 would survive.

The effect of total compliance with a minimum landing size (MLS) of 63 cm or 68 cm total length rather than the present 60 cm was estimated using the length frequency distributions of landings for the two seasons. The results are shown below:

	Estimated discard rates (%) by numbers		
Season	MLS 60 cm	MLS 63 cm	MLS 68 cm
1984/1985	13.5	19	36
1985/1986	1.9	6	22

If the MLS were abolished, discarding would probably continue. However, the implication of retaining the fish discarded in 1984/1985 was calculated to be:

Age class	No. of fish killed in fishery	No. of fish returning to home waters
1 SW	increased by 3,013	decreased by 2,280
2 SW	decreased by 7,684	increased by 5,235
3 SW	decreased by 739	increased by 2,170

The total weight of salmon returning to home waters would increase by 38 t. If the 1984/1985 discard rate is considered maximal, then the effect of retaining all fish caught would vary from a small amount to the calculated value.

Beginning in 1987, the Faroese Fisheries Laboratory has been empowered to close areas to salmon fishing if large numbers of small fish are present in the catch. ACFM noted that this approach may be more effective than a MLS in reducing discard rates. Increasing survival rates of discarded fish is considered impractical.

8.2 Home-Water Fisheries

8.2.1 Catches of salmon in the North-East Atlantic Commission area (NE a)

Catches from home-water fisheries are presented in Table 1. As in 1986, ACFM was unable to report catches in the categories requested. However, catches in home-water fisheries are divided into sea fisheries, estuarine fisheries, and river fisheries in Table 39. Only in the Faroese salmon fishery does the fishing season overlap the end of the year (see Section 8.1).

8.2.2 Description of salmon fisheries in the North-East Atlantic Commission area (NE a,h)

ACFM was asked to describe home-water fisheries and to consider the effects of regulation on the exploitation of home-water stocks. ACFM considered that home-water stocks were conserved by management measures laid down by various regulations and that these same regulations were largely responsible for the present form of the salmon fisheries. Consequently, it was not possible to estimate the incremental impact of the various regulations in force. The evolution of home-water fisheries and regulations is described for Norway, England and Wales, France, Finland, Northern Ireland, Scotland, Iceland, and Ireland in Section 4.2 of the Working Group report.

8.2.3 Effects of conservation measures on exploitation of home-water stocks (NE j)

A wide range of exploitation rates occurs in home-water fisheries in the North-East Atlantic, ranging from a few percent to over 90%. There is a large body of conservation measures in place including closed seasons, weekly closed times and closed areas, prohibition and definition of gears, and materials and methods of fishing. Size of boats, numbers of licenses, and sale of fish caught are also regulated. Evaluation of the effects of present and future conservation measures is subject to several difficulties. Catches do not necessarily reflect changes in stock abundance which is assessed for few rivers. Marine survival is variable, confounding the effects of changes in management measures. There is also evidence of significant illegal catches in some countries. For these reasons, ACFM was not able to assess the effects of specific measures.

8.2.4 Evolution of the fishing gear (NE h)

Most home-water fisheries have been controlled for at least 100 years. There has been little change in the gear used except that certain methods have been banned. The introduction of synthetic netting twines in the 1960s and especially monofiliament and monoply twine, however, affected the operation of many netting methods. Gillnets became much more effective and could be operated effectively in daylight and away from shore. This led to increased marine drift netting until it was restricted or banned.

8.3 Exploitation Rates (NE a)

Exploitation rates in various fisheries for some stocks in Norway, Scotland, Ireland, and Northern Ireland are presented in Tables 40 to 44. These rates were estimated from tag recovery data.

9. ACOUSTIC SURVEYS IN THE FAROESE SALMON FISHERY

The Study Group on the Norwegian Sea and Faroese Salmon Fishery recommended that acoustic methods should be used to assess numbers and biomass of salmon in the Faroese area. The Working Group expressed some doubts about the technique, especially concerning accuracy of the estimates, but recommended that a feasibility study be carried out to determine if these acoustic methods can work in high seas Atlantic salmon fisheries. ACFM endorses this recommendation.

10. SPECIAL STUDY GROUPS IN 1987

The results of two Study Groups are included in this report and should be referred to if further clarification is needed. These are the Report of the Study Group on the Norwegian Sea and Faroese Salmon Fishery (ICES Doc. C.M.1987/M:2) and the Report of the Acid Rain Study Group (ICES Doc. C.M.1987/M:3). The Working Group and ACFM endorsed the research initiatives recommended by the Study Group on the Norwegian Sea and Faroese Salmon Fishery and generally endorsed those of the Acid Rain Study Group. These are presented below:

The Study Group on the Norwegian Sea and Faroese Salmon Fishery made the following recommendations:

1. Sampling and screening the catches at Faroes

The Study Group considered the current effort put into sampling and screening catches adequate and recommends it be continued at a similar level.

2. Analysis of tag returns

The analysis of tag returns should include total returns to the home-water fisheries divided according to river origin and specifying whether fish are reared or wild.

3. Tagging in the high seas

Tagging using breakable hooks was discussed and the Study Group recommended that this method should be reviewed before the next meeting. In addition, an effort should be made to estimate the hook loss in the Faroese fishery, and the number of fish caught in the home-water fisheries with hooks in their mouth or alimentary canal.

4. Acoustic surveys

Work done on Pacific salmon stocks indicates that it is possible to assess numbers and biomass of salmon using acoustic methods. The Study Group considered that, although these results were obtained in restricted areas, they were so encouraging that similar work in the North-East Atlantic was recommended.

5. Separating salmon of wild and reared origin

The Study Group discussed various methods for separating wild and reared salmon in the Faroese fishery and made a number of recommendations for future work.

The Acid Rain Study Group, as a result of its work, made the following recommendations:

1. The major effort in North America should be devoted to the prevention of additional damage to existing Atlantic salmon stocks from acidification of habitat rather than mitigating damage after it occurs. The extensive damage to Atlantic salmon stocks in Scandinavia that has already resulted from acidification necessitates local mitigation measures to preserve and enhance existing stocks. Such damage is presently minimal in North America, but efforts undertaken to prevent such damage should include reduction in emissions of acid-precursors at their sources, if necessary.

2. Chemical and biological surveys should be conducted in Atlantic salmon rivers in order to better quantify the extent and degree of risk to the habitat, and long-term monitoring programs should be established on selected index rivers to obtain time-series data from which trends in acidity can be determined. The Study Group found that an estimation of the extent of North American Atlantic salmon habitat that is vulnerable to acidification, and of trends in the acidification of this habitat, was hampered by a lack of data on which to base these estimates.

3. Because of the importance of aluminum as a toxic substance to salmonids in acidified Scandinavian streams, further research should be conducted to resolve its importance (or lack thereof) in eastern North American salmon streams.

4. Consideration should be given to the advisability of developing programs to protect the genomes of Atlantic salmon stocks at risk from acidification. Protection techniques may include creation of refuges or preservation of male and female gonadal products and other genetic material.

5. A study plan should be prepared to determine the feasibility of transferring the existing European river liming technology to North American acidic Atlantic salmon waters. Although such liming practices are technologically and economically feasible in Scandinavia, North American rivers differ with respect to hydrological, chemical, and biological characteristics, and as a result, the technology may not be directly transferable.

6. Since it was not possible in the time available to provide complete and definitive answers on Atlantic salmon in relation to acid rain, consideration should be given to reconvening the Study Group in one year's time to complete its assigned tasks. Since the problem of acid rain concerns other anadromous and catadromous species and has an impact on marine biology, consideration should be given to broadening the terms of reference of the Study Group to include the direct and indirect effects of acid rain on the production of diadromous and marine species in the estuarine and coastal environments and to report its findings to both the ANACAT and Marine Environment Quality Committees.

7. The North Atlantic Salmon Working Group should undertake the assessment of the loss of production in acid-affected habitat using the two methods proposed in this report, or such other methods as it deems appropriate, because the Study Group judged itself as not having the competence to conduct an assessment with sufficient rigor.

REPORT TO THE GOVERNMENT OF NORWAY

1. HARP SEALS IN THE GREENLAND SEA

Source of information: Harp and Hooded Seals in the Greenland Sea Working Group report, October 1987 (C.M.1988/Assess:8)

1.1 Recent Catches

Catches from the West Ice have increased in the past two years, from 566 in 1985 to 4,755 animals of all ages in 1986 (Table 1). The Norwegian catch in 1987 was 11,444 animals, from a quota of 20,500, but no information is available on the USSR catch (quota 4,500). Substantial additional numbers (up to 6,000) of seals are taken each year in Norwegian coastal waters during January-April. These catches increased in 1986 and again in 1987 (to nearly 60,000 animals) as unusual numbers of predominantly young seals invaded the eastern Finnmark area. The cause of the invasion is not clear.

1.2 Stock Affinities

Animals tagged in the Jan Mayen area have been recaptured on the Norwegian coast, at Iceland, and at East Greenland. The spring "invasion" of eastern Finnmark, while apparently coming from farther east, included animals tagged in the Jan Mayen area.

1.3 Population Size

Tagging studies have generally involved insufficient animals each year for population assessment except that preliminary estimates of pup production in the Greenland Sea have been made for 1977, 1978, and 1983, but these numbers (40-50,000 animals per year) require confirmation by further analysis. A tagging programme designed to allow an estimate of pup production was conducted in 1987.

No estimates of total population numbers can be made as additional work is needed on historic catch figures which have been obtained recently, and on the consistency of the recent determination of the age of sampled animals, in comparison with age determination in earlier years.

1.4 Management Advice

No advice can be provided on sustainable yields nor on catch options. The basis for the advice on management measures that had been provided since 1971 to the Norway-USSR Sealing Commission and more recently to the Joint USSR-Norwegian Fishery Commission, is not included in the scientific reports of these bodies.

2. HOODED SEALS IN THE GREENLAND SEA

Source of information: Harp and Hooded Seals in the Greenland Sea Working Group report, October 1987 (C.M.1988/Assess:8).

2.1 Recent Catches

Catches in the West Ice have increased from a low of 582 animals of all ages in 1984 to 4,770 in 1986 (Table 2). The Norwegian catch in 1987 was 7,794 animals, from an allocation of 16,700, but no information is available about the USSR catch (quota 3,300).

2.2 Stock Affinities

Tagging studies indicate wide dispersal of pups, but animals whelped at the West Ice have not been shown to move to the Greenland coast. In contrast, pups tagged in the Davis Strait and off Newfoundland have been recaptured along both the west and east coasts of Greenland.

2.3 Population Size

Aerial surveys of whelping patches have been conducted by the USSR in 1984 (preliminary survey) and in 1986 and 1987. Summary results for the 1986 survey indicate approximately 25,000 pups in the patch studied. There was at least one other patch that was not surveyed. No firm estimates of pup production can be made without further information on the methodology used in conducting and analyzing the 1986 survey, and on the results of the 1987 survey.

There are no new estimates of population size, although the available age sampling data might be analyzed further to determine vital rates.

2.4 Management Advice

No advice can be provided on sustainable yield or catch options as estimates of current stock size are not available. The basis for the advice on management measures that has been given to the Joint Soviet-Norwegian Fishery Commission, or previously to the Norwegian-Soviet Sealing Commission, is not included in the reports of the scientific meetings of these bodies.

3. GENERAL COMMENTS

There is a considerable amount of biological data in national files, and much, but not all, of this has recently been made available to the Working Group on Harp and Hooded Seals in the Greenland Sea. The data may be amenable to a number of analytical approaches and these should be investigated on a national basis before the Working Group can be expected to make progress in assessing the populations of harp and hooded seals in the Greenland Sea. It will also be necessary for any outstanding data to have been exchanged prior to another meeting and to have participation from all countries carrying out research on these populations.

Table 1. Catches of harp seals in the West Ice, 1946-1987, including catches for scientific purposes.

	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	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	+	+	a)	23862+	13564+	37426+ a)
1956	8983	6894	15877	+	+	a)	8983+	6894+	15877+ a)
1957	4847	11801	16648	+	+	a)	4847+	11801+	16648+ a)
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	252	2252	15305	1793	17098
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	3030	9632	1961	243	2204	8563	3333	11896
1983	742	2576	3318	4263	0	4263	5005	2576	7581
1984	199	1779	1978	-	-	-	199	1779	1978
1985	532	25	557	3	6	9	535	31	566
1986	13	2	15	4490	250	4740	4503	252	4755
1987	7961	3483	11444	-	-	-	-	-	-

a) For 1955, 1956, and 1957 Soviet reports catches of harp and hooded seals at about 3900, 11600, and 12900, respectively (Sov. Rep. 1975).

Table 2. Catches of hooded seals in the West Ice, 1946-1987, 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	+	+	a)	45266+	11511+	56777+ a)
1956	31564	9224	40788	+	+	a)	31564+	9224+	40788+ a)
1957	13238	8951	22189	+	+	a)	13238+	8951+	22189+ a)
1958	38636	19906	58542	2861	3428	6299	41497	23344	64841
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	41080
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	1632	149	1781	1886	233	2119
1986	2738	161	2899	1072	799	1871	3810	960	4770
1987	0	7794	7794	-	-	-	-	-	-

a) For 1955, 1956, and 1957 Soviet reports catches of hooded and harp seals at about 3900, 11600, and 12900, respectively (Sov. Rep. 1975).

REPORT TO THE COMMISSION OF THE EUROPEAN COMMUNITIES

1. EUROPEAN EEL

Source of information: European Eel Assessment Working Group report, September 1987 (C.M. 1988/Assess:7).

1.1 Fisheries

Catch data as available from statistical tables from FAO are inadequate to show trends in production or to quantify the actual impact of exploitation by fishing on the eel stock. Working Group estimates of the total annual level of production by the countries represented on the Working Group (Tables 1 and 2) were 857 t of glass eel and 12,435 t of grown eel (yellow and silver eel combined). The FAO figure for 1981 of their total catch was 7,777 t, all life stages included. Of glass eels, more than 675 t are used for consumption, the remaining amount (less than 182 t) for transplantation and aquaculture.

1.2 Stock Identity

There is only one breeding stock. Environmental differences make it necessary to distinguish between several management units.

1.3 State of Stock

Currently available time series on catch and effort are not complete (Table 3). Data from many countries are missing and available series are not very comparable. Nevertheless, the recruitment of glass eels during 1980-1986 seems to be substantially lower than in the previous decade. However, the available data are insufficient to indicate whether: a) the decrease in glass eel recruitment will continue, b) catches of grown eel show a corresponding decline, c) the decrease in glass eel recruitment originates from a decreasing number of spawners, d) the decrease in silver eel catches is caused by over-exploitation of glass eels.

1.4 Parasites

Introduction of parasites from the Dactylogyrus group has caused major problems in eel farming. There is no indication, however, of an impact of this parasite on wild eel populations.

The import of three species of Anguillicola (parasitic swimbladder nematodes) from the Far East and Australia-New Zealand during the 1970s is becoming a major problem in western and central Europe.

The parasite causes growth retardation, feed conversion reduction (under farming conditions), and increased mortalities during transport and storing. If the swimbladder has a major function in the oceanic spawning migration of silver eels, this parasite may become a danger for the eel stock in total.

1.5 Recommendations

ACFM recommends that:

- International statistics on eel fisheries (Bulletin Statistique, FAO Statistical Yearbook) should be classified by life stages, giving glass eels and grown eels (yellow eel + silver eel) separately.

- An international inquiry for data on eel fisheries will be organized to assemble all data available on the regional administrative level. To evaluate any assumed changes in the fisheries, this inquiry should be repeated after ten years.

- National studies on glass eel immigration and monitoring will be encouraged. A future meeting of the Working Group will undertake the joint analysis of multiple (national) time series.

- National agencies are encouraged to undertake studies to assess the magnitude of amateur fishing on eels.

- An international study of infection of European eel by *Anguillicola* spp. will be undertaken with particular reference to: a) distribution and abundance of *Anguillicola*, b) impact on yield and spawner production, and c) impact on gonad development.

1.6 Comments

In the case of European eels, it is clear that management must be by fishery units, not for the total stock. Coordination of research on this species is badly needed.

Table 1 Catch (tonnes) of glass eels and grown eels estimated from data available to the Working Group and compared to official data.

Country	Glass eel	Grown eel: Inland	Atlantic	Baltic	Mediterranean	Total	Eel total	FAO statistics
Norway	-	-	350	-	-	350	350	346
Sweden	-	>31	240	850	-	1,121	1,121	1,335
Finland	-	2	-	1	-	3	3	38
Denmark	+	136	311	1,785	-	2,231	2,232	2,192
Germany,Fed.Rep.	+	>1,000	176	72	-	1,248	1,248	307
Netherlands	+	1,900	250	-	-	2,150	2,150	1,094
Belgium	-	+	+	-	-	-	+	-
Ireland	7	856	-	-	-	856	863	962
France	500	>1,000	475	-	2,000	3,475	3,975	1,483
Portugal	350	-	1,000	-	-	1,000	1,350	20
Total	857	4,925	2,802	2,708	2,000	12,435	13,292	7,777
Additional	-	-	-	-	-	-	-	5,612
Grand total	-	-	-	-	-	-	-	13,389

Note: - Grown eels include yellow eel and silver eel.
- FAO statistics give encrage catch of 1981, all life stages included.
- This table includes exactly known statistics as well as rough guesses.

Table 2 Presence of different classes of fishing gear in participating countries on a semi-quantitative scale (-absent, + present, *important).

Country	Area	Glass eels	Fixed gears	Movable	Long-line	Trawl	Angling	Fixed gears	Movable	Trawl
Norway	Marine	-	-	-	-	-	-	-	-	-
Denmark	Inland	-	*	+	+	-	+	*	*	-
	Baltic	-	*	*	+	*	+	+	*	+
	North Sea	-	*	*	+	+	+	+	*	+
Germany, Fed. Rep.	Inland	+	*	+	+	+	*	+	-	-
	Baltic	-	+	+	-	-	+	-	+	-
	North Sea	-	+	-	-	*	+	-	-	-
Netherlands	Inland	-	*	*	+	-	*	+	*	-
	Marine	+	+	-	-	+	+	-	+	*
Ireland	Inland	+	*	-	*	-	-	*	-	-
	Marine	-	+	-	-	-	-	-	-	-
France	Inland	-	*	-	+	-	*	*	+	-
	Atlantic	*	+	+	-	+	*	+	-	-
	Mediterr.	-	*	-	-	-	+	+	-	-

Table 3 Summary of time series on eel populations available to the Working Group.

Country	Area	Production (tonnes)	Landings data First	Landings data Last	Sampling data First	Sampling data Last	Effort data First	Effort data Last
Glass eel								
Norway	Imsa	-	1975	ctd	1984	ctd	1975	ctd
Denmark		1	1971	ctd	1984	ctd	-	-
Germany, Fed.Rep.	Ems	6	1960	ctd	-	-	-	-
Netherlands	IJsselmeer	1	1955	ctd	1970	ctd	1955	ctd
Ireland	Shannon	2	1977	ctd	-	-	1977	ctd
	L. Neagh	5	1965	ctd	-	-	1965	ctd
France	Vilaine	45	1972	ctd	1975	1985	1977	ctd
	Loire	125	1924	ctd	1976	1981	1977	ctd
	Sèvre N	27	1962	1983	1981	1984	1962	1983
	Somme	1	1980	ctd	-	-	1980	ctd
Yellow eel								
Norway	Imsa	2	1975	ctd	1980	ctd	1975	ctd
Sweden	Baltic	850	-	-	1977	1982	-	-
	Marlaren	20	-	-	1982	ctd	-	-
	Hjalmar	11	-	-	1982	ctd	-	-
Finland		2	1978	1984	-	-	-	-
Denmark		1,500	1908	ctd	occasionally		-	-
Germany, Fed.Rep.		400	-	-	occasionally		-	-
Netherlands	IJsselmeer	750	1945	ctd	1970	ctd	-	-
	Marine	250	-	-	1970	ctd	-	-
	Fresh	750	-	-	1970	ctd	-	-
Ireland	Shannon	6	1984	ctd	1969	ctd	1984	ctd
	L. Neagh	600	1960	ctd	1985	ctd	?	ctd
France	Blavet	5	1983	ctd	1983	ctd	1983	ctd
	Loire	40	1977	ctd	-	-	-	-
Silver eel								
Denmark		400	1908	ctd	occasionally		-	-
Germany, Fed.Rep.		400	-	-	occasionally		-	-
Netherlands	Ijsselmeer	150	1955	1970	1970	-	-	-
	Marine	*	-	-	1970	ctd	-	-
	Fresh	250	-	-	1970	ctd	-	-
Ireland	Shannon	50	1969	ctd	1978	ctd	1969	ctd
	L. Neagh	200	1960	ctd	-	-	1960	ctd

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

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