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ADDENDUM TO THE REPORT OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT TO THE 20th ANNUAL MEETING OF NEAFC

Copenhagen, 3-5 November 1981

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ADDENDUM TO THE REPORT OF THE ACFM TO THE 20th ANNUAL MEETING OF NEAFC

(November, 1981)

INTRODUCTION

As has been indicated in the Introduction to the ACFM Report to the Twentieth Annual Meeting of NEAFC, with the new timetable of ICES with one ACFM meeting in July and the other in November, three of the Assessment Working Groups did not meet until after the July 1981 ACFM meeting. Advice for the stocks considered by those Working Groups is provided by the present report.

During its July 1981 meeting ACFM had to defer providing complete advice on a number of topics because the requisite data were not then available. These items have also been dealt with during the November 1981 ACFM meeting. Therefore this report should be considered as a supplement to the ACFM Report issued in July 1981, and should be read in relation to what was said on these topics in that report.

B. REGION 1 FISHERIES

B.6 CAPELIN STOCKS

1. The Atlanto-Scandian Herring and Capelin Working Group met at ICES headquarters from 28-30 October 1981 to assess the state of the capelin stocks in Sub-areas I, II, V and XIV, and advise on any necessary management measures for these stocks.

2. As this was the first time that capelin stocks were dealt with in an ICES Assessment Working Group, it was decided to include sections on the general biology and life history of the two stocks concerned, i.e., the Barents Sea and the Icelandic capelin stocks.

Both stocks have short life span. The Barents Sea capelin become nature and spawn when they are 4 years and 5 years old. The Icelandic capelin has a faster growth, and they mature and spawn a year younger than the Barents Sea stock.

The most important biological characteristic from the harvesting point of view is that the spawning mortality is considered total. Therefore, the main object of the fisheries management is to secure that a certain minimum proportion of the stock is allowed to spawn in order to safeguard recruitment. The stock/recruitment data that are available so far do not allow one to pinpoint this minimum spawning stock abundance, but as guidelines the scientists concerned have in their advice arrived at a spawning stock of 500 000 tonnes and 400 000 tonnes for the Barents Sea and the Icelandic capelin, respectively.

3. The basis for the assessment of both stocks are the results of acoustic surveys, which are carried out in the autumn. In the case of the Barents Sea capelin, the acoustic surveys started in the early 1970s, while for the Icelandic capelin the acoustic surveys did not start until 1978. A length-dependent conversion factor is used to calculate fish abundance from echo-intensity. The value used corresponds to a target strength of -37 dB per kilo for 15 cm capelin weighing 17 g.

MEMBERS OF THE ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1980/81

Mr K Hoydal	Chairman
Mr A C Burd	Chairman, Demersal Fish Committee
*Mr O J Østvedt	Chairman, Pelagic Fish Committee
Dr O Rechlin	Chairman, Baltic Fish Committee

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M E Cadima/Alternate: Ms A M Tavares
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Mr B Sjöstrand
Dr S A Studenetsky/Alternate: Dr A I Mukhin
Mr Ø Ulltang
Mr B Vaske

Dr V M Nikolaev, Council's Statistician
Secretary to the ACFM

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* Unable to attend the November 1981 Meeting.

B.6.1 BARENTS SEA CAPELIN

4. Since 1979 the Barents Sea capelin fishery has been regulated by bilateral fishery management agreements between the USSR and Norway. Recent TACs and catches (in thousand tonnes) are given in the text table below (see also Table 1):

1979			1980			1981		1982
Rec. TAC	TAC	Catch	Rec. TAC	TAC	Catch	Rec. TAC	TAC	Rec. TAC
1 800	1 800	1 783	1 600	1 600	1 649	1 900	1 900	1 600

These TACs have been recommended by a bilateral USSR/Norwegian assessment group.

5. As in previous years the basis for the present assessment of the Barents Sea capelin is the results of the USSR/Norwegian acoustic survey carried out in September-October each year. The 1981 survey gave the following abundance estimate:

Year class	No. x 10^{-11}	Mean weighting	Biomass in t x 10^{-6}
1980	3.85	2.2	0.85
1979	1.95	9.4	1.82
1978	0.48	17.0	0.81
1977	0.14	23.3	0.33

Compared to a similar estimate in 1980 the number of 1 year old capelin in 1981 is very high and that of 2 year old capelin is about the same in 1981 as estimated in 1980. In 1981 the numbers of 3 and 4 year old capelin were only about 1/3 of the number of these age groups estimated in 1980. Besides, the mean weight was lower in 1981 than in the previous year, and therefore the total biomass of 3 and 4 year old capelin was 1.1 million tonnes in 1981 compared to 3.6 million tonnes in 1980.

6. Estimates of the abundances of 2 and 3 year old capelin are made each year by acoustic techniques. The ratio of these values, adjusted for the catches, provides estimates of natural mortality.

During the period 1973-78 these estimates of the natural mortality coefficient M were very stable giving an M = 0.05 per month for 2-3 year old capelin. The low estimate of 3 ringers in 1981 in comparison with the number of 2 ringers in 1980 means that the calculated M value for 2-3 ringers in 1980-81 is more than twice the value calculated for the period 1973-78.

This increase in the calculated M value could be due to an underestimate of stock size in 1981.

7. In order to study the effects of various catch levels during the winter of 1982, the stock in number by age at 1st January 1982 was calculated from the 1981 acoustic stock estimate using an M value of 0.05 per month. Assuming that all capelin with the length of

above 14 cm will mature and spawn, the effects of various levels of winter catches on the potential spawning stock are given in the text table below:

TAC estimates (in thousand tonnes) and corresponding spawning stock biomass (maturing length = 14 cm)

TAC	600	700	800	900	1 000
Spawning stock	584	493	401	312	223

8. A TAC of 800 000 tonnes will reduce the spawning stock biomass below the minimum level of stock size (500 000 tonnes) agreed upon as the guideline for the TAC assessment. It was, however, felt that the apparently high mortality rate estimated in 1980-81 for the immature part of the stock could partly be due to an underestimate of the present stock in the 1981 survey. On this basis, the ACFM agreed to recommend that the TAC for the period 1 January to 1 May 1982 should be set at the range of 600 000 - 800 000 tonnes.

9. By projecting the immature stock, i.e., capelin below 14 cm, one year ahead, and using an M = 0.05 per month, a total catch of 1.6 - 1.8 million tonnes taken in the autumn of 1982 and the winter of 1983 would reduce the total potential spawning stock to the same level as in 1982. On the basis of this prognosis, the ACFM recommends that the TAC for the autumn fishery (15 August - 31 December 1982) should be in the order of 800 000 tonnes, this being approximately half of the expected catch in the 1982-83 season.

B.6.2 ICELANDIC CAPELIN

10. Recent catches and TACs for the Icelandic capelin are given below in thousand tonnes (see also Table 2):

1979/80			1980/81			1981/82
Preliminary TAC	Rec. TAC	Catch	Preliminary TAC	Rec. TAC	Catch	Preliminary TAC
650	850	962	775	450	680	700

11. Preliminary TACs were set prior to the fishing season after bilateral negotiations between Iceland and Norway. Recommended TACs were based on results of the acoustic surveys which were carried out in October and January, each season. On the basis of the winter surveys it has been possible to calculate the spawning stock in 1979-1981. The results are given in the text table below:

Year	1979	1980	1981
Spawning stock	600	300	160

Thus, there has been a drastic reduction in the spawning stock during the last three years.

In the case of the Icelandic capelin stock the available series of data on stock/recruitment relationship is too short to pinpoint the minimum amount that must be allowed to spawn in order not to reduce recruitment for that reason. The data nevertheless strongly indicate overfishing.

12. The acoustic abundance estimate this year is much lower than that obtained in corresponding surveys in 1980 and 1979. Thus, the present biomass is only 1/6 of the estimated biomass in 1979 as shown in the text table below.

Acoustic estimates of the Icelandic capelin stock obtained in October surveys 1979-1981

Age	1981		1980		1979	
	Number $\times 10^{-9}$	Tonnes $\cdot 10^{-3}$	Number $\times 10^{-9}$	Tonnes $\cdot 10^{-3}$	Number $\times 10^{-9}$	Tonnes $\cdot 10^{-3}$
1	0.9	5	23.6	171	22.3	141
2	7.0	135	19.6	378	42.4	639
3	0.2	4	4.8	128	7.9	167
Sum	8.1	144	48.0	677	72.6	947

It is, however, noted that the extension of the drift ice prevented surveying in areas where dense concentrations of capelin were located in 1980. Therefore, it is possible that the estimate for 1981 given in the text table above is a serious underestimate.

13. A preliminary TAC of 700 000 tonnes has been agreed between Iceland and Norway. At the time of the survey, approximately 360 000 tonnes had been taken by various nations fishing on the stock.

Although the 1981 acoustic stock estimate may be an underestimate, there is a real danger that if the remainder (340 000 tonnes) of the preliminary TAC were taken, the spawning stock will be fished out before the spawning season begins.

14. In previous years it has been established that an acoustic estimate can be obtained in January (Vilhjálmsson et al., 1980) at the beginning of the spawning migration when capelin have migrated away from the ice border. In view of this and the fact that the remainder of the preliminary TAC can be taken during the winter season in 1982, it is recommended that the fishery on the Icelandic capelin stock should be stopped until a new acoustic abundance estimate has been carried out.

15. A final TAC should be calculated in the light of the results of that estimate and taking into account the guidelines for an appropriate spawning stock. This will have to be done on a real time basis without the ACFM being able to evaluate the results prior to their implementation.

B.7 NORTH-EAST ARCTIC COD AND HADDOCK

16. The Arctic Fisheries Working Group met at ICES headquarters from 16-23 September 1981 to assess TACs for cod and haddock in Sub-areas I and II. In addition, the Working Group considered a suggestion from the Dialogue Meeting (October 1980) concerning specific TACs for the Svalbard (Spitsbergen) area.

B.7.1 NORTH-EAST ARCTIC COD

17. Recent catches and recommended TACs, in thousand tonnes:

1978			1979			1980			1981	
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch*	Total quota	Estim. catch*
850	850	699	600	700	441	390	390	382	300	400

* Preliminary

18. Revised figures for cod landings in 1979 amounted to 440 538 tonnes (Tables 3 and 4). The provisional catch figure for 1980 of 381 709 tonnes indicates a reduction of about 13% compared to the previous year. Total landings for 1981 were estimated to be 400 000 tonnes.

19. Some preliminary estimates of total trawler effort have been made which seemed to indicate that the total trawler effort exerted in 1981 would be somewhat lower than that in 1980, continuing the declining tendency of recent years.

20. The declining trend in catch per unit effort observed in the trawl fishery for all three regions (i.e., Sub-area I and Divisions IIa and IIb) during the period 1976-79 was reversed in 1980. The increase in catch per unit effort figures for gears other than trawl in Division IIa might be interpreted as a combined effect of the increased available stock abundance (1975 year class) and higher catchability in the Lofoten area.

21. The more westward distribution of cold water masses observed in 1978, 1979 and 1980 continued in 1981. The corresponding westward distribution of cod was observed in all four years and the fishing activity of the different fleets has been adapted to this new distribution pattern.

22. Fishing mortalities for different age groups in 1981 were estimated on the basis of information from the Norwegian acoustic survey and the Norwegian groundfish survey for the younger ages and for the older age groups (8+) and on catch and effort data for the two components (trawls and other gears) of the fishery.

Mean fishing mortality on age groups 5 to 10 increased to a level of 0.82 and 0.90 for the years 1977 and 1978, respectively, from a relatively stable level of about 0.6. Since 1979, $\bar{F}_{(5-10)}$ declined continuously to a level of 0.48 in 1981 which, however, is still almost twice as high as $F_{max} = 0.25$.

23. Estimated total recruited biomass (age 3+) declined continuously since 1974, when the strong 1970 year class was fully recruited to the fishery. The expected level at the beginning of 1982 is the lowest ever recorded in the history of this stock. The declining trend in the spawning stock biomass from the relatively high level of 680 000 tonnes in 1971-72 (when the strong 1963 and 1964 year classes became 8 years old) was interrupted in 1977 and 1978 by a relatively small contribution by the rich 1970 year class which had been heavily fished at younger ages. For 1980, 1981 and 1982, the level of spawning stock biomass is estimated to be around 220 000 tonnes.

24. Results of the catch predictions and the historic development of yield and spawning stock biomass are given in Figures 1 and 2 respectively. In the following text table a number of options are presented.

1981				Management option for 1982	1982				1983	
Stock biom. (3+)	Spawning stock biom. (8+)	$\bar{F}_{(5-10)}$	Catch (3+)		Stock biom. (3+)	Spawning stock biom. (8+)	$\bar{F}_{(5-10)}$	Catch (3+)	Stock biom. (3+)	Spawning stock biom. (8+)
1 562	225	0.48	400	$F_{0.1}$	1 434	221	0.14	142	1 540	710
				F_{max}			0.25	240	1 420	630
				TAC 1982 = 300			0.32	300	1 350	580

Weights in thousand tonnes

25. In the 1979 report of the Arctic Fisheries Working Group (C.M.1979/G:20) it was pointed out that, based on a Ricker stock/recruitment relationship, the optimum level of spawning stock biomass ranges from 500 000 tonnes to 1 000 000 tonnes. The lower level of this range is considered by the Working Group as a minimum requirement to reduce the probability of recruitment failure due to low spawning stock levels.

The relatively strong 1975 year class will be fully recruited to the spawning stock in 1983. Its contribution to the spawning stock biomass in 1983 is expected to be within a range of approximately 500 000 tonnes to 300 000 tonnes, depending on the level of exploitation in 1982.

However, the 1975 year class is followed by a series of at least six relatively poor or even very weak year classes. As a consequence, the spawning stock biomass can only be maintained into 1984 at the required minimum level if the exploitation in 1982 and 1983 will not exceed the F = 0.4 level. This management strategy is associated with catch levels around 350 000 tonnes for the years 1982 and 1983 (see the next text table).

Fishing at higher levels of exploitation, e.g., F = 0.5 is expected to prevent a substantial recovery of the spawning stock. Fishing with a stable TAC of 400 000 tonnes would drastically reduce the spawning stock by 1986, if estimates of recruiting year classes' strength proved to be accurate.

At a stable TAC of 300 000 tonnes over a series of years the spawning stock biomass will be maintained above the required minimum level into 1985 and is expected to fall slightly below that level by 1986. This management strategy is considered by ACFM as the upper level of exploitation inside safe biological limits.

ACFM recommends that fishing mortality should be reduced as far as possible towards F_{max}. Fishing at F_{max} from 1982 onwards is expected to keep the spawning stock biomass safely within its optimal range up to the beginning of 1986.

Fishing at the $F_{0.1}$ level would result in a rapid increase in the spawning stock biomass to a level above 1 million tonnes in 1984 corresponding to the spawning stock biomass at the end of the 1950s.

Calculated spawning stock biomass in 1982-86 and calculated catch 1982-84 at constant levels of exploitation in thousand tonnes.

(Catch figures for 1985 and 1986 are depending on recruiting year classes beyond 1981 and are therefore not given in the table)

MANAGEMENT STRATEGY	$F_{0.1}$ = 0.14		F_{MAX} = 0.25		F = 0.4		F = 0.5		Stable TAC 300 000 t		Stable TAC 400 000 t	
YEAR	SSB	CATCH	SSB	CATCH	SSB	CATCH	SSB	CATCH	SSB	$F_{(5-10)}$	SSB	$F_{(5-10)}$
1982	221	142	221	240	221	362	221	434	221	0.320	221	0.451
1983	710	176	630	269	534	354	479	388	583	0.302	505	0.494
1984	1043	196	832	269	608	307	494	309	732	0.320	521	0.67
1985	1074		764		479		353		623	0.390	298	1.484
1986	1014		645		349		235		448		60	

B.7.2 NORTH-EAST ARCTIC HADDOCK

26. Recent catches and recommended TACs, in thousand tonnes:

1978			1979			1980			1981	
Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch	Rec. TAC	Total quota	Actual catch*	Total quota	Estim. catch*
150	150	95	206	206	104	55-78	75	87	110	80

* Preliminary

27. Final figures for haddock landings in 1979 amounted to 103 623 tonnes (Tables 5 and 6), the preliminary figure for 1980 is 87 246 tonnes, i.e., a decrease from the 1979 level of about 16%. Expected landings in 1981 have been estimated to be 80 000 tonnes.

28. In 1980 and 1981 the catch per unit of effort continued the upward trend observed since 1978 in Sub-area I and Division IIa. This is mainly due to the 4-6 years old fish of the good 1975 and 1976 year classes.

29. Fishing mortalities on age groups 5 and 6 for 1981 were estimated on the basis of fishing effort by both trawls and other gears. These age groups contribute most to the catches. F values for age groups 3 and 4 were selected to give the expected levels of recruitment derived from surveys. For the older age groups (7+), which are making up only 5% of the estimated catch in numbers in 1981, the value of F on 6 year old haddock was adopted. Average fishing mortality on age groups 4-7 declined continuously from a high level of 0.71 in 1977 to 0.21 in 1981, i.e., a level considerably below $F_{max} = 0.42$ and close to $F_{0.1} = 0.17$.

30. Total recruited biomass (age 3+) increased to about 430 000 tonnes in 1980-81 from the 1977-78 level of 350 000 tonnes which was the lowest on record.

Spawning stock biomass decreased continuously from the very high level in 1975-76 of about 400 000 tonnes to the lowest on record of 81 000 tonnes in 1980. This downward trend was followed by an increase to 214 000 tonnes in 1981 due to the contribution of the good 1975 year class.

31. Results of the catch predictions are given in Figure 3, and the historic yield and spawning stock biomass are shown in Figure 4. Four management options are listed in the following text table.

1981				Management option for 1982	1982				1983	
Stock biom. (3+)	Spawn. stock biom. (6+)	$\bar{F}$ (4-7)	Catch (3+)		Stock biom. (3+)	Spawn. stock biom. (6+)	$\bar{F}$ (4-7)	Catch (3+)	Stock biom. (3+)	Spawn. stock biom. (6+)
439	214	214	80	TAC 1982 = 1981 catch	414	286	.25	80	377	250
				$F_{0.1}$			.17	57	404	275
				F_{max}			.42	122	332	210
				Maintaining 1981 level of exploit.			.214	70	388	260

Weights in thousand tonnes

32. Following the increase in 1981 from the very low 1980 level, the spawning stock biomass in 1982 is expected to increase further to a level of about 286 000 tonnes due to the contribution by the good 1976 year class in 1982 of about 100 000 tonnes. No further increase in the spawning stock biomass can be expected up to 1987, since all year classes recruiting to the spawning stock during this period are poor. If management aims at maintaining a reasonable spawning stock size over a longer period, a cautious approach in the long-term policy is advisable.

33. Long-term projections for different management strategies in the haddock fishery are not very meaningful, since in setting a TAC for haddock it has to be remembered that a considerable part of the haddock catch is taken in a mixed fishery together with other species (mainly cod) in Sub-areas I and II. Therefore, the haddock stock cannot be managed completely independently from the management adopted for cod.

The ratio of cod and haddock in the catches indicates that, at the present biomass levels, the weight of haddock taken in the mixed fishery is about $\frac{1}{4}$ of that of cod.

The present level of exploitation corresponds to a position on the yield per recruit curve where the curve has almost reached the top level. Therefore, ACFM prefers that fishing mortality should not be above the 1981 level.

B.7.3 SPECIFIC TACs FOR THE SVALBARD FISHERY PROTECTION ZONE

34. Cod and haddock in the Svalbard fishery protection zone (the major part of Division IIb) are part of the North-East Arctic cod and haddock stocks.

Catches from this area are highly variable depending on year class strengths and on hydrographic conditions. These factors are hard to predict and their effects on the distribution of cod and haddock in that area cannot be quantified. It is, therefore, not possible to estimate the proportion of a TAC for Sub-areas I and II which is likely to be caught in Division IIb. Furthermore, no data are available which would allow a further breakdown between the Svalbard fishery protection zone and the remaining part of Division IIb.

B.7.4 MESH SIZE

35. In its 1980 report (Coop.Res.Rep., No.102, p. 79-80) ACFM reiterated the advice given in 1979 (Coop.Res.Rep., No.93) on an increase in a minimum mesh size which reads:

"ACFM recommends that in Sub-areas I and II the minimum mesh size for all towed gears, in Recommendation 1 fisheries, should be increased to 155 mm".

36. If this advice had been followed, the good 1975 year classes of both cod and haddock would have been protected as 3 and 4 years old fish and their contribution to the total yield and to the spawning stock biomass would have been greater.

37. In the present situation when the recruiting year classes are all poor, at least up to 1984, the immediate losses due to an increase in the mesh size cannot be large. Since ACFM is concerned about the state of the spawning stock biomass, particularly for cod, good survival of recruits is essential if a viable spawning stock is to be maintained. ACFM, therefore, again reiterates the advice quoted above.

D. REGION 2 FISHERIES

D.1.1.8 HERRING IN THE SKAGERRAK AND THE KATTEGAT (Division IIIa)

Survey Results

38. A Danish-Swedish acoustic survey was, as in 1979 and 1980, carried out in August-September 1981. The area covered had been extended and the fishing intensified compared to the previous surveys. The Swedish R/V "Argos" undertook the fishing operations, while the Danish R/V "Dana" made the acoustic integrations using a SIMRAD EX-38 KHz equipment.

39. From this survey the stock size of herring was calculated based upon a target strength of -38.3 dB/kg measured by "Argos" in 1980 using a 120 KHz echosounder. Intercalibration between "Dana" and "Argos" suggests that these systems are not directly comparable, since the comparison during daytime and during nighttime gives rather different relationships. Furthermore, ACFM has reservations on the applicability of the target strength measured by "Argos" on different makes of equipment. The target strength applied for North Sea herring is about -34 dB/kg in contrast to that of -38.3 dB/kg obtained by "Argos".

40. ACFM concluded that little confidence could be placed on the absolute level of stock size estimated by the 1981 survey without measurement of target strength of herring, using the "Dana" equipment. These measurements will be available before the next round of the Assessment Working Group. The 1981 survey represents a significant step forward towards a reliable assessment of the Division IIIa herring.

41. The year class 1979 appears to be strong. This is confirmed by the age composition data obtained through the August-September survey and by the index of 2 group in the International Young Fish Survey in 1981.

Preliminary data from the fishery in January-August 1981 also suggest that the 1979 year class is abundant. The 1980 year class appears from the IYFS to be average. Comparison of the 1980 year class with the 1979 year class in the acoustic survey suggests that the 1980 year class is 30% to 40% of the 1979 year class strength.

42. Taking into account dubieties regarding the absolute level of the stock estimated from the acoustic survey and the highly variable F estimates obtained from trial VPAs, no analytical assessment is possible at present for this stock.

Commercial Fishery in 1981

43. No agreement between EEC, Norway and Sweden on a TAC for 1981 for the Skagerrak has been reached. EEC and Sweden agreed on a TAC of 35 600 tonnes for 1981 for the Kattegat. In October 1980 ACFM recommended a TAC for Division IIIa of 53 000 tonnes.

Preliminary data on the commercial landings in the period January-August 1981 indicate a total of 95 000 tonnes. This includes landings for human consumption, by-catches and withdrawals. There is no information on discards at sea. In 1981, the Danish herring fishery in the Skagerrak did not start before June, and by agreements between the Danish and Swedish fishermen's organisations the Danish fishery stopped in early August when the Swedish trawl fishery commenced. Purse-seiners were allowed to fish from 16 June to 7 August in the Skagerrak. Since fishing for herring in the Skagerrak is prohibited from 1 October and Denmark banned all its herring fisheries for the last 3 weeks of September, it is reasonable to assume that at least 80% of the 1981 landings were taken prior to the survey.

44. The total landings in 1981 are thus expected to total about 120 000 tonnes. Of this total about 40% by weight is taken as "by-catch" in the sprat fishery.

The TACs in previous years have also been overshot by around a factor of 2 (see Table 31 of the July 1981 ACFM report). The catch of herring in the sprat fishery is such that no effective enforcement of the by-catch regulation has taken place. Very few sprat (about 10% by weight of the herring) were recorded in the acoustic survey suggesting that little directed sprat fishery is possible in Division IIIa at present.

The species composition obtained from the acoustic survey is shown in Figure 5.

45. ACFM must point out the harmful effects of the uncontrolled sprat fishery on the herring stocks and strongly stresses the importance of adherence to the by-catch regulations. If these are not adhered to, a complete ban on the sprat fishery may be the only feasible action, if viable herring stocks have priority.

The state of the sprat stocks will be reviewed by the ICES Working Group on Norway Pout, Sandeels and Sprat Fisheries in the North Sea and Adjacent Waters (ICES Sub-area IV, Divisions IIIa and VIa) in March 1982.

46. The herring stock in Division IIIa is of mixed origin including indigenous spring spawners, spring spawners from the Baltic and autumn spawners from the North Sea. The 0 and 1 groups exploited by the sprat fishery contain a major North Sea herring stock component, and this could be a factor in the failure of the rebuilding of the Divisions IVa and IVb herring stock components.

47. ACFM recommends a TAC in the range of 30 000 - 40 000 tonnes for herring in Division IIIa for 1982. This range is calculated from the TAC for 1981 corrected for the underestimation of the 1979 year class strength (TAC - 1981 ≈ 85 000 tonnes) and the expected catch of about 120 000 tonnes in 1981.

48. ACFM repeats the advice from its July 1981 report that:

> "Regardless of the origin of young herring, every effort should be made to decrease the exploitation of the youngest age groups. One method of achieving this could be to increase the trawl mesh size (see Section D.1.1.9)".

Accordingly, ACFM recommends that the minimum mesh size in trawl gears in directed fisheries for herring is increased to 40 mm in Division IIIa.

D.3 COD, HADDOCK AND WHITING STOCKS IN THE NORTH SEA (Sub-area IV)

49. In the report from the July 1981 meeting of ACFM it was described how ACFM had to undertake the major task of redoing all the assessments of the North Sea and Division VIa roundfish stocks.

The time to do this during the meeting was very restricted and nobody from the Working Group on North Sea Roundfish stocks was present to assist ACFM in doing this.

It was felt wise to have these re-assessments checked once more by the people usually involved in these assessments and, therefore, the Chairman of the North Sea Roundfish Working Group had a meeting with the Chairman and Secretary of ACFM prior to the November meeting of ACFM to achieve this.

50. The outcome of this meeting is given in the text table below as the final version of the option tables for the three North Sea stocks (see also Figures 6-8).

There are some minor differences in the figures coming from the recalculations compared to the figures given in the July report for cod and haddock, but for whiting the difference is significant and no explanation can be given for that.

North Sea COD

Management options for 1982

1981 SSB (≥3)	1981 $\bar{F}$ (3-8)	1981 HCL		1982 SSB	1982 $\bar{F}$	1982 HCL	1983 SSB
280	.57	230	$\bar{F}_{0.1}$	370	.125	65	655
			$\bar{F}_{max}$		.19	95	605
			$\bar{F} = 0.8 \times \bar{F}_{81}$		.46	200	445
			$\bar{F} = 0.9 \times \bar{F}_{81}$		.51	220	415
			$\bar{F} = \bar{F}_{81}$		.57	235	390

North Sea HADDOCK

(Option 1 : $\bar{F}_{81} = \bar{F}_{80}$)

1981 SSB (≥2)	1981 $\bar{F}$ (2-6)	1981 Landings*)		1982 SSB	1982 $\bar{F}$	1982 Landings*)	1983 SSB
660	.95	230	$\bar{F}_{max}$	440	.21	90	585
			$\bar{F} = 0.8 \times \bar{F}_{81}$		.76	180	400
			$\bar{F} = 0.9 \times \bar{F}_{81}$		.86	190	380
			$\bar{F} = \bar{F}_{81}$		.95	200	360

North Sea WHITING

(Option 1 : $\bar{F}_{81} = \bar{F}_{80}$)

1981 SSB (≥2)	1981 $\bar{F}$ (2-6)	1981 Landings*)		1982 SSB	1982 $\bar{F}$	1982 Landings*)	1983 SSB
580	.516	210	$\bar{F}_{max}$	500	.17	140	605
			$\bar{F} = 0.8 \times \bar{F}_{81}$		.41	185	525
			$\bar{F} = 0.9 \times \bar{F}_{81}$		.46	195	510
			$\bar{F} = \bar{F}_{81}$		.516	200	500

Weights in thousand tonnes.

*) For human consumption and industrial purposes (see separate graphs in Figures 7 and 8).

SSB = Spawning stock biomasses
For cod - fish at age 3 and older
For haddock and whiting - fish at age 2 and older.

HCL = Human consumption landings.

F = Fishing mortality generated by human consumption fisheries only.

51. One of several reasons why ACFM could not accept the assessments done by the North Sea Roundfish Working Group this year, was that the approach used by the Group produced estimates of fishing mortality which would seem to infer a drastic change in fishing pattern for haddock and whiting, which was difficult to explain.

In the approach used by ACFM the assessments still seem to produce rather low estimates of fishing mortality on 1 and 2 group haddock and whiting and a generally lower level of fishing mortality in the whiting fisheries.

At present ACFM saw no way to solve this problem, but the Working Group will be urged to have a closer look at this at its forthcoming meeting in March 1982.

52. To illustrate the effect of these low estimates of fishing mortality on certain age groups of haddock and whiting, ACFM made computer runs for each stock, assuming the average 1975-77 exploitation pattern for 1980. This assumption would mean that the calculated catch options for 1982 for haddock and whiting would have to be reduced by 50% and 20%, respectively.

Therefore, the options calculated for haddock and whiting and given in the text table above should be interpreted with some caution.

53. For several years ACFM advised that the only way to reach a more stable situation in the fisheries for roundfish in the North Sea is to a) bring the total mortality level in these fisheries down closer to the biological reference points, which indicate the potentials of these stocks, and b) bring down the fishing mortality levels on the younger age groups.

It is obvious that very little has been achieved in this respect. This is indicated by the low F_{max} values for all three stocks and by the fact that the present level of exploitation for cod is 3 times F_{max}, for haddock 4.5 times F_{max} and for whiting 3 times F_{max}.

54. At its July 1981 meeting ACFM based its advice on TACs for 1982 on a continuous decrease in fishing mortality from the 1979 level and onwards, recommending stepwise reductions from the recommended levels rather than from the actual levels.

As nothing has been achieved in bringing the general fishing pressure on the three stocks down, these reductions in fishing mortality recommended for 1982 meant drastic cutbacks compared to the 1981 levels.

55. In view of what has been said about reaching fishing mortality levels which are closer to the biological reference points, ACFM recommends that fishing mortality on all three North Sea roundfish stocks should be reduced as far as possible towards F_{max}.

D.7 PLAICE AND COMMON SOLE STOCKS IN THE NORTH SEA (Sub-area IV) AND THE CHANNEL (Divisions VIId and VIIe)

56. The North Sea Flatfish Working Group met at ICES headquarters from 21-26 September 1981 to:

(i) assess TACs for sole and plaice in the North Sea and Channel for 1982,

(ii) collate the results of mesh selection experiments using beam trawls carried out in 1980 and comment on the effects of the results on ICES previous advice on this topic,

(iii) comment on the available by-catch data in fisheries for Crangon and advise if there are areas within 12 mile limits or seasons when a by-catch limit of 10% should be needed.

In addition, the Group was asked to:

(i) estimate the short-term losses and long-term gains for all species for which data are available, but in particular soles, which will arise from the change to 90 mm in the minimum mesh size for trawls and Danish seines in Sub-area IV from 1.10.1982, on the assumption that 80 mm mesh will have been in effect from 1.12.1980. Mesh sizes are those irrespective of material;

(ii) evaluate whether the selectivity factor for sole is proportional to brake horsepower and to advise, in particular, whether there is any scientific evidence that the selectivity of trawls used by vessels of less than 300 brake horsepower is less than that of larger vessels;

(iii) estimate the short-term losses and long-term gains or losses for all species for which there are data available which will result from the introduction of an 80 mm mesh size irrespective of material, for trawls and Danish seines in Divisions VIId and VIIe.

D.7.1 NORTH SEA SOLE

57. Recent catches and recommended TACs, in thousand tonnes:

1977			1978			1979		
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Actual catch
6.7	12.5	18.2*	8	10	20.3*	13	15	22.5*

1980			1981		1982
Rec. TAC	EEC TAC	Actual catch	Rec. TAC	EEC TAC	Rec. TAC
15	15	15.8**	15	15	15

* Including estimates of non-reported landings
** Preliminary

58. Compared to 1979, the catches decreased by 30% in 1980 due to the poor recruitment of the 1977 and 1978 year classes (Table 7). The latter was severely reduced by the severe 1979 winter.

59. The 1979 year class was estimated to be 1.5 times the average recruitment. From the 1981 autumn pre-recruit survey it appears that the 1980 year class is about 1.3 times the average.

The present level of fishing mortality was derived from regressions between indices of total international effort and terminal F values in trial VPAs. These seem to indicate that fishing mortality in 1980 was close to the 1979 level.

60. The VPA results indicate that the spawning stock biomass decreased continuously since 1966 from 104 000 tonnes to 35 600 tonnes in 1977. This decrease is caused by fishing out the extremely strong 1963 year class(6 times the average) and by a considerable increase in effort in that period. Thereafter the spawning stock biomass increased in 1978 and 1979 to 40 000 tonnes and 45 000 tonnes respectively due to the recruitment of the good 1975 and 1976 year classes. A considerable decrease occurred in 1980 to a level of 34 000 tonnes.

The catch per unit of effort series for Belgium, United Kingdom and the Netherlands do not show the same trend in spawning stock biomass during the period 1971-81.

61. ACFM reviewed the relationship between the decline in calculated biomass from VPA and catch per unit of effort (cpue) by Dutch beam trawls. The agreement was quite good from 1964 to 1972 and poor from 1973 to 1980. From 1973 to 1976 the catch per unit effort did not decline, whereas the VPA estimate of the spawning stock biomass continued the apparent steady decline which began after 1966. From 1977 to 1980 the agreement between the estimates of spawning stock biomass and cpue was very good but the absolute values of cpue were greater than expected, given the estimates of spawning stock biomass in the Working Group report and the relationship of cpue and biomass of earlier years. These high estimates of cpue can be explained if the abundance has increased or the catchability of sole or the effective fishing effort have increased. The Working Group apparently felt that, due to an increase in fishing mortality, the abundance of sole continued to decrease through 1980, except for temporarily slight increases in 1978 and 1979. The relationships between fishing mortality and effort suggest that catchability is constant although the straight lines do not go through the origin. If catchability is constant and spawning stock biomass is declining, then it could be assumed that the fishing effort efficiency has increased in recent years and the effective effort could be much higher in 1980 than reported in the Working Group report. If effective effort has increased in recent years, then the estimate of F in the Working Group report may, in turn, be underestimated. The lack of agreement between estimates of cpue and SSB need to be resolved by the Working Group in future assessments, preferably before the July 1982 ACFM meeting.

62. ACFM recommends that the North Sea Flatfish Working Group should hold a special meeting in advance of their 1982 September meeting in order to review the historical data base on a quarterly basis. This meeting should require 4 days and is planned to take place in IJmuiden. The exact date of the meeting will be set by the Chairman of the Working Group after consultation with the Working Group members.

63. The assessment has been done assuming the unchanged minimum mesh size, i.e., the unchanged exploitation pattern, although an 80 mm mesh size has been introduced from 1.12.1980 onwards, since the effective mesh size in the sole fishery is well below 75 mm (see Section D.7.6).

64. From the existing assessment the management advice could be based on two grounds:

1) a minimum spawning stock size of 40 000 tonnes produced during the last ten years almost continuously year classes of above average strength. A spawning stock size of 40 000 tonnes in 1983 and no change in the actual fishing mortality would be obtained with a 1982 catch of 21 500 tonnes;

2) bringing fishing mortality to the F_{max} level in 1982 would require a reduction in F of 40% resulting in a catch of 14 000 tonnes (Figure 9).

65. However, there is serious concern that the above-mentioned analytical assessment could have overestimated the stock size, due to uncertainties about the actual fishing mortality levels in recent years. A cautious approach is therefore warranted and ACFM recommends a TAC for 1982 of 15 000 tonnes.

D.7.2 NORTH SEA PLAICE

66. Recent catches and recommended TACs, in thousand tonnes:

1977			1978			1979		
Rec. TAC	NEAFC TAC	Actual catch	Rec. TAC	EEC/Nor. TAC	Actual catch	Rec. TAC	EEC/Nor. TAC	Actual catch
71	99.9	118*	115	115	112*	120	120	145*

1980			1981	
Rec. TAC	EEC/Nor. TAC	Actual catch	Rec. TAC	EEC/Nor. TAC
112	112	139**	105	105

* Including estimates of non-reported landings
** Preliminary and including estimated non-reported landings

In 1980, landings by most countries were similar to those in 1979, but a drop of 30% in the United Kingdom catch was noted (Table 8).

67. The international effort estimate suggests that fishing mortality was increasing in recent years.

According to commercial catch and research vessel data the 1977 and 1979 year classes are of the same order as the 1972 year class, i.e., about 600 million fish.

Yield and biomass per recruit were calculated for both sexes. The yield per recruit curve shows that the current fishing mortality is close to the F_{max} point on the curve for males, but well above F_{max} for females.

68. Maintenance of the F_{80} over the period 1981 and 1982 would result in a catch of 148 000 tonnes in 1981 and 145 000 tonnes in 1982. The resulting spawning stock biomass in 1983 would then be 310 000 tonnes (see text table below and Figure 10).

1981				Management option for 1982	1982				1983	
Stock biom. 1-17+	Spawn. stock biom. ≥ 4 ♀ ≥ 2 ♂	$\bar{F}$ (2-10)	Catch		Stock biom.	Spawn. stock biom.	$\bar{F}$ (2-10)	Catch	Stock biom.	Spawn. stock biom.
488	336	.55 ♂ .41 ♀	148	F_{max}	466	316	0.22 ♂ 0.16 ♀	70	540	390
				$F_{1982} = F_{1980}$			0.55 ♂ 0.41 ♀	145	435	310
				$F_{1982} = 0.8\ F_{1980}$			0.44 ♂ 0.33 ♀	120	450	340

Weights in thousand tonnes.

69. Fishing mortality on plaice has increased recently and the general trend in stock size has been downwards since the peak level of 1970. The stock is increasing at the moment because of the effect of the 1972 year class, and the 1979, 1977 and 1978 year classes. The stock and recruitment diagram does not suggest an immediate concern for the spawning stock biomass. However, the yield per recruit curve indicates that fishing mortality is well above F_{max} for the current exploitation pattern. Diversion of effort from the sole fishery may further increase the fishing mortality on plaice.

70. ACFM recommends that fishing mortality should be reduced towards F_{max} as far as possible as a step towards the long-term objective of increasing the female spawning stock size.

D.7.3 SOLE IN DIVISION VIId

71. Recent catches and recommended TACs, in thousand tonnes:

1977		1978		1979		1980		1981
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC
1.0	1.28	1.15	1.4	2.2	1.8	1.38	1.6*	1.2

* Preliminary and including estimated non-reported landings

Recent landings including unreported catches were amended by a field and questionnaire survey. After a peak of 1 842 tonnes in 1979 the landings decreased to 1 553 tonnes in 1980 (Table 9).

72. Total international effort appears to have increased by about 40% since 1973.

As the separate sex data are extremely variable, the Working Group decided that the assessment should be based on combined data.

The 1979 year class seems to be very abundant from the pre-recruit surveys. The series of these surveys is, however, too short and does not allow to produce a reliable estimate. Recent catch figures also indicate the abundance of this year class.

73. An analytical assessment made by the Working Group could not be endorsed because of uncertainties about the present levels of fishing mortality, although some improvement has been made in recent years. ACFM endorses further every improvement in the biological sampling in that area.

Therefore, any advice must be based on historic catches given in Table 9.

D.7.4 SOLE IN DIVISION VIIe

74. Recent catches and recommended TACs, in thousand tonnes:

1977		1978		1979		1980		1981	1982
Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Actual catch	Rec. TAC	Rec. TAC
0.45	0.6	0.35	0.86	0.5	1.2	0.78	1.3*	1.0	0.8

* Preliminary estimate of landings

75. Landings increased in 1980 by a factor of 3.7 since 1969 (Table 9). Indices of total international effort indicated an increase by a factor of 3 from the 1972-77 mean to 1980.

76. An analytical assessment made by the Working Group could not be endorsed because the only available catch at age data base was derived from one country accounting for about 60% of the total international catches. Therefore, in order to stop the increase in fishing effort on the stock, a TAC of 800 tonnes is recommended.

D.7.5 PLAICE IN DIVISIONS VIId and VIIe

77. Landings increased considerably in 1980 and accounted for about 4 400 tonnes which is similar to the catches obtained in 1966-67 (Table 10).

In the past it has been felt that the English Channel plaice data were poor because only some part of the landings was sampled for age. Despite the inclusion of French length distributions, the situation has not changed substantially, and it was therefore decided not to proceed with a trial analytical assessment at present.

There are indications that the 1977 and 1978 year classes are abundant.

78. In the absence of an analytical assessment, any advice must be based on historic catches given in Table 10.

D.7.6 SELECTIVITY EXPERIMENTS

79. Mesh assessments for North Sea sole have been carried out in 1968 and 1974. It was suggested that the increasing ship size and the corresponding increase in horse power and weight of the gear might lead to a different selectivity rate for sole on all fishing grounds.

From October 1979 up to August 1981, more than 50 sole selectivity experiments on beam trawlers have been carried out by four countries. The results obtained from these experiments do not indicate that the selectivity in the North Sea sole fisheries has changed significantly after 1968.

The selection factor and the selection range calculated from the recent experiments are 3.3 and 3.8, respectively, which are similar to those previously derived for otter trawls.

The results also indicate that selection factor and selection range are largely independent of riggings, horse power, towing speed and towing duration.

80. ACFM could not endorse the results on short-term losses or long-term gains calculated by the Working Group, since the effective mesh size had not been taken into account in these assessments. It is believed that although an 80 mm mesh size has been introduced from 1.12.1980 onwards, the effective mesh size in the sole fishery is well below 75 mm. No data were, however, available to produce an estimate of this effective mesh size, and ACFM recommends further examination in this field; therefore, no assessment of the effects of a 90 mm mesh size was possible at present.

The 50% retention length for an 80 mm minimum mesh size is 26.4 cm, and the 25% retention length is 24.5 cm.

D.7.7 BY-CATCH DATA IN FISHERIES FOR CRANGON

81. ACFM took notice of the EEC's request to ICES dated 10 October 1980. However, in the meantime a contract for scientific research on this topic was made between the Commission and a member country. This study started on 1 April 1981 and will be completed by the end of March 1982.

E. STOCKS IN REGIONS 2 AND 3

E.1 EASTERN AND WESTERN MACKEREL STOCKS

E.1.5 MACKEREL IN DIVISIONS IIa AND Vb

82. In previous assessments of the mackerel stocks in the ICES area the catches in Division IIa have been combined with those from Sub-area IV and Division IIIa on the assumption that the catches taken in Division IIa were predominantly part of the North Sea stock. The recommendations from ACFM regarding TAC levels for 1982 for both

the Western and North Sea stocks, however, did not include Division IIa in the areas to which they should apply, largely because of the doubts existing about the stock composition in that Division.

83. Catches in Division IIa in 1979 and 1980 were within the range 7 000 - 8 000 tonnes (see Table 69 in the July 1981 ACFM report), but in 1981 the preliminary catch estimates from this area have probably increased to 15 000 tonnes - including some catches reported from Divisions Vb and IIa which may have been taken elsewhere to evade limitation of catches in areas subject to regulations.

84. Accordingly, because of the uncertainties about the stock identity of mackerel caught in Division IIa, special efforts were made in 1981 to recover possible tags in catches taken from that area. Due to various technical difficulties only about 1 800 tonnes could be screened. 12 tags were recovered and 9 and 3 of these had been released off Ireland and in the North Sea, respectively. Although the number of tags are too few to make an accurate assessment of stock composition in Division IIa, the data indicate that the catches were dominated by mackerel from the Western stock. Under various assumptions about the mixing into the Western stock of tags released off Ireland, the calculated proportion of North Sea mackerel in the catches varies from 6% to 25%. Taking into account the possibility that some of the mackerel tagged in the North Sea may be Western mackerel, the real percentage may be even lower.

85. Assuming that mackerel in Division Vb are of the same origin as mackerel in Division IIa, ACFM would, accordingly, recommend that the TAC for the Western stock mackerel in 1982 should be 272 000 tonnes applicable in Divisions IIa and Vb and in Sub-areas VI, VII and VIII.

H. REGION 3 FISHERIES

H.1 SARDINE IN DIVISIONS VIIIc AND IXa

86. The Working Group for Appraisal of the Sardine Stocks in Divisions VIIIc and IXa met in Lisbon from 30 June to 3 July 1981, with the following terms of reference:

(i) to summarise and update current data on the biology of sardine in Divisions VIIIc and IXa,

(ii) to standardise age-reading methods,

(iii) to assess the state of the exploited stocks.

Landings

87. Sardine in Divisions VIIIc and IXa are exploited by Portuguese and Spanish purse-seiners. Recent landings (during 1976-80) are as follows:

Year	1976	1977	1978	1979	1980
Landings (t)	135 306	121 146	134 935	141 956	175 474

Landings increased by about 30 000 tonnes in 1980 above the level maintained from 1976 to 1979.

Fleet

88. The Portuguese fleet is composed of 283 purse-seiners, with mean horse power (HP) of 283, while the Spanish fleet is composed of 168 purse-seiners of 208 HP on average.

Annual landings per a Portuguese purse-seiner during the period 1970-80 were as follows (tonnes):

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Land./boat	168	206	259	373	294	374	309	320	323	282	319

Data base

89. The Group compiled data on maturity, length distribution, age/length and weight at age. The recent years' catches have been quite extensively sampled, but the time series is rather short.

Assessments

90. In previous reports, general production models and Beverton & Holt yield per recruit curves were calculated. At present, in spite of the incomplete data base, a VPA was tried. M values of 0.5 and 0.6 were assayed. Average Z values were obtained from catch curves for the years 1976-80; F values were derived from them and used as terminal Fs for the corresponding year.

1980 Fs for ages 0 and 1, and 1979 F for age 0 were taken as a fixed proportion of the terminal F of the corresponding year, given that these age groups are not completely recruited. The other Fs at age in the period considered were computed by cohort analysis (Pope method). F at age in 1980 was considered to be constant for two year olds and older age groups. The biomasses estimated from cohort analysis for the years 1976-80 are around 600 000 tonnes.

91. The Working Group considered that the current level of catches should not be increased, and the ACFM requested the Group to meet again in April 1982 to assess the state of the exploited stocks and advise on any necessary management measures for these stocks in 1983.

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Vilhjálmsson, H et al. 1980. Acoustic abundance estimates of the Icelandic stock of capelin, October 1978 - January 1980. ICES, C.M.1980/H:63 (mimeo.).

Table 1. Annual catches of Barents Sea CAPELIN ('000 tonnes) in the years 1965-80.

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

Table 2. Annual catches ('000 tonnes) from the Icelandic CAPELIN stock, 1964-80.

Year	Winter Season		Summer and Autumn Seasons			Total
	Iceland	Faroes	Iceland	Norway	Faroes and EEC	
1964	8.6					8.6
1965	49.7					49.7
1966	124.5					124.5
1967	97.2					97.2
1968	78.1					78.1
1969	170.6					170.6
1970	190.8					190.8
1971	182.9					182.9
1972	276.5					276.5
1973	440.9					440.9
1974	461.9					461.9
1975	457.6		3.1			460.7
1976	338.7		114.4			453.1
1977	549.2	25.0	259.7			833.9
1978	468.4	38.4	497.5	154.1		1 158.4
1979	521.7	17.5	441.9	126.0	2.5	1 109.6
1980	392.0		367.2	118.6	38.7	916.5
1981*	156.0			91.4		

* Preliminary

Table 3. COD. Total nominal catch (tonnes) by fishing areas (landings of Norwegian coastal cod not included).

Year	Sub-area I	Division IIb	Division IIa	Total catch
1960	375 327	91 599	155 116	622 042
1961	409 694	220 508	153 019	783 221
1962	548 621	220 797	139 848	909 266
1963	547 469	111 768	117 100	776 337
1964	206 883	126 114	104 698	437 695
1965	241 489	103 430	100 011	444 930
1966	292 253	56 653	134 805	483 711
1967	322 798	121 060	128 747	572 605
1968	642 452	269 160	162 472	1 074 084
1969	679 373	262 254	255 599	1 197 226
1970	603 855	85 556	243 835	933 246
1971	312 505	56 920	319 623	689 048
1972	197 015	32 982	335 257	565 254
1973	492 716	88 207	211 762	792 685
1974	723 489	254 730	124 214	1 102 433
1975	561 701	147 400	120 276	829 377
1976	526 685	103 533	237 245	867 463
1977	538 231	109 997	257 073	905 301
1978	418 265	17 293	263 157	698 715
1979	195 166	9 923	235 449	440 538
1980*	172 375	17 523	191 811	381 709

*Provisional figures

Expected Catches

1981	160 000	12 000	228 000	400 000

Table 4. COD. Nominal catch (tonnes, whole weight) by countries (landings of Norwegian coastal cod not included). (Sub-area I and Divisions IIa and IIb combined.) (Data provided by Working Group members.)

Year	Faroe Islands	France	German Dem.Rep.	Germany Fed.Rep.	Norway	Poland	United Kingdom	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	-	-	255	1 073	255 611	-	140 387	676 758	-	1 074 084
1969	29 374	-	5 907	5 343	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[1]	38 453	1 102 434
1975	11 309	28 734	9 981	30 037	277 099	7 435	101 834	343 580[1]	19 368	829 377
1976	11 511	20 941	8 946	24 369	344 502	6 986	89 061	343 057[1]	18 090	867 463
1977	9 167	15 414	3 463	12 763	388 982	1 084	86 781	369 876[1]	17 771	905 301
1978	9 092	9 394	3 029	5 434	363 088	566	35 449	267 138[1]	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	1 740	233	1 924	229 628	3	10 366	115 194	12 640	381 709

*) Provisional figures.

1) Murman cod included.

Table 5. HADDOCK. Total nominal catch (tonnes) by fishing areas. (Data provided by Working Group members.)

Year	Sub-area I	Division IIb	Division IIa	Total
1960	125 675	1 854	27 925	155 454
1961	165 165	2 427	25 642	193 234
1962	160 972	1 727	25 189	187 888
1963	124 774	939	21 031	146 744
1964	79 056	1 109	18 735	98 900
1965	98 505	939	18 640	118 079
1966	124 115	1 614	34 892	160 621
1967	108 066	440	27 980	136 486
1968	140 970	725	40 031	181 726
1969	88 960	1 341	40 208	130 509
1970	59 493	497	26 611	86 601
1971	56 300	435	21 567	78 302
1972	221 183	2 155	41 979	265 317
1973	283 728	12 989	23 348	320 065
1974	159 037	15 068	47 033	221 138
1975	121 686	9 726	44 330	175 742
1976	94 064	5 649	37 566	137 279
1977	72 159	9 547	28 452	110 158
1978	63 965	979	30 478	95 422
1979	63 841	615	39 167	103 623
1980 *	64 431	67	32 748	87 246

*Provisional figures

Expected catches

1981	42 000	37 800	200	80 000

Table 6. HADDOCK. Nominal catch (tonnes) by countries. (Sub-area I and Divisions IIa and IIb combined.)
(Data provided by Working Group members.)

Year	Faroe Islands	France	German Dem.Rep.	Germany Fed.Rep.	Norway	Poland	U.K.	USSR	Others	Total
1960	172	-	-	5 597	47 263	-	45 469	57 025	125	155 651
1961	295	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	-	181 726
1969	2	-	309	1 490	67 549	-	37 234	24 211	25	130 820
1970	541	-	656	2 119	36 716	-	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	434	32 408	186 534	2 501	322 626
1974	925	3 601	454	23 409	66 164	3 045	37 663	78 548[1]	7 348	221 157
1975	299	5 191	437	15 930	55 966	1 080	28 677	65 015[1]	3 163	175 758
1976	537	4 459	348	16 660	49 492	986	16 940	42 485[1]	5 358	137 265
1977	213	1 510	144	4 798	40 118	-	10 878	52 210[1]	287	110 158
1978	466	1 411	369	1 521	39 955	1	5 766	45 895[1]	38	95 422
1979	343	1 198	10	1 948	66 849	2	6 454	26 365	454	103 623
1980*	497	220	15	1 365	61 410	-	2 948	20 706	85	87 246

* Provisional figures
1) Murman haddock included

Table 7. Nominal catches (tonnes) of SOLE in Sub-area IV, 1968-80. (Data for 1968-78 allocated by countries are from Bulletin Statistique.)

Country	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979*)	1980*)
Belgium	3 874	2 703	1 880	2 227	1 834	1 485	1 130	1 383	1 456	1 673	1 728	2 043	1 378
Denmark	1 590	842	525	1 149	671	957	705	682	574	348	465	279	754
France	273	364	265	403	206	250	195	297	598	308	346	309	232
Germany, Fed.Rep. of	1 138	692	318	600	258	336	173	233	192	316	467	242	338
Netherlands	25 175	22 032	16 024	18 776	17 662	15 883	15 343	15 242	11 044	10 873	6 749	7 646	12 695
Poland	-	-	-	-	-	-	-	-	5	-	-	-	-
Sweden[a]	...	-	13	12	13	13	12	+	-	-	-	-	-
U.K. (Engl.+Wales)	1 129	927	660	485	449	387	340	426	455	492	626	600	430
U.K. (Scotland)	-	-	1	2	+	1	...	-	2	2	1	+	-
Total	33 179	27 560	19 686	23 654	21 093	19 312	17 898	18 263	14 326	14 012	10 382	11 119	15 827
Unreported landings								2 500	3 000	4 000	9 900	11 354	-
Grand Total								20 763	17 326	18 012	20 282	22 473	15 827

*) National landings as determined by the Working Group.

a) Figures include catches made in Division IIIa. The 1968 catch was included in 148 tonnes of Various Pleuronectiforms.

Table 8. North Sea PLAICE. Nominal catch (tonnes) in Sub-area IV, 1969-80 (from Bulletin Statistique).

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980*
Belgium	4 476	4 360	5 073	5 531	6 133	6 202	6 154	4 574	6 547	6 036	7 687	7 006
Denmark	35 227	32 807	22 278	24 494	23 266	19 814	22 731	25 612	20 900	21 285	27 497	25 879
Faroe Islands	-	-	-	-	1	-	1	-	1	-	-	-
France	1 330	1 406	1 380	1 062	1 355	519	536	497	598	750	856	711
Germany, Fed.Rep.of	5 071	5 519	3 296	4 318	5 451	3 233	4 040	3 654	5 423	4 674	4 315	4 550
Netherlands	39 420	46 080	44 502	52 048	57 948	54 438	51 293	46 457	42 307	28 219	38 295	39 782
Norway	26	22	18	19	15	13	13	20	16	13	13	13
Poland	-	-	-	-	1	-	153	40	-	-	-	-
Sweden[a]	772	608	588	626	432	431	35	28	-	-	7	6
UK (England & Wales)	30 349	34 839	32 576	31 642	30 400	23 854	20 290	23 789	27 623	27 862	25 825	18 687
UK (Scotland)	4 981	4 703	4 210	3 410	4 815	4 002	3 266	3 310	3 622	3 877	4 126	4 336
USSR	-	-	-	-	397	39	-	-	-	-	-	-
Total	121 652	130 344	113 921	123 150	130 214	112 545	108 512	107 981	107 037	92 716	108 621	100 970
Unreported landings[b]								5 000	11 384	21 150	36 705	38 023
Grand Total								112 981	118 421	113 866	145 326	138 993

*) Preliminary
a) 1969-74 includes Division IIIa.
b) Estimated by the Working Group

Table 9. English Channel SOLE. Nominal catch (in tonnes) in Divisions VIId and VIIe, 1969-80.

Year	Belgium		Denmark	France		Netherl.	Ireland	U.K.		Total	
	VIId	VIIe	VIIe	VIId	VIIe	VIId,e	VIIe	VIId	VIIe	VIId	VIIe
1969	10	8	-	606		-	-	177	138	939	(353)
1970	127	10	-	753		1	-	228	125	1 244	(391)
1971	157	3	-	816		1	-	254	152	(953) 1 383	(432)
1972	147	6	-	676		8	-	322	201	(921) 1 360	(437)
1973	126	2	-	775		-	-	360	194	(1 000) 1 457	(459)
1974	159	6	-	706		3	-	309	181	(940) 1 364	(427)
1975	132	3	-	464	271	1	-	244	217	841	491
1976	203	4	-	599	352	-	-	404	260	1 206	616
1977	225	3	-	737	331	-	-	315	272	1 277	606
1978	241	4	20	782	384	-	-	366	453	1 389	861
1979	311	1	-	1 129	515	-	-	402	665	1 842	1 181
1980	304	45	-	970[1]	483[1]	-	13	278[2]	764	1 553	1 305

1) Figures supplied by French Working Group member.

2) Official figure + 120 tonnes unreported, estimated by the English Working Group member.

Bracketed figures are those used in the assessments.

Table 10. English Channel PLAICE. Nominal catch (tonnes) in Divisions VIId and VIIe, 1962-80.

Year	Belgium		Denmark		France		Netherlands	U.K. (England & Wales)		Total	
	VIId	VIIe	VIId	VIIe	VIId	VIIe	VIId,VIIe	VIId	VIIe	VIId	VIIe
1962	24		-	-	874		-	545	373	1 816	
1963	32		-	-	1 162		-	472	506	2 172	
1964	28		-	-	1 393		-	616	422	2 459	
1965	33		-	-	2 130		-	841	445	3 449	
1966	25		-	-	2 700[1]		-	1 067	681	4 473	
1967	11		-	-	2 905		-	976	829	4 721	
1968	30		-	-	1 920		-	713	641	3 304	
1969	18	12	-	-	1 681		-	521	508	2 740	
1970	170	13	-	-	2 161		6	1 126	391	3 867	
1971	175	4	-	-	2 635		-	1 025	440	4 279	
1972	163	14	-	-	1 866		17	855	327	3 242	
1973	139	5	-	-	1 735		-	889	367	3 135	
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]	-	1 714	336	-	302	363	2 246	702
1978	161	3	-	156[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

*) Raised for under-reporting.
1) Figure from Révue des Travaux de l'Institut des Pêches maritimes raised to round fresh weight.
2) Includes VIIe.
3) Includes VIId.

Note: All combined VIId,e figures and the 1975-78 data are from Bulletin Statistique. All others from national statistics.

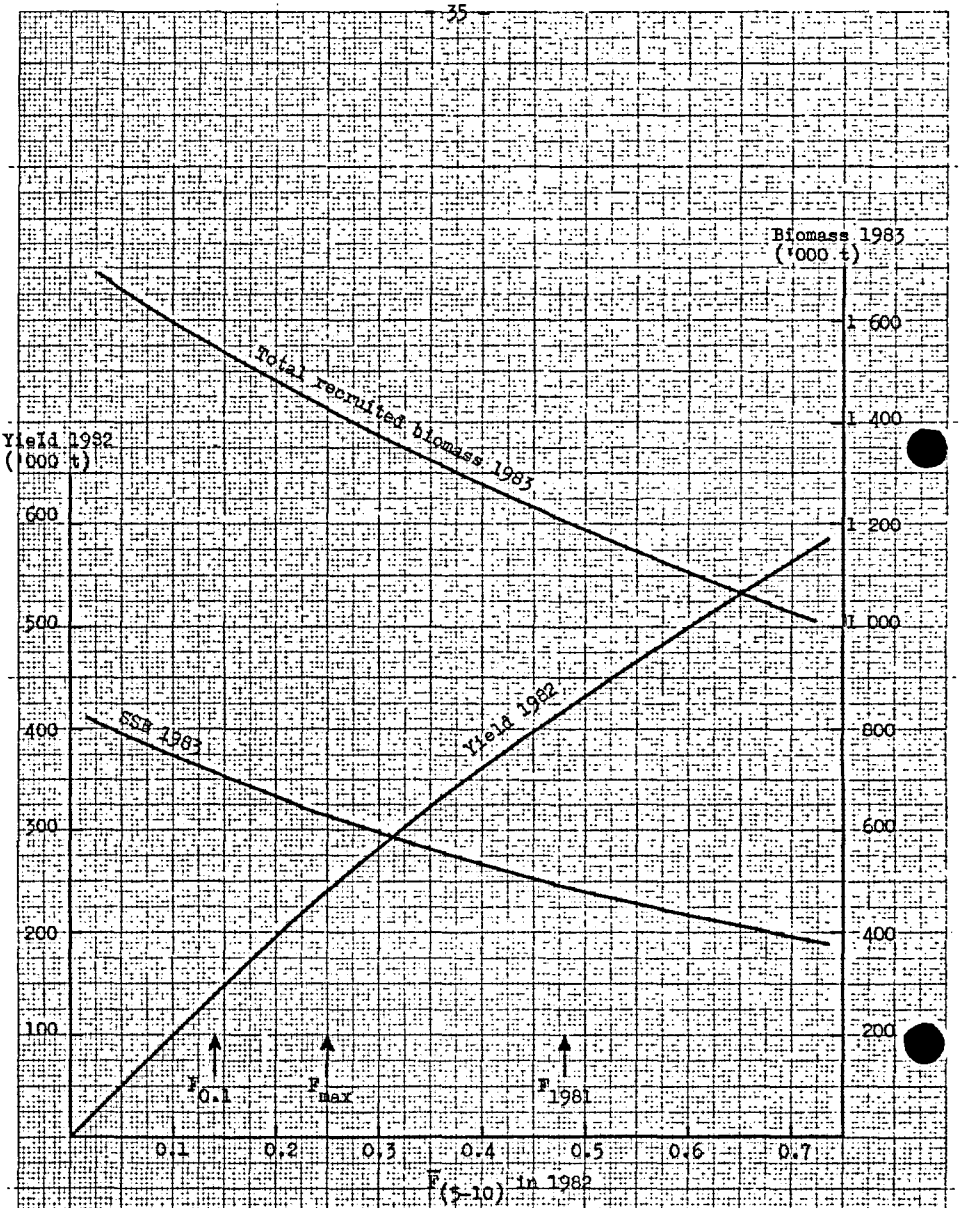


Figure 1. North-East Arctic COD. Yield 1982, total recruited biomass (age 3+) and spawning stock biomass (age 8+) at the beginning of 1983 for different levels of fishing mortality in 1982.

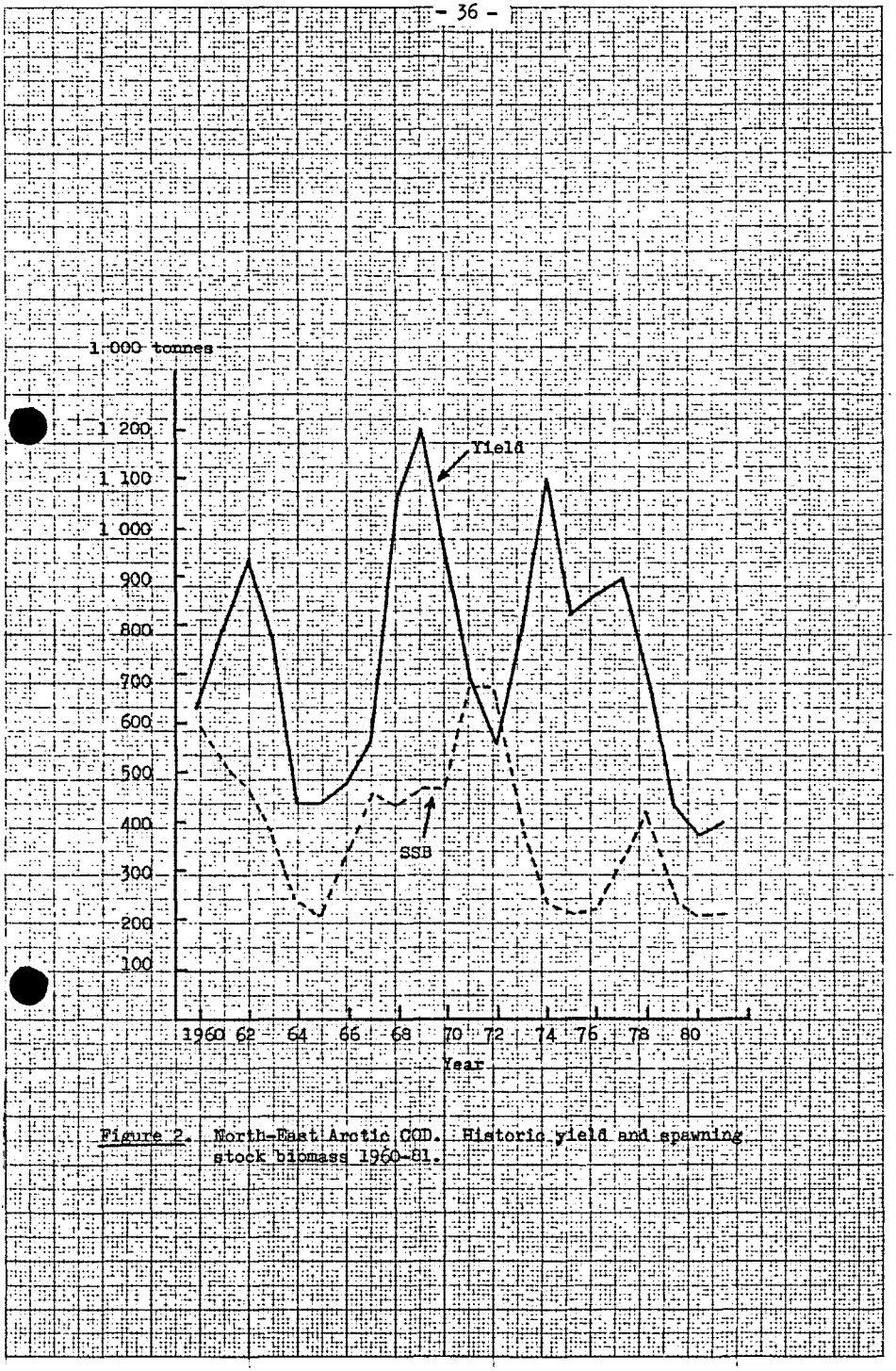


Figure 2. North-East Arctic COD. Historic yield and spawning stock biomass 1960-81.

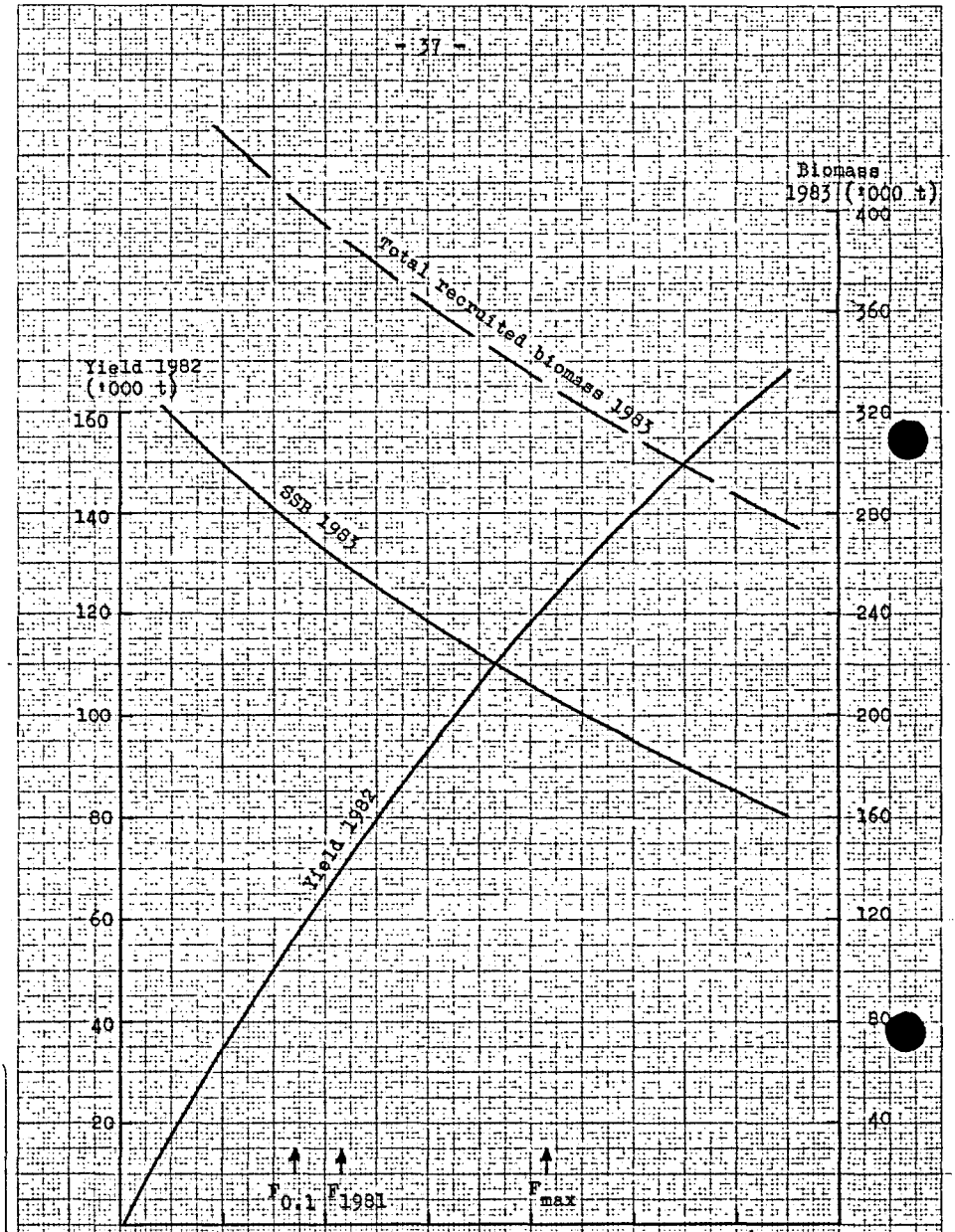


Figure 3 North-East Arctic HADDOCK. Yield 1982, total recruited biomass (age 3+) and spawning stock biomass (age 6+) at the beginning of 1983 for different levels of fishing mortality in 1982.

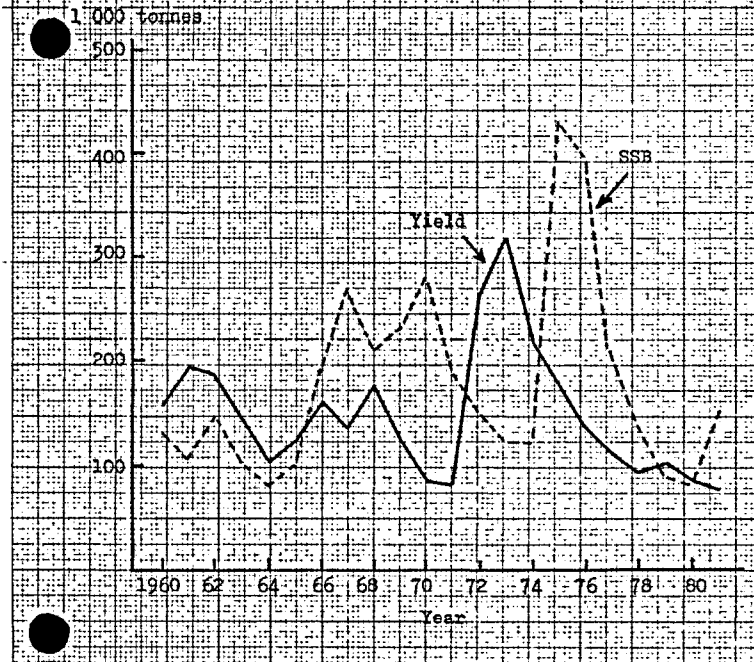


Figure 4. North-East Arctic HADDOCK. Historic yield and spawning biomass 1960-81.

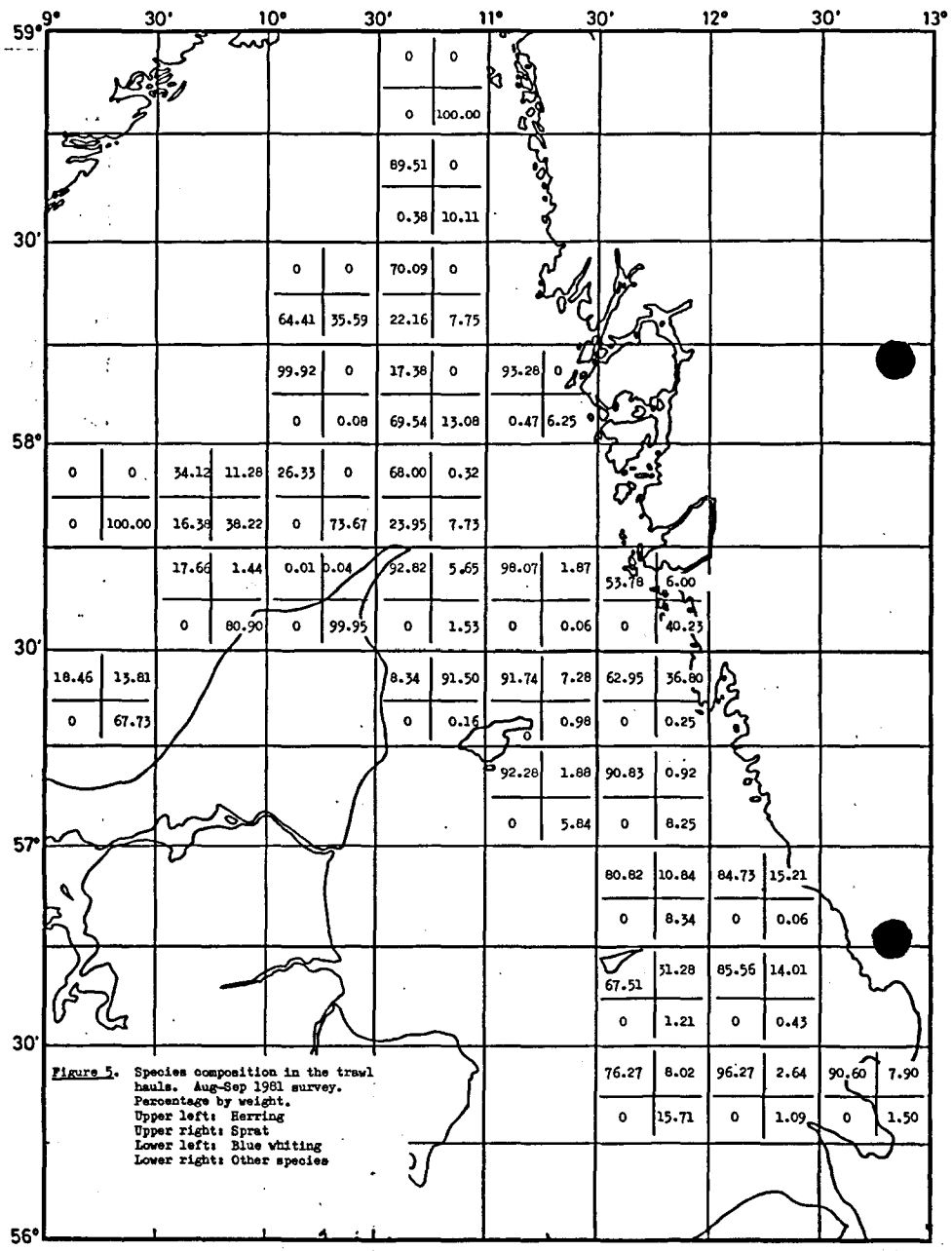


Figure 5. Species composition in the trawl hauls. Aug-Sep 1981 survey. Percentage by weight.
Upper left: Herring
Upper right: Sprat
Lower left: Blue whiting
Lower right: Other species

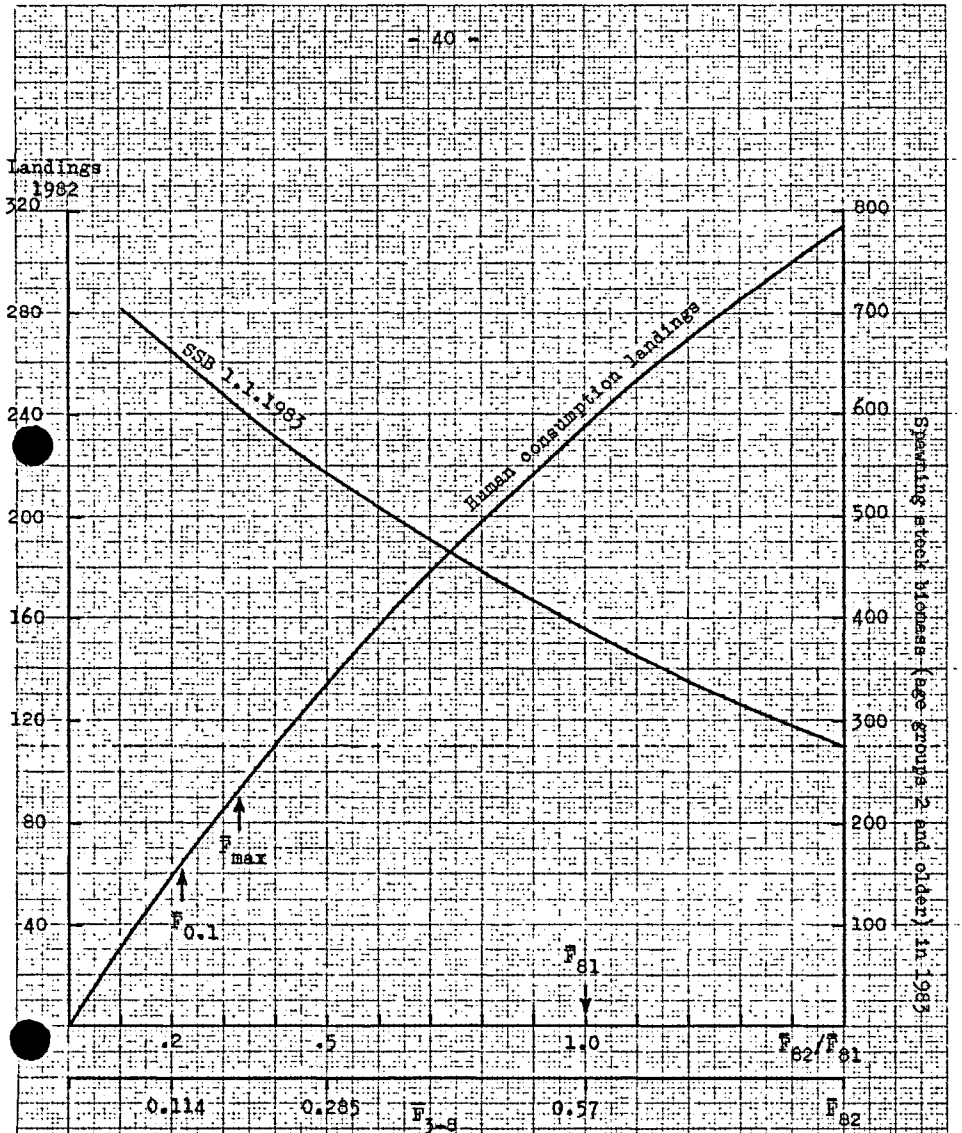


Figure 6. North Sea COD. Predictions for catch in 1982 and spawning stock biomass in 1983, in thousand tonnes. ($\bar{F}_{81} = \bar{F}_{80} = 0.57$)

Figure 7. North Sea HADDOCK. Predictions for catch in 1982 and spawning stock biomass in 1983, in thousand tonnes.

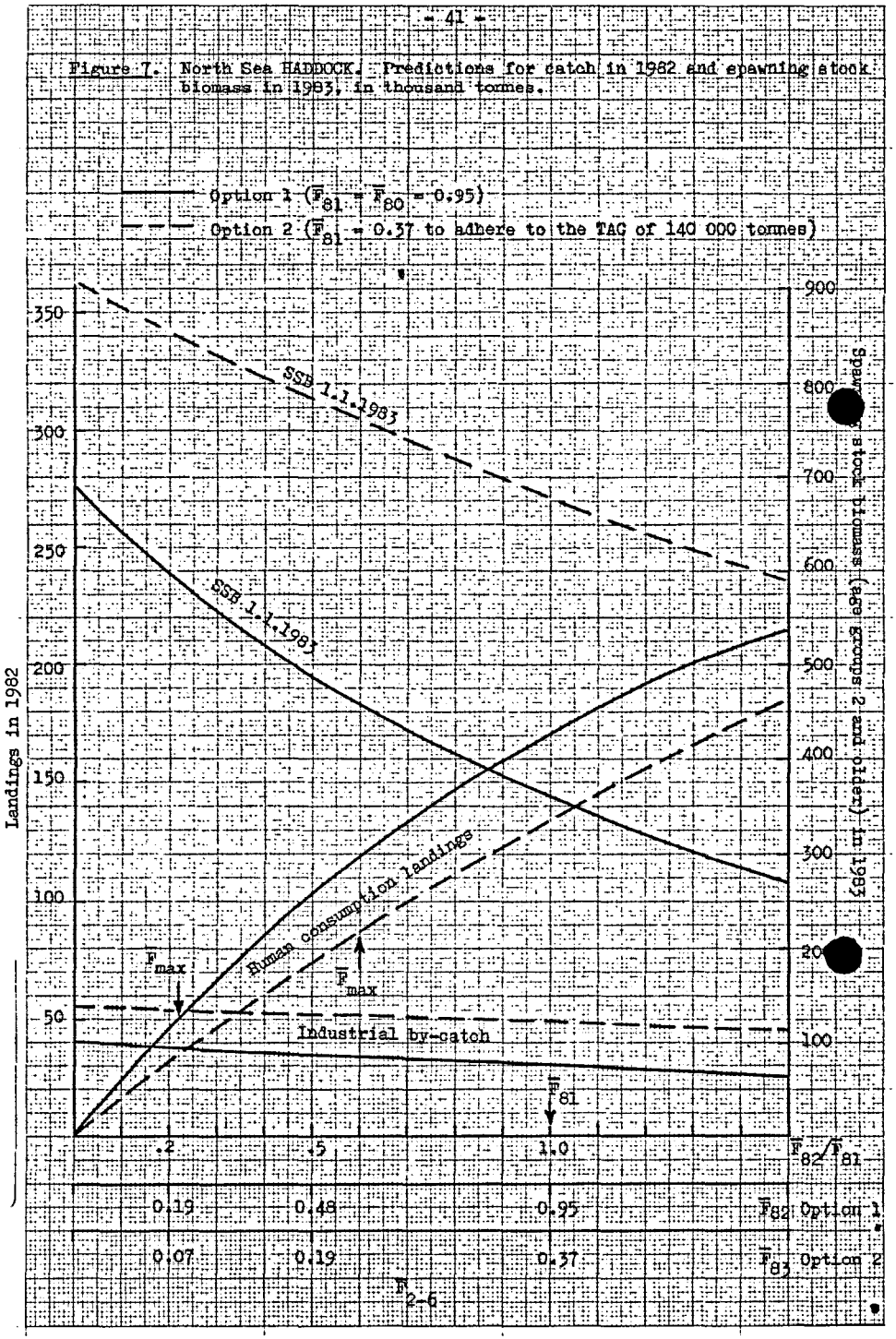
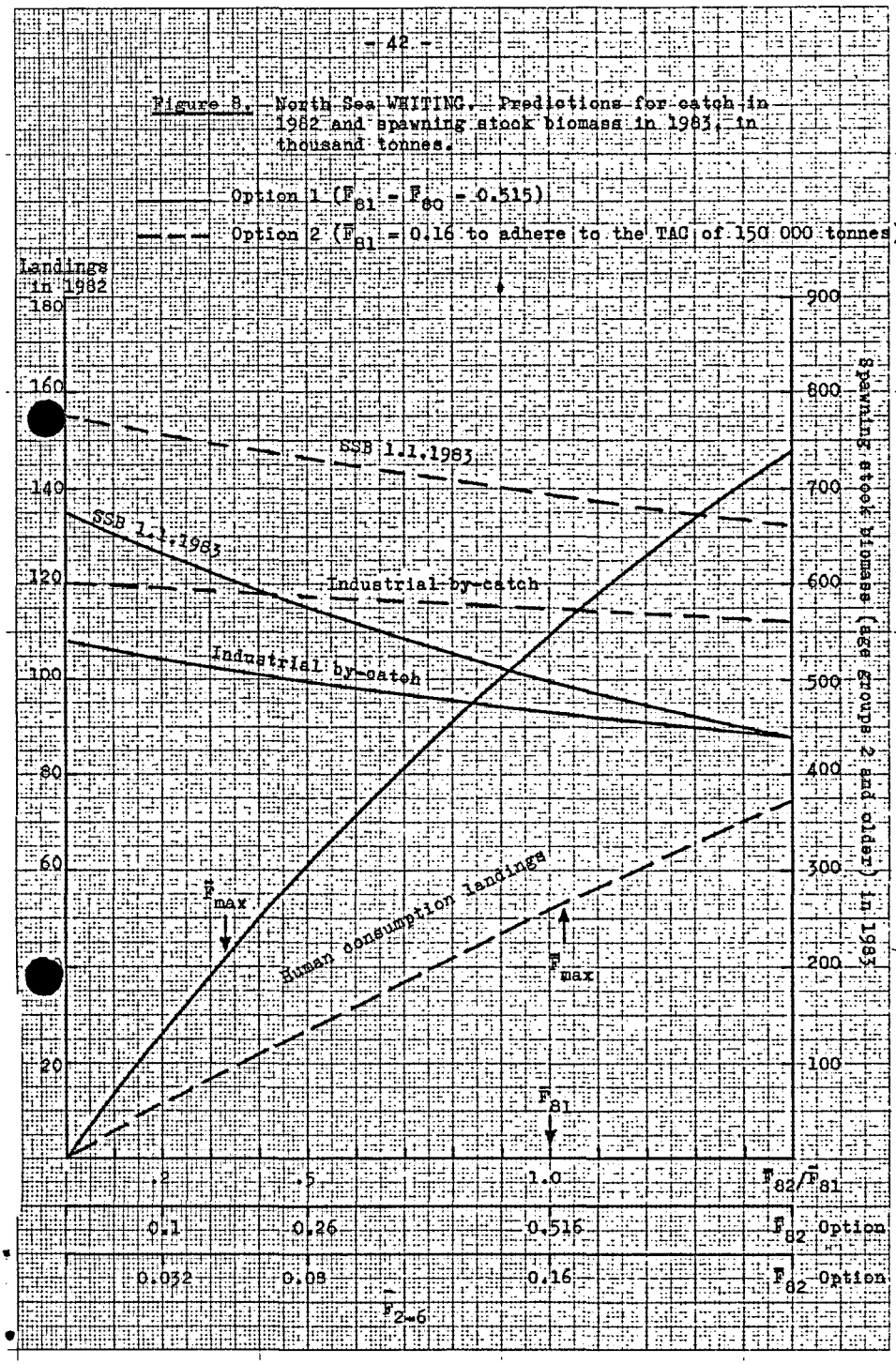


Figure 8. - North Sea WHITING. Predictions for catch in 1982 and spawning stock biomass in 1983, in thousand tonnes.



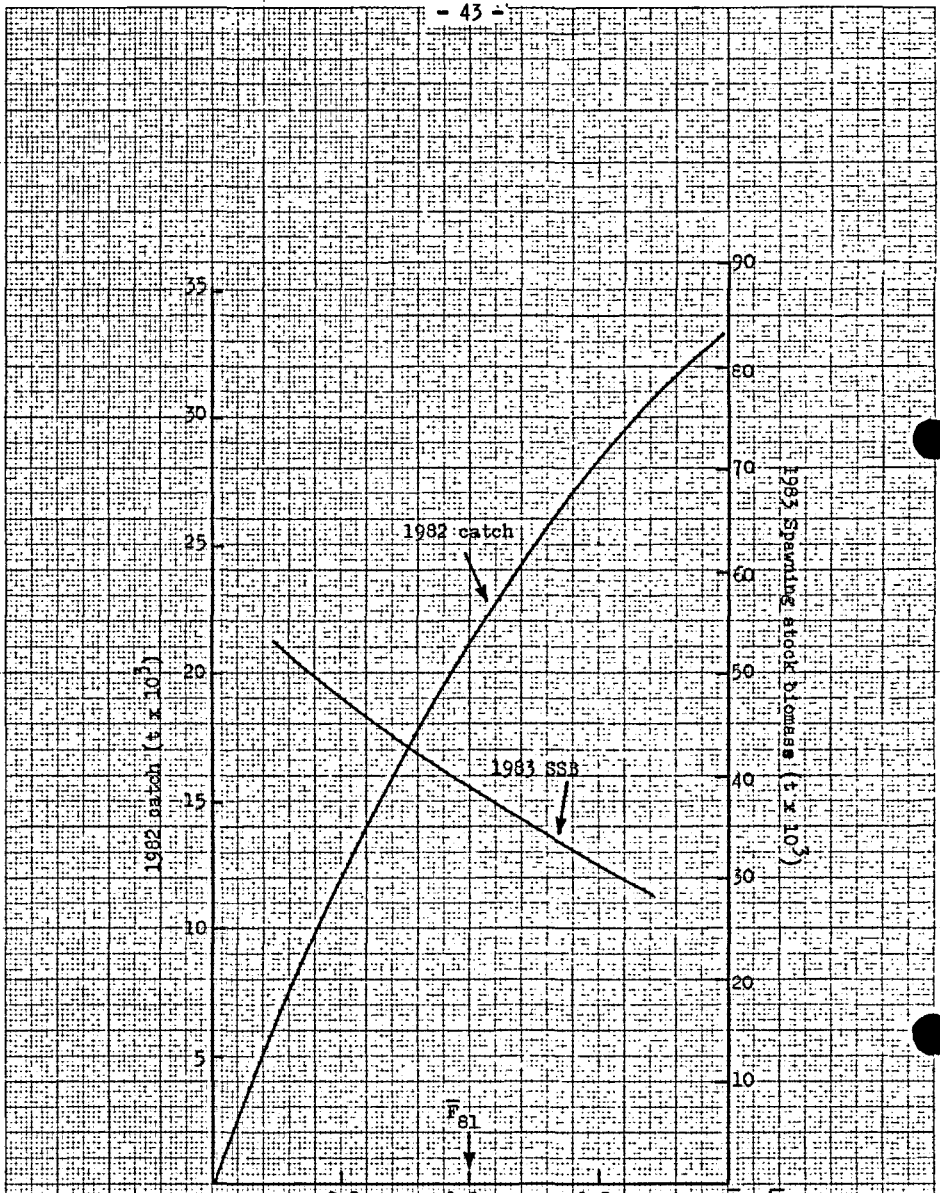


Figure 9. North Sea SOLE. Predictions for catch in 1982 and spawning stock biomass in 1983.

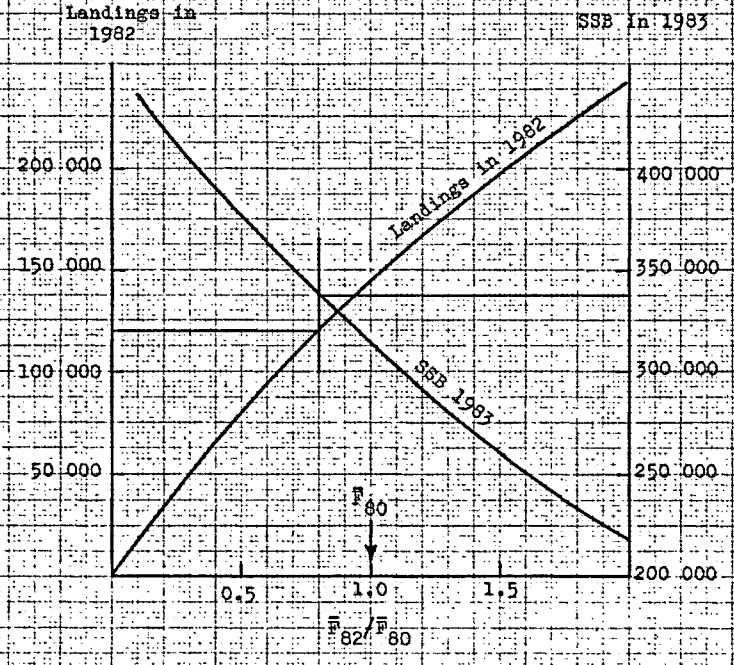
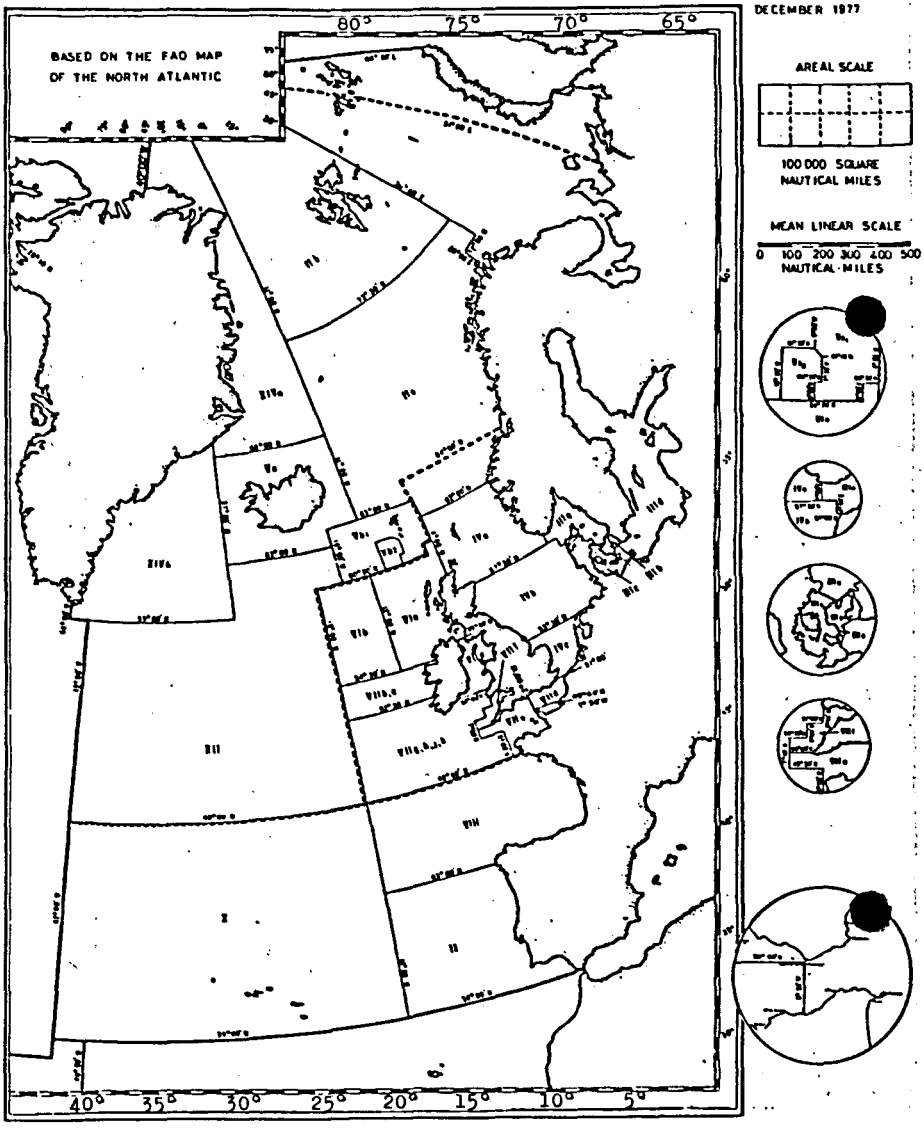


Figure 10. North Sea PLAICE. Predictions for landings in 1982 and spawning stock biomass in 1983.



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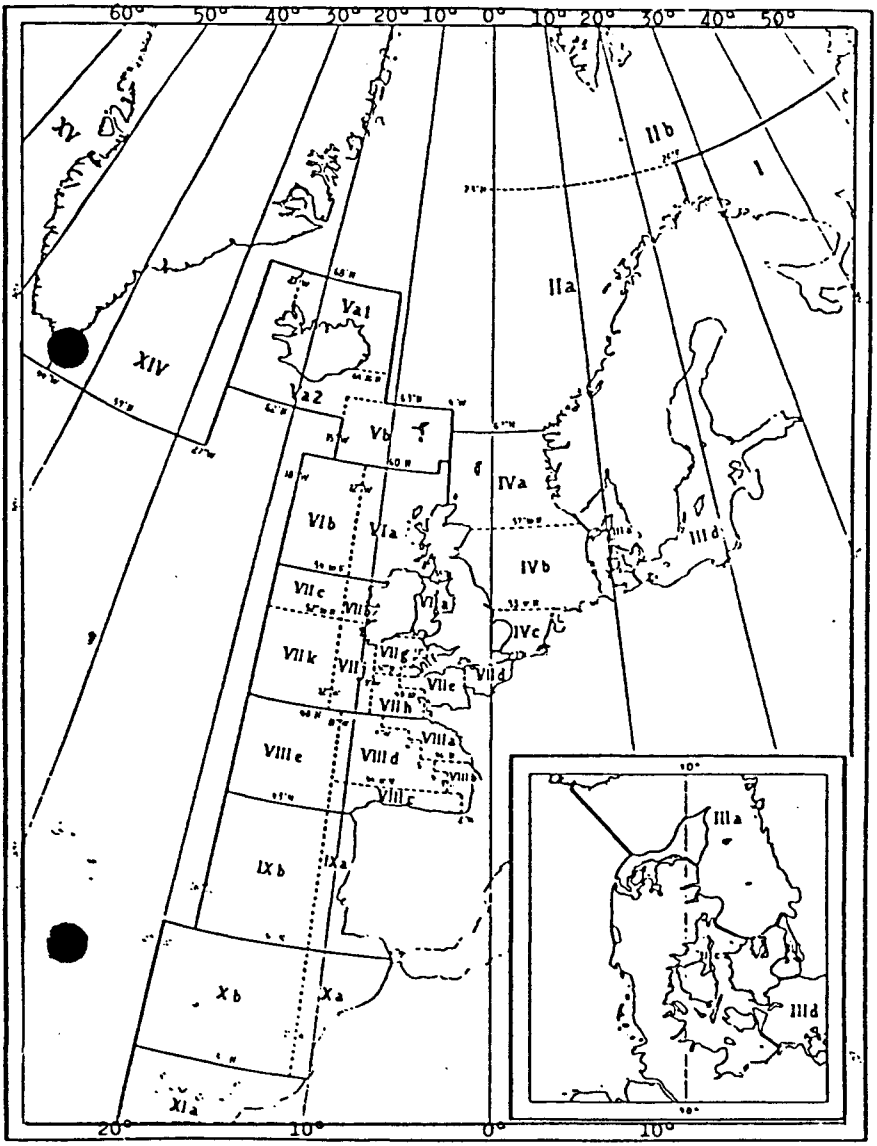

Chart of former statistical Divisions
referred to in Section H of the Report.