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REPORT OF THE DIVISION IIIA DEMERSAL STOCKS WORKING GROUP

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Based on the IYFS, the 1984 year class was assumed low (12×10^9) and the 1985 year class was assumed high (30×10^9). This method was preferred by the Working Group in preference to the assumption of average year-class strengths, even if the method is dubious.

For Kattegat, no information was available and the 1984 and 1985 year classes were assumed to be of average strength.

The data and methods available for predictions of recruitment is at present far from satisfactory for this area. The IYFS data for the demersal species in Division IIIa have only had limited application because only a few analytical assessments have been available. However, the Working Group considered it possible to improve the utilisation of IYFS data in parallel with the improved assessment.

2.2 Stock Assessment - Kattegat

2.2.1 Catch at age

Catch in numbers at age by quarter were given by Denmark and applied on Danish and Swedish quarterly catch figures. Table 2.5 shows the catch in numbers.

2.2.2 Weight at age

Mean weights at age in the catch are given in Table 2.6. The weights at age in the stock were obtained from a smoothed weight-at-age curve and refer to the beginning of the year. They are given in Table 2.11 and were used for all years.

2.2.3 Catch per unit of effort

Two data sets on cpue were presented to the Group. Catch per day fishing in four Danish cod fisheries were given for 1983-85 on a quarterly basis (Table 2.7). Catch per hour in two Swedish trawl fisheries was supplied for 1978-85 (see Table 2.8). Both sets were based on fishermen's logbooks.

2.2.4 Fishing mortality

Since the Danish cpue data from trawls, Danish seines and gillnets (Figure 2.1) and the Swedish data from Nephrops trawls (Figure 2.2) gave the same pattern of variation for the period 1983-85, the data series from Nephrops trawls was chosen to calibrate the VPA.

The levels of fishing mortaliy in 1985 on 3-group or older were selected to fit the spawning stock biomasss to the cpue data. SSB and cpue for the Nephrops trawl were plotted for a trial run using the data from 1972-84. Using the cpue in 1985 and the regression, the SSB in 1985 is calculated. Input F in 1985 which corresponds to this SSB was then used in a new run. This pro-

Genetic investigations by Moth-Poulsen (1982) showed that the cod stock in the open Skagerrak was genetically distinct from the Kattegat-northern Sound stock.

The cod on the Norwegian Skagerrak coast thus appear to be a separate stock independent from the cod on the Danish side of the Skagerrak.

Kattegat

According to Poulsen (1931), the cod spawning in the southern Kattegat last from February to May, but the main spawning occurs in February-March. He found cod larvae in the whole area in April-May, being, however, scarcer in the northeastern Kattegat.

Very few tagging experiments have been carried out in the Kattegat area, mostly as transplantation experiments (Bagge, 1973), but experiments in the western Baltic (Bagge, 1969) showed that some fish migrate to the southern Kattegat. Berner (1967) obtained a similar result.

According to the growth pattern (Bagge and Steffensen, 1980 and Steffensen and Bagge, 1983), the cod population in the Kattegat might belong to two different stocks, one in the northern and one in the southern part. Moth-Poulsen (1982) concluded that the cod from the Kattegat and the northern Sound genetically belonged to one stock. Though the Working Group members felt that more information should have been available for drawing a relatively safe conclusion about the stock identity in the Division IIIa area, it seems likely that the cod in the Skagerrak and Kattegat belong to two different stocks.

In view of these considerations, the Working Group decided to assess the Kattegat and Skagerrak cod separately.

2.1.2 Recruitment estimates for the Skagerrak and Kattegat stock

It proved difficult to estimate the recruitment for the cod stocks in the Skagerrak and the Kattegat. Since 1977, the IYFS has been carried out in Division IIIa and indices of 1-group cod for the combined area (Division IIIa) were available.

The Working Group decided to assess the cod stocks in Skagerrak and Kattegat separately and it would, therefore, be appropriate to correlate recruitment as estimated in VPA's with indices for Skagerrak and Kattegat separately.

It was not possible to rearrange the survey data during the meeting of the Working Group, but it was decided to reanalyse the data in view of the improved estimates of recruitment from the VPA's.

A very rough procedure was used this year to estimate the strengths of the 1984 and 1985 year classes. Correlation of the Skagerrak VPA 1-group with the IYFS suggests that the 1984 year class is low and the 1985 year class is high.

The recruitment to the Skagerrak stock as estimated in the VPA was divided into three groups: low, average and high recruitment.

2 COD

2.1 The Fishery

Landings of cod from the Danish and Swedish fisheries were reported from the Skagerrak and the Kattegat. No information was presented on the amounts taken as by-catches in the small-meshed trawl fisheries. The Norwegian landings stem from fishing in the Norwegian coastal area in the Skagerrak, while the Federal Republic of Germany reported a small catch from the Kattegat. No data were given on Dutch or Belgian catches.

Tables 2.1 and 2.2 show the landings from the Skagerrak and Kattegat and Table 2.3 gives the combined figures for Division IIIa. Table 2.4 shows the quarterly catch taken by Denmark for the period 1976-85.

The total Division IIIa landings decreased slightly to about 32,000 tonnes.

2.1.1 Cod stock identity

Skagerrak

On the Norwegian Skagerrak coast, the spawning occurs from February to May with the main spawning in March-April (Dannevig, 1966; Dahl, 1906; Dahl *et al.*, 1983). Although there is very little information, it is supposed that the cod is spawning in most of the fjords and in the skerries. The 0-group cod appear to stay in the fjords, and Tveite (1971) has shown that there is a good correlation between the index from the 0-group survey on the coast and the year class as 1- to 4-year-olds in catches taken in the coastal areas of the Skagerrak. Tagging experiments on the Norwegian Skagerrak coast show that the cod population in the area undertakes only short migrations along the coast (Dahl, 1906; Ruud, 1939; Løversen, 1946; Danielssen, unpublished).

Very little is known about the spawning on the Danish side of the Skagerrak. From scanty material on the stage of maturity, Poulsen (1931) indicates that the main spawning is over by the beginning of April. Anon. (1970) conclude, however, that there is no evidence of spawning off the Danish Skagerrak coast even though cod larvae have been found to be abundant in this area (Poulsen, 1931). The IYFS shows that the 1-group is also found in the area.

Tagging experiments on cod from this part of the Skagerrak gave no recaptures on the Norwegian Skagerrak coast (Danielssen, 1969). Most of the cod (80%) were recaptured on the Danish side of the Norwegian Deep in the Skagerrak. Only 5% of the recaptures (mainly immature fish) came from the Kattegat (North of Læsø) and 14% (mainly mature fish) from the North Sea. Small cod showed no pronounced seasonal movement. Larger cod showed little seasonal movement in the summer and autumn, but had a southwesterly movement towards the North Sea in the winter (Anon., 1971).

1 INTRODUCTION

1.1 Participation

D. S. Danielsen	Norway
K. Popp Madsen	Denmark
N. A. Nielsen (Chairman)	Denmark
E. Nielsen	Denmark
B. Sjöstrand	Sweden

1.2 Terms of Reference and the Requirement of Meetings of the Working Group

At the Statutory Meeting in 1985 it was decided (C.M.Res.1985/2:3:13) that the Working Group should meet at ICES Headquarters from 17 - 20 March 1986 to assess the status of cod, haddock, whiting and plaice in Division IIIa and provide catch options inside safe biological limits.

The meeting in 1986 was the first meeting of the Working Group since 1981 and in between, the stocks have been tentatively assessed by the colleagues from the Danish Institute.

The members of the Working Group found the meeting useful and the available information in terms of biological data, recruitment estimates and cpue from the fishery provided a reasonable basis for the analytical assessments.

The Working Group recommends that a meeting be held in 1987. At that meeting, the advances in the analytical assessments made this year should hopefully be continued. Moreover, it would be important to analyse the IYFS data for the Skagerrak and Kattegat separately. Finally, the catch/effort information available this year proved useful, and the processing of these data should certainly be continued.

1.3 Research Requirements

During the work and discussions of the Working Group, it was often noted that there is an apparent lack of basic biological knowledge of several species in the area. There are no recent studies on spawning areas, egg and larval drift of cod, haddock and whiting in the area.

The Working Group recommends that research programmes, which will update this knowledge, be initiated by the laboratories in the countries bordering the area.

cedure resulted in $\bar{F}_{(3-6)u}$ = 1.25 and the correlation coefficient 0.87.The regression is given in Figure 2.3.

F on the youngest age group was chosen to give an average size of the 1984 year class.

Fishing mortalities are shown in Table 2.9 and the estimated stock size in Tables 2.10 and 2.11.

2.3 Prognosis

Average recruitment in the period 1973-83 (20.6 x 10^6) 1-group cod was assumed for the 1984-86 year classes. The average weight at age in the catch for 1978-85 was used in the prediction. Weight at age for the stock is shown in Table 2.12.

The input data for prediction are shown in Table 2.13 and the results in Table 2.14. The stock summary graphs are shown in Figure 2.4.

2.4 State of the Stock and Management Considerations

The fishing mortality on the cod stock in the Kattegat in 1985 is at a high level and has been increasing over the last decade. Even though the assessment suggests a slight increase in spawning stock from the low 1983 level, the spawning stock is lower than in the 1970's.

The 1985 year class seems to be a good one, but because of the uncertain split of the recruitment in the Skagerrak and the Kattegat, the estimate must be treated with caution.

2.5 Stock Assessment - Skagerrak

2.5.1 Catch at age

Danish age compositions given by quarter of the year were applied to Danish and Swedish quarterly catch data. The sum for the year was raised to the total international catch (see Table 2.15).

2.5.2 Weight at age

Mean weights at age in the catch are given in Table 2.16. Mean weights in the stock were arrived at by smoothing the catch weights (see Table 2.20).

2.5.3 Catch per unit of effort

Danish data on catches per fishing day were given for the years 1983-85 and are shown in Table 2.7. Catches per hour trawled in the Swedish cod and Nephrops fisheries were reported for 1978-85 (Table 2.8). Figures 2.5 and 2.6 show the Danish and Swedish cpue data. The Swedish series shows a decline in cpue from the higher

levels in the beginning of the 1980's. The cpue has been stable in the more recent years. This observation is supported by the shorter Danish time series.

2.5.4 Fishing mortality

The VPA was calibrated to the Swedish cpue data, both gears combined. The SSB estimates were calculated from a trial run and regression against the cpue series for the years 1978-84. Input F in 1985 was then selected to produce a 1985 SSB as predicted by the regression (Figure 2.6). The correlation coefficient is remarkably high, a value of 0.98.

The level of fishing mortality in 1985 needed to produce the predicted 1985 SSB is high: $\bar{F}_{(3-6)u} = 0.96$. Fishing mortalities and estimated stock sizes are given Tables 2.17, 2.18 and 2.19.

2.6 Prognosis

The 1978-82 average recruitment appears from the VPA as 22 x 10^6 1-group cod. The index from the IYFS for the 1984 year class is, however, one of the lowest in the data series and that for the 1985 year class one of the highest. Even if the IYFS indices (Table 2.22) are calculated for the whole of Division IIIa, they show a certain covariation with the 1-group cod in the Skagerrak. The Working Group, therefore, chose to use a low figure for the 1984 year class (12 x 10^6) and a high one for the 1985 (30 x 10^6). The average weight at age in the catches for 1978-85 was used in the prediction. The fishing pattern used was the 1978-83 average.

Table 2.20 shows the input values, while catch options are given in Table 2.21. The stock summary graphs are shown in Figure 2.8.

2.7 State of the Stock and Management Considerations

The fishing mortality on the cod stock in Skagerrak is high and shows similar levels as the cod stock in the Kattegat. The stock size has been decreasing since the beginning of the 1980's; however, the time series is too short to judge whether this decrease is part of the long-term fluctuations, or whether the biomass is generally decreasing.

A comparison of the assessment of the Skagerrak and the Kattegat cod stocks with the assessment of the North Sea cod stock and the cod stocks in the Baltic shows a high level of exploitation in all cod stocks in the area.

The IYFS suggests a good 1985 year class, but as discussed in Section 2.4, the split in the Skagerrrak and the Kattegat stocks is uncertain.

3 HADDOCK

3.1 The Fishery

Table 3.1 shows annual landings of haddock from Division IIIa by country. For the years 1975-83, figures are in agreeement with Bulletin Statistique, while those for 1984-85 are preliminary figures partly of official standing and partly provided by Working Group members.

According to these figures, landings increased about 7% from 1984 to 1985 or to a level only slightly higher than the 10-year average of 8,900 tonnes.

3.2 Stock Assessment

3.2.1 Stock identity

It is not yet clear whether the haddock in Division IIIa is a self-supporting stock or just an extension of that in the North Sea. In an earlier report (Anon.,1980), this problem was discussed at some length. Later material on average weight at age confirms the observation made then, i.e., that average weight of the Division IIIa haddock is much higher than in the North Sea.

The presence of mature fish in Division IIIa in the spawning period is well established. The Flødevigen Biological Station has secured haddock in spawning condition for rearing experiments from long-line fishing outside the Norwegian Skagerrak fjords and concentrations of large haddock are observed regularly in the Bohuslän skerries in the inner most part of the Skagerrak.

Even though a local spawning within the Skagerrak is strongly indicated, it cannot, of course, exclude that a certain exchange takes place between Division IIIa and the North Sea.

3.2.2 Age distribution

Age data were available for the Danish landings and were raised by the SOP's to total international landings on a yearly basis. The catch in numbers so arrived at are given in Table 3.2.

3.2.3 Weight-at-age data

Data were available for the whole period and were used for calculating a common set of mean weight at age (Table 3.3).

3.2.4 Recruitment

No indices of year-class strength from IYFS were available at the Working Group meeting. Such data are, however, stored in the survey files and should be produced at future assessments.

3.2.5 Fishing mortality

From catch curves, a Z = 1.4 was derived and F = 1.2 was introduced as the terminal value in the VPA. Danish effort figures are only available for 1983-85, and considering the short period in question, they could not be used in this connection. CPUE figures for the second half of 1985 show a clear increase concommitant with what from the VPA would appear as being a strong 1983 year class.

3.2.6 Results from the VPA

Outputs from the VPA are shown in Tables 3.4 and 3.5 and in Figure 3.1. Fishing mortality seems to be high during the whole period, while there is a declining trend in biomass.

3.2.7 Prognosis

Without recruitment indices available, a prognosis could not be undertaken. With no change in the fishing mortality, the apparently stronger 1983 year class should increase the spawning stock somewhat.

4 WHITING

Nominal landings are shown in Table 4.1. The preliminary figure for 1985 is almost the same as in 1984 and the total landings have stayed at a remarkably stable level in the last four years.

There is no basis for an analytical assessment and the IYFS index for 1-group whiting (Table 2.22) does not appear to be a reliable predictor of future landings. If it were, prospects would be good as the 1986 index is more than twice the average for 1981-85.

5 PLAICE

5.1 The Fishery

5.1.1 Landings from the Skagerrak

The landings from the Skagerrak are shown in Table 5.1 for the period 1972-85. No information on the landings in 1985 was available from the Netherlands, and it was, therefore, assumed that the Dutch quota of 1,800 tonnes had been fished in 1985.

The landings have increased from 9,545 tonnes in 1984 to 12,520 tonnes in 1985. The landings in 1985 are at the same level as landings in the period 1977-79. However, because of the lack of catch statistics from the Netherlands for this area, the estimates of total catch have been very uncertain in recent years.

5.1.2 Landings from the Kattegat

The landings from the Kattegat are shown in Table 5.2. The catch in 1985 is still at the same low level as has been observed since 1981. The landings in the 1980's amount to 25% of the landings in the 1970's.

The total catch of plaice from the combined areas (Division IIIa) is shown in Table 5.3. The quarterly breakdown of the Danish catches from the Skagerrak and the Kattegat is shown in Table 5.4.

5.2 Stock Assessment for the Kattegat

5.2.1 Age distribution

Age data were available for the Danish landings and were raised to the total landings. The catch in number for 1974-85 is given in Table 5.5.

5.2.2 Weight-at-age data

Weight-at-age data were available for each of the years 1978-85. The average weight at age for this period was used in the period 1968-77 (Table 5.6) where no data were available.

Figure 5.1 shows the weights at age for male and female separately for each of the years 1980-85. The weight-at-age curves for male plaice show reduced growth in plaice below 6 years for the period 1980-82. Since 1983, there has been an apparent lack of growth for all age groups. The phenomenon is less apparent for female plaice. However, reduced growth is observed in 1983 and 1984 for age groups 5 to 9.

A considerable part of the Danish catches consisted of small and old male plaice. The otoliths of these fish have been re-analysed and no errors seem to have been made. Fishermen in the Kattegat have reported that increased catches of mature plaice below the minimum landing size have been observed since 1981.

Thus, the rather odd growth curves do not seem to be an artefact. There are several possible causes for this phenomenon. Investigation of O-group plaice (Nielsen and Bagge, 1985) indicates that the southern part of the Kattegat is a mixture of different stocks, and different mixing rates of the stocks could change the weight at age.

In recent years, adverse environmental conditions have been observed in the southern Kattegat, and this has possibly reduced the growth rate. An investigation of these problems has been initiated at the Danish Institute.

5.2.3 Recruitment

Indices of year-class strength for the 1-group were available from the Danish young plaice survey. The survey has been carried out since the 1930's using a Petersen young fish trawl. The indices from 1960 onwards are shown in Table 5.7.

In 1973, the young fish survey was discontinued but the survey was carried out again in 1981, 1984 and onwards. In the period 1981-83, the survey used a 2-m beam trawl. This gear proved inefficient and it was decided to replace it with a Petersen young fish trawl, as used in earlier surveys.

The relationship between VPA 1-group and Petersen young fish trawl survey index is shown in Figure 5.2. Applying this log-log regression, estimates of the 1983 and 1984 year classes are obtained:

$$\text{1-group 1984} \sim 8{,}400 \times 10^3$$
$$\text{1-group 1985} \sim 17{,}500 \times 10^3$$

The 1984 year class is weak compared to year classes in the period around 1970, but stronger than the average year classes in the period 1979-83 ($14{,}300 \times 10^3$).

5.2.4 Catch-per-unit-effort data

Cpue data were available for 1983, 1984 and 1985 from the Danish logbook system. The processed logbooks cover 30-40% of the Danish catch in the Kattegat. Cpue was calculated as average catch per day for each gear on a quarterly basis. The cpue data are shown in Table 5.8 and Figure 5.3.

The most important gear in the plaice fisheries was the Danish seine. The catch from seiners constituted 60% of the Danish plaice catch, and 5-6% of the catch was taken by gill net. The trawlers were separated in groups below 30 BRT and above 30 BRT. They took 24% and 9%, respectively, of the total plaice catch.

5.2.5 Fishing mortality and natural mortality

An annual weighted cpue was calculated for each vessel category and the results are shown in Figure 5.3. The figure shows an increase in the estimated yearly cpue from 1983-85. The Danish catch has in the same period been constant at 3,000 tonnes. The Working Group decided to match the increase in the cpue by selecting input values for F_{85} lower than F_{84} as estimated from trial VPA. This seems to be realistic as some of the effort is diverted to cod and Nephrops, because of relatively low prices on plaice in 1985. Using this set of input values for F, SSB's in 1983 and 1984 are nearly at the same level, whereas the SSB in 1985 is at a slightly higher level, and the SSB in the period 1983-85 follows the same trend as the cpue data. No other information was available to substantiate the choice of F. The natural mortality was, as in earlier years, set at 0.1.

5.2.6 Results from the VPA

The fishing mortalities and stock sizes are shown in Figure 5.4 and Tables 5.9 and 5.10. The recent spawning stock level is still very low which was to be expected because of the very low recruitment since 1979.

5.2.7 Prognosis for plaice in the Kattegat

Prediction was made assuming that the exploitation pattern in 1986-88 will remain unchanged compared to the pattern in 1985.

The mean weight at age for the most recent years (1983-85) was applied in 1986-88.

The spawning stock consists of fish 3 years and older.

It was assumed that the recruitment will remain at a low level [mean recruitment (1979-83) will be 15,000 tonnes].

Predictions were made for two different options for the strength of the 1983 year class.

1983 year class

1) The strength of the 1983 year class is set at the value estimated from the recruitment survey (Figure 5.2). The predicted value as 1-group is 8,000 x 10^3.

2) In order to estimate a 1983 year-class strength of 8,000 x 10^3 in the VPA, the input F on 2-group in 1985 has to be very high (F = 0.175) compared to recent years. Assuming F_{85} in 2-group is average (= 0.08), the 1983 year class as 1-group is estimated to be 19,000 x 10^3.

1984 year class

The value estimated from the young fish surveys is 17,500 x 10^3 as 1-group.

The input data are shown in Tables 5.11 and 5.13 and the catch options are shown in Tables 5.12 and 5.14 for options 1 and 2, respectively.

5.3 State of the Stock

The assessment shows that the biomass of the plaice stock in the Kattegat has been at a relatively constant level since 1981. However, the stock size in recent years makes up only one third of the level observed around the 1970's. This seems to be caused by reduced recruitment since the late 1970's and the recruitment by the 1983 and 1984 year classes is a continuation of this low level.

5.4 Stock Assessment for the Skagerrak

In last year's report, the Working Group did a combined assessment on the Skagerrak and the Kattegat besides the separate assessments. Because of the uncertainties about stock identity in the area (see Section 5.2.2), a combined assessment was not undertaken at the present meeting.

5.4.1 Age distribution

Catch-at-age data were available from the Skagerrak since 1978 for the Danish landings and were raised to the assumed total landings. The catch in numbers are given in Table 5.15.

5.4.2 Weight at age

Weight data were available since 1978, and are shown in Table 5.16.

5.4.3 Recruitment

No recruitment survey on 0-group and 1-group was carried out, so no information on the recruitment in the Skagerrak is available.

5.4.4 Catch-per-unit-effort data

Cpue data were available from the Danish logbook system. The cpue data were given as average catch per day for each gear on a quarterly basis. The trawlers were separated in sizes below 30 BRT and above 30 BRT. The cpue data are shown in Table 5.8 and Figure 5.5. A weighted annual cpue was calculated, and the result is shown in the figure. The figure shows that the cpue has increased slightly from 1983-85. The reported catch to the logbook system constitutes 15-25% of the total catch. The Working Group decided to select input F's which would produce a slightly increased biomass. Using average F's over the period 1981-84 from a trial run, gave moderately increasing exploited biomass in recent years. In view of the poor quality of total international catch data for this area and the short cpue series, the Working Group did not try to refine the procedure any further.

5.4.5 Results from the VPA

Results of the VPA are shown in Tables 5.17 and 5.18. The SSB seems to have increased since 1980. The SSB in 1984 and 1985 is at the same level, and has increased compared to the 1983 level.

5.4.6 Prognosis for plaice in the Skagerrak

Due to the lack of the catch figures from the Netherlands, the relatively short cpue series data, and the lack of recruitment data, the Working Group decided not to carry out any prediction for this stock.

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Table 2.1 Cod landings from the Kattegat, 1971-85 (tonnes).

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[2]	8,847	3,435	36	12,318

[1] Landing statistics incompletely split on the Kattegat and the Skagerrak. The figures are estimated by the Working Group.

[2] Preliminary.

Table 2.2 Cod landings from the Skagerrak, 1971-85 (tonnes).

Year	Denmark	Sweden	Norway[1]	Others	Total
1971	5,914	2,040	1,355	13	9,322
1972	6,959	1,925	1,201	22	10,107
1973	6,673	1,690	1,253	27	9,643
1974	6,694	1,380	1,197	92	9,363
1975	14,171	917	1,190	52	16,330
1976	18,847	873	1,241	466	21,427
1977	18,618	560	979	675	20,832
1978	23,614	592	1,442	260	25,908
1979	14,007	1,279	1,745	213	17,244
1980	21,551	1,712	1,982	341	25,586
1981	25,498	2,835	2,073	294	30,700
1982	23,377	2,378	1,730	41	27,526
1983	18,467	2,803	1,765	163	23,198
1984	17,443	1,981	1,458	156	21,038
1985[2]	15,943	2,524	1,164	N/a	19,631

[1] Mainly landings from Norwegian fjords.

[2] Preliminary.

Table 2.3 Cod landings from Division IIIa - the Kattegat and the Skagerrak, 1971-85 (tonnes).

Year	Denmark	Norway[1]	Sweden	Others	Total
1971	17,662	1,355	6,002	35	25,054
1972	20,410	1,201	5,882	56	27,549
1973	21,586	1,253	5,540	101	28,480
1974	23,737	1,197	6,097	212	31.243
1975	25,920	1,190	4,559	146	31.815
1976	31,833	1,241	4,115	513	37,702
1977	35,286	979	3,960	726	40,951
1978	33,907	1,442	3,485	464	39,298
1979	25,052	1,745	5,042	235	32,074
1980	30,816	1,982	5,918	379	39,095
1981	36,171	2,073	7,215	578	46,037
1982	32,697	1,730	5,465	99	39,991
1983	27,616	1,765	6,428	217	36,026
1984	25,033	1,458	6,072	361	32,924
1985[2]	24,790	1,164	5,959	36	31,949

[1] Mainly landings from Norwegian fjords.

[2] Preliminary.

Table 2.4 Danish landings of cod by quarters (tonnes).

Quarter	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
					Kattegat 1976-85					
Jan-Mar	7,010	10,899	5,949	6,839	6,314	6,392	5,865	4,627	4,813	6,001
Apr-Jun	2,093	1,960	1,822	1,996	1,037	1,318	1,256	1,683	759	940
Jul-Sep	1,433	1,629	886	636	694	851	791	1,001	710	825
Oct-Dec	2,450	2,180	1,636	1,574	1,220	2,112	1,408	1,838	1,417	1,081
Total	12,986	16,668	10,293	11,045	9,265	10,673	9,320	9,149	7,699	8,847
					Skagerrak 1976-85					
Jan-Mar	4,452	4,941	3,848	3,963	5,460	5,912	6,042	4,133	4,775	3,296
Apr-Jun	4,124	4,071	5,671	5,143	5,297	5,758	7,171	5,895	5,623	4,310
Jul-Sep	4,856	4,472	5,873	2,244	5,317	5,185	5,480	3,803	3,065	3,987
Oct-Dec	5,415	5,134	8,222	2,657	5,477	8,643	4,684	4,636	3,969	4,350
Total	18,847	18,618	23,614	14,007	21,551	25,498	23,377	18,467	17,432	15,943

Table 2.5 VIRTUAL POPULATION ANALYSIS

COD IN THE KATTEGAT (PART OF FISHING AREA IIIA)

CATCH IN NUMBERS UNIT: thousands

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	58	5	591	186	106	1	88	215	552	528	540	655
2	3811	623	4250	3610	4451	2214	6015	5161	1517	5918	5196	5194
3	6422	2167	6945	2900	6933	7078	2551	6116	5454	2578	5229	4770
4	2427	3954	4543	5251	1855	4942	2100	991	3347	4026	2145	1221
5	809	2280	1558	661	1059	492	915	1039	558	1588	677	604
6	455	780	549	429	257	378	83	230	380	146	435	200
7	94	212	85	47	139	137	99	11	120	93	115	56
8+	53	160	31	19	57	102	71	47	35	78	36	25
TOTAL	14072	10181	18515	11111	14982	15346	11920	11848	11543	12555	10169	12523

	1984	1985
1	127	564
2	4528	2364
3	4753	6318
4	1749	2192
5	281	305
6	34	79
7	27	8
8+	19	18
TOTAL	11378	12428

Table_2.6 SUM OF PRODUCTS CHECK

COD IN THE KATTEGAT (PART OF FISHING AREA IIIA)
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.699	.699	.699	.699	.699	.699	.699	.708	.691	.604	.600	.595
2	.880	.880	.880	.880	.880	.880	.880	.868	.893	.799	.784	.752
3	1.069	1.069	1.069	1.069	1.069	1.069	1.170	1.086	.951	1.123	1.235	1.129
4	1.673	1.673	1.673	1.673	1.673	1.673	1.690	1.890	1.440	1.432	1.391	1.943
5	2.518	2.518	2.518	2.518	2.518	2.518	2.360	2.215	2.478	2.076	2.078	3.348
6	3.553	3.553	3.553	3.553	3.553	3.553	4.120	3.382	3.157	3.532	2.911	3.141
7	5.340	5.340	5.340	5.340	5.340	5.340	5.180	7.514	3.526	4.420	3.698	5.501
8+	6.635	6.635	6.635	6.635	6.635	6.635	6.900	6.101	6.903	4.644	6.460	6.325

	1984	1985
1	.711	.605
2	.745	.802
3	1.153	.974
4	1.687	1.609
5	2.798	2.545
6	3.022	4.058
7	5.273	6.792
8+	7.442	7.260

Table 2.7 Cpue data by vessel category for the Danish fishery in Division IIIa expressed as average catch (kg) per fishing day.

Year	Quarter	Netters	Danish seiners	Trawlers			
				<30 GRT	30-75 GRT	75-100 GRT	>150 GRT
				Skagerrak			
1983	1	179	78	73	128	151	210
	2	94	259	82	143	128	102
	3	50	161	61	151	130	171
	4	424	158	59	101	184	104
1984	1	238	212	67	113	78	54
	2	94	282	103	130	246	80
	3	140	145	82	91	98	163
	4	208	78	49	67	129	81
1985	1	190	88	70	134	307	876
	2	194	178	94	112	99	34
	3	265	363	98	247	159	177
	4	353	207	81	114	104	99
				Kattegat			
1983	1	169	386	364	245	224	3
	2	28	78	147	395	-	-
	3	98	65	107	158	-	-
	4	108	173	89	141	-	667
1984	1	28	341	330	353	269	4,509
	2	35	56	92	23	265	-
	3	58	59	96	88	-	-
	4	82	114	86	109	190	-
1985	1	125	397	448	555	235	320
	2	66	94	167	146	-	198
	3	105	117	216	92	102	580
	4	73	79	128	116	226	540

Table 2.8 Cpue data by vessel category for the Swedish fishery expressed as average catch (kg) per hour.

Year	Bottom trawl								
	Skagerrak			Kattegat			Division IIIa		
	C	f	C/f	C	f	C/f	C	f	C/f
1978	86	3,511	24.5	1,151	13,436	85.6	1,237	16,947	73.0
1979	104	3,670	28.4	1,771	12,230	144.8	1,875	15,900	117.9
1980	268	6,676	40.1	1,715	14,866	115.4	1,983	21,542	92.0
1981	319	7,312	43.6	1,750	12,454	140.5	2,066	19,766	104.5
1982	463	8,205	56.4	1,579	10,443	151.2	2,042	18,648	109.5
1983	326	8,415	38.7	2,371	17,311	137.0	2,697	25,726	104.8
1984	373	12,075	30.9	1,746	19,168	91.1	2,119	31,243	67.8
1985	362	12,209	29.7	1,146	13,052	87.8	1,508	25,261	59.7

Year	Nephrops trawl								
	Skagerrak			Kattegat			Division IIIa		
	C	f	C/f	C	f	C/f	C	f	C/f
1978	572	31,450	18.2	726	11,471	63.3	1,298	42,921	30.2
1979	936	34,419	27.2	1,142	13,735	83.2	2,079	48,154	43.2
1980	1,173	37,526	31.2	972	14,137	68.7	2,145	51,663	41.5
1981	1,458	37,540	38.8	884	13,871	63.7	2,342	51,411	45.6
1982	1,212	33,595	36.1	603	14,270	42.2	1,815	47,865	37.9
1983	1,038	40,626	25.6	485	11,739	41.3	1,523	52,365	29.1
1984	878	48,582	18.1	398	13,718	29.0	1,276	62,300	20.5
1985	958	49,798	19.2	482	11,645	41.4	1,440	61,443	23.4

Table 2.2 VIRTUAL POPULATION ANALYSIS

COD IN THE KATTEGAT (PART OF FISHING AREA IIIA)

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

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.00	.00	.02	.01	.02	.00	.00	.02	.04	.02	.02	.03
2	.28	.04	.45	.18	.26	.31	.32	.20	.18	.47	.29	.42
3	.56	.26	.71	.65	.60	.85	.72	.62	.62	.58	.95	.96
4	.54	.81	1.53	.90	1.21	1.24	.67	.69	.85	1.46	1.84	1.22
5	.56	1.61	.91	.85	.54	1.47	.82	.87	.57	1.11	1.14	.98
6	.75	1.97	1.39	.71	.74	.87	1.18	.50	.95	.48	1.50	1.45
7	.60	1.10	1.10	.70	.50	1.00	.60	.46	.53	.65	.88	.80
8+	.60	1.10	1.10	.70	.60	1.00	.60	.46	.53	.65	.88	.80
(3- 6)U	.60	1.16	1.08	.74	.65	1.11	.85	.67	.75	.91	1.35	1.15
(3- 6)W	.56	.71	.91	.75	.71	1.00	.72	.65	.70	1.01	1.25	1.02

	1984	1985
1	.01	.04
2	.32	.36
3	.58	1.10
4	1.28	1.54
5	1.11	1.21
6	1.73	1.21
7	.73	.80
8+	.78	.80
(3- 6)U	1.25	1.26
(3- 6)W	.98	1.20

Table 2.10 VIRTUAL POPULATION ANALYSIS

COD IN THE KATTEGAT (PART OF FISHING AREA IIIA)

STOCK SIZE IN NUMBERS UNIT: thousands

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	23040	15572	30575	26159	11279	29654	23501	10858	14497	17142	20527	21834
2	17063	18829	12745	24499	21247	9084	24277	19161	8698	11371	13738	16499
3	16457	10545	14853	6624	16807	13411	5444	14472	12842	5935	5798	8375
4	6397	7726	6683	5962	2826	7515	4675	2180	6580	5656	2731	1874
5	2069	3064	2801	1454	1988	689	1777	1951	900	2242	1078	555
6	893	970	501	924	600	702	150	641	672	416	604	282
7	228	344	110	102	374	235	240	33	319	212	210	111
8+	92	260	50	41	105	175	172	140	93	178	67	49
TOTAL NO	66237	57308	68319	65766	55224	61464	60216	49436	44401	43152	44753	49579
SPS NO	26154	22907	24999	15108	22698	22726	12438	19417	21206	14639	10488	11047

	1984	1985	1986
1	12272	15860	0
2	17286	9935	12476
3	8849	10264	5561
4	2615	3004	2797
5	453	594	527
6	110	122	145
7	54	16	30
8+	38	36	19
TOTAL NO	41678	39827	
SPS NO	12119	14055	

Table 2.11 VIRTUAL POPULATION ANALYSIS

COD IN THE KATTEGAT (PART OF FISHING AREA IIIA)

STOCK BIOMASS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	10368	7007	13759	11772	5075	13344	10575	4886	6524	7714	9237	9825
2	11944	13180	8921	17149	14673	6359	16994	13413	6088	7960	9617	11549
3	17230	11070	15596	8955	17647	14081	5717	15195	13404	6232	8088	8794
4	9275	11202	9690	8645	4098	10897	6773	3161	9251	8201	3960	2718
5	4551	6741	6162	5199	4573	1515	5910	4293	1979	4932	2571	782
6	2767	3006	1553	2665	1861	2175	402	1988	2084	1290	1872	674
7	990	1498	481	445	1026	1025	1045	142	1588	924	915	482
8+	552	1560	302	247	617	1051	1051	837	558	1069	401	297
TOT.BIOM	57727	55265	56404	51277	50171	50446	46451	43916	41557	53321	34460	35520
SPS BIOM	35415	35077	33784	22356	30222	30743	18881	25017	28745	22047	15006	15946

	1984	1985
1	3522	7157
2	12100	6955
3	9291	10777
4	3792	4356
5	997	1506
6	339	576
7	256	69
8+	229	214
TOT.BIOM	32508	31138
SPS BIOM	14856	17099

Table 2.12 VIRTUAL POPULATION ANALYSIS

COD IN THE KATTEGAT (PART OF FISHING AREA IIIA)

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
1	.450	.450	.450	.450	.450	.450	.450	.450	.450	.450	.450	.450
2	.700	.700	.700	.700	.700	.700	.700	.700	.700	.700	.700	.700
3	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050
4	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450
5	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200	2.200
6	3.100	3.100	3.100	3.100	3.100	3.100	3.100	3.100	3.100	3.100	3.100	3.100
7	4.350	4.350	4.350	4.350	4.350	4.350	4.350	4.350	4.350	4.350	4.350	4.350
8+	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000

	1984	1985
1	.450	.450
2	.700	.700
3	1.050	1.050
4	1.450	1.450
5	2.200	2.200
6	3.100	3.100
7	4.350	4.350
8+	6.000	6.000

Table 2.13

List of input variables for the ICES prediction program.

COD IN THE KATTEGAT (PART OF DIV. IIIA)
The reference F is the mean F for the age group range from 3 to 6

The number of recruits per year is as follows:

Year	Recruitment
1986	20000.0
1987	20000.0
1988	20000.0

Proportion of F (fishing mortality) effective before spawning: .0000
Proportion of M (natural mortality) effective before spawning: .0000

Data are printed in the following units:

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

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	23000.0	.05	.20	.00	652.000	450.000
2	16559.0	.56	.20	.00	815.000	700.000
3	3561.0	1.10	.20	1.00	1100.000	1050.000
4	2797.0	1.54	.20	1.00	1635.000	1450.000
5	527.0	1.41	.20	1.00	2550.000	2200.000
6	145.0	1.21	.20	1.00	3415.000	3100.000
7	30.0	.30	.20	1.00	5130.000	4550.000
8+	19.0	.00	.20	1.00	5507.000	6000.000

Table 2.14

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

COD IN THE KATTEGAT (PART OF DIV. IIIA)

Year 1986					Year 1987					Year 1988	
factor	ref. F	stock biomass	sp.stock biomass	catch	factor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	1.26	32	12	13	.0	.00	34	14	0	51	30
					.1	.13			2	48	27
					.2	.25			4	46	25
					.4	.51			7	43	22
					.6	.76			9	40	19
					.8	1.01			12	37	16
					1.0	1.26			15	35	14
					1.2	1.52			15	33	13
					1.4	1.77			16	32	11
					1.6	2.02			18	31	10
					1.8	2.28			19	29	9
					2.0	2.53			20	29	8

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for 1 January.
The reference F is the mean F for the age group range from 3 to 6

Table 2.15 VIRTUAL POPULATION ANALYSIS

COD IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985
1	4593	481	1156	413	1138	1886	560	1436
2	11855	4812	7027	11712	4689	6410	1470	6034
3	3059	3289	5138	6585	7013	3586	3284	3157
4	861	554	1865	1241	2118	1715	775	985
5	193	225	372	506	255	309	296	227
6	176	38	100	47	134	90	74	136
7	47	37	87	52	77	54	25	38
8+	55	31	12	6	28	15	18	8
TOTAL	20777	9447	15735	20562	15502	14101	12298	12021

Table 2.16 SUM OF PRODUCTS CHECK

COD IN THE SKAGERRAK (PART OF FISHING AREA IIIA)
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: Kilogram

	1978	1979	1980	1981	1982	1983	1984	1985
1	.599	.599	.746	.619	.656	.590	.647	.647
2	.960	.960	1.146	.972	1.204	1.007	1.150	1.150
3	1.894	1.894	1.570	1.902	1.865	1.967	2.170	2.170
4	3.498	3.498	3.547	3.711	2.709	3.350	3.616	3.616
5	5.510	5.510	4.865	5.261	6.107	5.751	5.505	5.505
6	7.095	7.095	6.952	7.491	8.018	8.074	7.814	7.814
7	7.504	7.504	8.301	8.514	8.758	8.506	10.319	10.319
8+	9.838	9.838	11.085	10.094	12.658	11.965	12.856	12.856

Table 2.17 VIRTUAL POPULATION ANALYSIS

COD IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

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

	1978	1979	1980	1981	1982	1983	1984	1985
1	.24	.02	.04	.05	.07	.11	.05	.06
2	.91	.44	.46	.67	.56	.72	.86	.72
3	1.07	.71	1.21	1.09	1.19	1.20	1.06	1.20
4	.81	.53	1.25	1.19	1.47	1.14	.95	1.16
5	.47	.55	.88	.68	.36	.93	.61	.85
6	.74	.16	.51	.25	1.22	.88	.60	.63
7	.75	.33	.65	.54	.83	.79	.58	.72
8+	.75	.33	.65	.54	.83	.79	.58	.72
(3- 6)U	.77	.49	.96	.80	1.19	1.04	.80	.96
(3- 6)W	.95	.65	1.18	1.07	1.24	1.16	.99	1.15

Table 2.18 VIRTUAL POPULATION ANALYSIS

COD IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

STOCK SIZE IN NUMBERS UNIT: thousands

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986
1	25299	25970	35149	14995	17935	19296	16054	27179	0
2	21484	14945	20828	26114	11904	13657	14098	12819	20857
3	5059	7059	7919	10753	10918	5550	5459	4889	5108
4	1606	1426	2845	1952	2960	2724	1567	1554	1406
5	556	585	689	678	432	555	711	431	599
6	369	290	276	255	282	168	179	318	151
7	97	144	205	136	149	68	57	81	159
8+	114	121	68	16	54	146	45	17	59
TOTAL NO	52592	50537	68938	54650	44683	42163	37970	7287	
SPS NO	7802	7624	11959	15749	14844	9210	7518	7289	

Table 2.19 VIRTUAL POPULATION ANALYSIS

COD IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

STOCK BIOMASS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985
1	13464	11667	14917	6748	8071	8683	7224	12231
2	15059	10460	14580	18280	8333	9560	9868	8973
3	7841	10942	12274	16668	16722	8602	8462	7577
4	4813	4278	8550	5796	8881	8175	4100	4661
5	2771	2856	3378	3523	2363	2719	3486	2114
6	2467	1943	1848	1562	1888	1123	1202	2129
7	545	1257	1768	1186	1293	590	497	702
8+	1250	1531	508	175	594	1601	492	137
TOT.BIOM	48215	44755	57603	55735	48345	41051	35331	38574
SPS BIOM	19992	22606	28106	28708	31941	22808	18258	17570

Table 2.20

List of input variables for the ICES prediction program.

COD IN SKAGERRAK (PART OF DIV. IIIA)
The reference F is the mean F for the age group range from 3 to 6

The number of recruits per year is as follows:

Year	Recruitment
1985	30000.0
1987	22440.0
1988	22440.0

Proportion of F (fishing mortality) effective before spawning: .0000
Proportion of M (natural mortality) effective before spawning: .0000

Data are printed in the following units:

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

Age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	3000.0	.058	.200	.000	.638	.450
2	9267.0	.553	.200	.000	1.059	.700
3	5106.0	1.097	.200	1.000	1.929	1.550
4	1208.0	1.035	.200	1.000	3.418	3.000
5	599.0	.771	.200	1.000	5.502	4.900
6	151.0	.652	.200	1.000	8.041	8.700
7	139.0	.644	.200	1.000	8.673	8.700
8+	59.0	.644	.200	1.000	11.411	11.000

Table 2.21

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

COD IN SKAGERRAK (PART OF DIV. IIIA)

Year 1986					Year 1987					Year 1988	
factor	ref. F	stock biomass	sp.stock biomass	catch	factor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.35	56	16	16	.0	.000	43	14	0	71	48
					.1	.021			3	67	44
					.2	.171			5	64	41
					.4	.34			10	58	35
					.6	.52			14	52	30
					.8	.69			18	48	26
					1.0	.86			21	44	22
					1.2	1.04			25	41	19
					1.4	1.21			26	38	16
					1.6	1.38			28	36	14
					1.8	1.55			29	33	12
					2.0	1.72			31	32	11

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for 1 January.
The reference F is the mean F for the age group range from 3 to 6

Table 2.22 Indices of 0-group cod on the Norwegian Skagerrak coast and 1-group cod and 1-group whiting in Division IIIa from International Young Fish Survey.

Year class	Cod		Whiting
	0-group	1-group (<25 cm)	1-group (<20 cm)
1971	-	11	-
1972	-	84	-
1973	-	22	-
1974	-	34	499
1975	6.1	12	236
1976	11.4	80	99
1977	3.4	88	392
1978	6.0	25	561
1979	21.4	181	722
1980	7.1	28	968
1981	5.0	66	690
1982	12.4	54	262
1983	1.9	33	500
1984	4.2	16	940
1985	20.3	155	1,379

Table 3.1 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	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]	8,705	279	330	1	9,314

[1] Preliminary.

[2] Includes Divisions IVa and IVb.

Table 3.2 SUM OF PRODUCTS CHECK

HADDOCK IN FISHING AREA IIIA
CATEGORY: TOTAL

CATCH IN NUMBERS UNIT: thousands

	1981	1982	1983	1984	1985
1	30	314	1113	18	0
2	9903	2299	4624	6554	8554
3	4962	12055	2728	4481	3805
4	771	1113	4004	715	1218
5	151	209	525	524	190
6	84	22	65	91	220
7	36	11	11	0	33
8+	3	6	6	16	7
TOTAL	15940	16029	13074	12405	13917

Table 3.3 SUM OF PRODUCTS CHECK

HADDOCK IN FISHING AREA IIIA
CATEGORY: TOTAL

MEAN WEIGHT AT AGE IN THE CATCH UNIT: kilogram

	1981	1982	1983	1984	1985
1	.350	.350	.350	.350	.350
2	.530	.530	.530	.530	.530
3	.760	.760	.760	.760	.760
4	1.096	1.096	1.096	1.096	1.096
5	1.518	1.518	1.518	1.518	1.518
6	1.828	1.828	1.828	1.828	1.828
7	2.400	2.400	2.400	2.400	2.400
8+	2.700	2.700	2.700	2.700	2.700

Table 3.4 VIRTUAL POPULATION ANALYSIS

HADDOCK IN FISHING AREA IIIA (KATTEGAT AND SKAGERRAK)

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

	1981	1982	1983	1984	1985	1981-84
1	.00	.02	.07	.00	.01	.02
2	.37	.41	.46	.67	.60	.48
3	1.12	1.08	1.26	1.15	1.20	1.15
4	1.14	.83	1.52	1.62	1.20	1.28
5	1.38	1.21	1.56	.86	1.20	1.26
6	1.67	.77	1.94	.95	1.20	1.33
7	1.20	1.20	1.20	1.20	1.20	1.20
8+	1.20	1.20	1.20	1.20	1.20	1.20
(2- 6)W	.53	.89	.87	.87	.77	
(2- 5)W	.53	.89	.87	.87	.77	

Table 3.5 VIRTUAL POPULATION ANALYSIS

HADDOCK IN FISHING AREA IIIA (KATTEGAT AND SKAGERRAK)

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES, EXCEPT THOSE REFERRING TO THE SPAWNING STOCK ARE GIVEN FOR 1 JANUARY: THE SPAWNING STOCK DATA REFLECT THE STOCK SITUATION AT SPAWNING TIME, WHEREBY THE FOLLOWING VALUES ARE USED: PROPORTION OF ANNUAL F BEFORE SPAWNING: .150
PROPORTION OF ANNUAL M BEFORE SPAWNING: .250

	1981	1982	1983	1984	1985	1986	1981-85
1	9252	17209	13749	25253	111	0	14116
2	35052	7548	13806	14346	20663	90	18283
3	7995	19307	4117	7153	5892	9285	8994
4	1229	2144	5516	958	1686	1453	2346
5	218	322	764	980	155	465	489
6	111	45	79	161	541	38	147
7	56	17	17	9	51	84	30
8+	5	9	9	25	11	15	12
TOTAL NO	55917	47101	43057	48899	29110		
SPS NO	23486	21520	14219	13594	15605		
TOT.BIOM	25646	23118	19054	19561	16045		
SPS BIOM	13271	14694	10097	9133	9712		

Table 4.1 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	34	632	-	13,337

[1] Preliminary.

Table 5.1 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	10,228	362	1,800	114	16	12,520

Table 5.2 Plaice landings from the Kattegat (tonnes).

Year	Denmark	Sweden	Germany	Total
1972	15,504	348	-	15,852
1973	10,021	231	-	10,252
1974	11,401	255	-	11,656
1975	10,158	369	-	10,527
1976	9,487	271	-	9,758
1977	11,611	300	-	11,911
1978	12,685	368	-	13,053
1979	9,721	281	-	10,002
1980	5,582	289	-	5,871
1981	3,803	232	-	4,035
1982	2,717	201	-	2,918
1983	3,280	291	-	3,571
1984	3,252	323	32	3,607
1985	2,972	331	-	3,303

Table 5.3 Plaice landings in Division IIIa, the Kattegat and the Skagerrak combined. Data submitted by Working Group members.

Year	Denmark	Sweden	Others	Total
1971	19,560	395	19	19,974
1972	20,599	418	80	21,097
1973	13,892	311	55	14,258
1974	14,830	325	58	15,213
1975	15,046	446	199	15,691
1976	18,738	352	756	19,846
1977	24,466	442	884	25,792
1978	26,068	462	480	27,01
1979	20,766	386	810	21,96.
1980	15,096	381	56	15,533
1981	11,918	355	316	12,589
1982	10,506	345	8	10,859
1983	10,108	461	741	11,310
1984	10,812	679	1,629	13,120
1985[1]	13,200	693	1,930	15,823

[1] Preliminary.

Table 5.4 Danish landings of plaice by quarters in the Kattegat and the Skagerrak (tonnes).

Quarter	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
					Kattegat 1975-85						
Jan-Mar	2,127	2,637	2,526	2,410	2,002	1,825	1,196	941	531	779	586
Apr-Jun	2,372	2,096	2,497	2,487	2,786	1,168	774	619	595	745	596
Jul-Sep	2,781	2,183	2,924	3,815	2,525	1,396	1,069	599	1,195	955	714
Oct-Dec	2,878	2,571	3,663	3,973	2,422	1,193	764	558	959	773	1,076
Total	10,158	9,487	11,610	12,685	9,721	5,582	3,803	2,717	3,280	3,252	2,972
					Skagerrak 1975-85						
Jan-Mar	668	1,732	2,119	1,289	967	1,042	751	849	895	964	919
Apr-Jun	949	2,234	3,617	3,522	5,097	3,325	3,036	3,084	2,729	2,675	2,948
Jul-Sep	1,514	2,944	4,614	4,302	2,963	3,381	2,239	2,583	1,941	2,461	3,519
Oct-Dec	1,757	2,341	2,505	4,270	2,018	1,766	2,089	1,273	1,263	1,460	2,842
Total	4,888	9,251	12,855	13,383	11,045	9,514	8,115	7,929	6,828	7,560	10,228

Table 5.5 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE KATTEGAT (PART OF FISHING AREA IIIA)

CATCH IN NUMBERS UNIT: thousands

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	1	1	1	1	1	1470	50	140	10	10	1	37
2	5790	1180	5660	680	1120	8590	5100	7890	8657	5330	147	859
3	20320	14070	11830	8190	21790	5830	21630	7330	11026	20150	9686	6464
4	10570	10510	9760	23570	17720	6260	3470	8140	2100	9230	27862	17531
5	2280	2840	5140	14170	7910	5130	2620	1040	3060	2630	8685	7984
6	790	760	710	1870	1110	1770	1020	730	431	900	1144	1715
7	500	300	650	350	200	510	740	420	280	230	227	576
8	260	300	370	190	120	180	330	350	207	270	49	105
9	180	270	370	330	80	20	120	150	87	210	48	73
10	70	240	240	260	80	10	80	110	74	130	33	49
11	1	50	80	80	50	30	50	50	10	100	17	38
12+	50	100	140	40	60	30	140	10	13	190	40	16
TOTAL	38812	30621	30951	49731	50221	27830	33350	26350	25955	37430	47939	35247

	1980	1981	1982	1983	1984	1985
1	1	2	20	54	7	6
2	301	191	548	1495	1334	1255
3	2855	1817	1526	5029	4408	4943
4	7179	4754	1986	2298	2880	3962
5	3355	3198	1935	888	619	421
6	2310	1056	1011	585	585	86
7	501	416	380	561	540	79
8	159	196	157	402	675	112
9	127	131	65	216	566	91
10	53	91	23	54	288	102
11	32	51	25	39	27	69
12+	17	39	9	71	70	64
TOTAL	18890	11942	7485	11692	11799	11190

Table 5.6 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE KATTEGAT (PART OF FISHING AREA IIIA)

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	.176	.176	.176	.176	.176	.176	.176	.176	.176	.176	.200	.120
2	.243	.243	.243	.243	.243	.243	.243	.243	.243	.243	.230	.220
3	.273	.273	.273	.273	.273	.273	.273	.273	.273	.273	.240	.258
4	.291	.291	.291	.291	.291	.291	.291	.291	.291	.291	.260	.275
5	.325	.325	.325	.325	.325	.325	.325	.325	.325	.325	.300	.303
6	.408	.408	.408	.408	.408	.408	.408	.408	.408	.408	.460	.344
7	.556	.556	.556	.556	.556	.556	.556	.556	.556	.556	.720	.450
8	.686	.686	.686	.686	.686	.686	.686	.686	.686	.686	.780	.650
9	.822	.822	.822	.822	.822	.822	.822	.822	.822	.822	.800	.920
10	.907	.907	.907	.907	.907	.907	.907	.907	.907	.907	.820	1.005
11	.952	.952	.952	.952	.952	.952	.952	.952	.952	.952	.830	1.030
12+	.992	.992	.992	.992	.992	.992	.992	.992	.992	.992	.850	1.061

	1980	1981	1982	1983	1984	1985
1	.120	.180	.260	.275	.255	.247
2	.263	.250	.270	.285	.287	.283
3	.277	.270	.320	.285	.300	.277
4	.300	.290	.350	.298	.318	.309
5	.310	.350	.360	.350	.358	.393
6	.356	.440	.440	.385	.324	.455
7	.500	.530	.580	.402	.316	.484
8	.600	.690	.710	.461	.340	.507
9	.690	.790	.910	.581	.327	.556
10	.810	.900	1.000	1.035	.412	.610
11	.890	.960	1.050	1.182	.876	.644
12+	.950	1.050	1.070	1.173	1.136	1.052

Table 5.7 Petersen young fish trawl indices for 1-group plaice in the Kattegat.

Year class	Beam trawl	Petersen young fish trawl	VPA 1-group
1960	-	5.80	-
1961	-	1.87	-
1962	-	7.92	-
1963	-	10.42	-
1964	-	16.22	-
1965	-	45.38	-
1966	-	-	-
1967	-	34.39	68,213
1968	-	26.38	49,206
1969	-	19.37	45,001
1970	-	22.56	18,392
1971	-	73.60	57,240
1972	-	59.10	26,604
1973	-	-	-
1974	-	-	-
1975	-	-	-
1976	-	-	-
1977	-	-	-
1978	-	-	-
1979	-	5.72	8,397
1980	3.6	-	-
1981	5.9	-	-
1982	23.8	-	-
1983	2.2	3.22	8,423[1]
1984	-	10.23	17,497[1]

[1] Predicted.

Table 5.8 Mean catch per fishing day in kg for gears in the Kattegat and the Skagerrak.

Year	Quarter	Gillnets below 30 BRT	Seiners	Trawl below 30 BRT	Trawl above 30 BRT
			Kattegat		
1983	1	27	40	26	32
	2	33	78	21	29
	3	24	176	14	31
	4	29	106	33	69
1984	1	60	63	33	42
	2	28	127	44	15
	3	16	176	19	35
	4	21	99	36	52
1985	1	2	64	29	59
	2	53	348	36	23
	3	183	415	75	36
	4	234	315	60	42
			Skagerrak		
1983	1	30	169	26	31
	2	128	255	67	22
	3	69	355	36	333
	4	80	332	62	110
1984	1	81	143	58	36
	2	108	264	54	66
	3	69	525	48	62
	4	54	254	59	39
1985	1	60	113	57	33
	2	337	262	87	45
	3	547	588	149	119
	4	151	526	173	141

Table 5.9 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE KATTEGAT (PART OF FISHING AREA IIIA)

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

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	.000	.000	.000	.000	.000	.060	.001	.002	.000	.000	.000	.005
2	.070	.020	.090	.018	.073	.191	.155	.181	.111	.072	.006	.057
3	.721	.350	.257	.266	.988	.572	.875	.573	.366	.357	.274	.334
4	1.025	.925	.588	1.026	1.279	.767	.708	.871	.282	.525	1.058	.968
5	.567	.758	.699	1.406	1.088	.710	.763	.419	.861	.612	1.249	.906
6	.353	.330	.377	1.091	.313	.670	.467	.436	.272	.589	.509	.787
7	.271	.196	.462	.288	.268	.207	.582	.317	.264	.204	.254	.461
8	.140	.232	.348	.211	.135	.365	.180	.533	.227	.389	.055	.160
9	.130	.190	.438	.527	.116	.027	.392	.104	.216	.336	.098	.097
10	.114	.230	.230	.556	.207	.017	.129	.664	.062	.505	.072	.124
11	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100
12+	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100	.100
(3- 9)U	.458	.426	.424	.688	.598	.474	.567	.465	.355	.430	.499	.530

	1980	1981	1982	1983	1984	1985	1979-83
1	.000	.000	.001	.002	.001	.000	.002
2	.043	.032	.049	.092	.070	.175	.055
3	.240	.343	.291	.704	.375	.350	.383
4	.664	.689	.679	1.034	1.036	.600	.807
5	.816	.623	.592	.655	.777	.350	.719
6	.640	.323	.361	.315	.586	.200	.485
7	.490	.197	.165	.510	.474	.200	.325
8	.197	.320	.095	.235	.658	.150	.201
9	.263	.221	.144	.165	.529	.150	.178
10	.086	.272	.049	.160	.307	.150	.138
11	.100	.100	.100	.100	.100	.100	.100
12+	.100	.100	.100	.100	.100	.100	.100
(3- 9)U	.473	.388	.332	.488	.634	.286	

Table 5.10 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE KATTEGAT (PART OF FISHING AREA IIIA)

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	68215	49206	45001	18592	57240	26604	55231	96006	55615	29333	18118	8597
2	59086	61721	44523	40717	16641	51792	22675	49928	86736	50313	26532	16593
3	41506	49862	54726	36808	36196	13995	38709	17574	37695	70259	42361	23868
4	17183	18169	31777	38293	25535	12200	7144	14606	8965	23656	44470	29141
5	5513	5581	6522	19503	12425	6430	5124	3184	5551	6120	12667	13974
6	2786	2830	2366	2933	4325	3788	2859	2161	1896	2116	3002	3286
7	2206	1772	1840	1468	891	2861	1753	1621	1264	1506	1063	1633
8	2085	1522	1319	1050	996	617	2105	886	1069	878	964	746
9	1545	1640	1092	842	769	788	588	1591	471	770	538	825
10	683	1227	1227	638	450	620	894	237	1297	343	498	442
11	11	552	883	883	331	331	552	552	110	1103	188	419
12+	552	1105	1545	441	662	331	1545	110	143	2096	441	177
TOTAL NO	201169	195184	192820	161969	156463	120354	138779	188456	200792	188294	150842	99502
SPS NO	73870	84257	103297	102659	82581	41958	60872	42522	58441	108648	106192	74512
TOT.BIOM	50673	51636	52225	45944	40424	32140	36133	43661	49562	51709	39514	27193
SPS BIOM	24516	27978	33584	32812	26506	14873	20902	14631	18717	34320	29788	22579

	1980	1981	1982	1983	1984	1985	1986
1	8958	13334	19790	23026	9073	18017	0
2	7503	6277	12064	17883	20784	8205	16297
3	14017	6557	5498	10395	14765	17538	6230
4	15457	7974	4210	3717	4652	9182	11183
5	10019	7207	4530	1932	1196	1494	4560
6	5139	4003	3496	2266	908	498	952
7	1354	2438	2625	2205	1498	457	369
8	952	759	1811	2014	1463	844	539
9	575	692	493	1490	1442	686	657
10	673	406	502	586	1143	769	534
11	353	565	276	435	298	761	599
12+	138	436	99	781	772	706	1201
TOTAL NO	65193	52631	55595	66533	57994	59154	
SPS NO	43692	35020	23541	25021	28137	32954	
TOT.BIOM	15944	16502	18876	21561	17730	18013	
SPS BIOM	10122	1	10475	10151	9083	11241	

Table 5.11

List of input variables for the ICES prediction program.

PLAICE IN THE KATTEGAT (Option 1)
The reference F is the mean F for the age group range from 3 to 9

The number of recruits per year is as follows:

Year	Recruitment
1986	15000.0
1987	15000.0
1988	15000.0

Proportion of F (fishing mortality) effective before spawning: .0000
Proportion of M (natural mortality) effective before spawning: .0000

Data are printed in the following units:

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

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	15000.0	.00	.10	.00	.252	.252
2	16297.0	.08	.10	.00	.285	.285
3	6230.0	.35	.10	1.00	.287	.287
4	11185.0	.60	.10	1.00	.308	.308
5	4560.0	.35	.10	1.00	.367	.367
6	952.0	.20	.10	1.00	.387	.387
7	369.0	.20	.10	1.00	.401	.401
8	339.0	.15	.10	1.00	.436	.436
9	657.0	.15	.10	1.00	.488	.488
10	534.0	.15	.10	1.00	.685	.685
11	599.0	.10	.10	1.00	.900	.900
12+	1201.0	.10	.10	1.00	1.122	1.122

Table 5.12

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

PLAICE IN THE KATTEGAT (Option 1)

Year 1986					Year 1987					Year 1988	
factor	ref. F	stock biomass	sp.stock biomass	catch	factor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.29	19	10	3	.0	.00	19	11	0	22	15
					.1	.03			0	22	14
					.2	.06			1	21	14
					.4	.11			1	21	13
					.6	.17			2	20	13
					.8	.23			2	20	12
					1.0	.29			3	19	11
					1.2	.34			3	19	11
					1.4	.40			4	18	10
					1.6	.46			4	18	10
					1.8	.51			5	17	10
					2.0	.57			5	17	9

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for 1 January.
The reference F is the mean F for the age group range from 5 to 9.

Table 5.13

List of input variables for the ICES prediction program.

PLAICE IN THE KATTEGAT (Option 2)
The reference F is the mean F for the age group range from 3 to 9

The number of recruits per year is as follows:

Year	Recruitment
1986	15000.0
1987	15000.0
1988	15000.0

Proportion of F (fishing mortality) effective before spawning: .0000
Proportion of M (natural mortality) effective before spawning: .0000

Data are printed in the following units:

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

age	stock size	fishing pattern	natural mortality	maturity ogive	weight in the catch	weight in the stock
1	15300.0	.00	.10	.00	.252	.252
2	16297.0	.03	.10	.00	.285	.285
3	14314.0	.35	.10	1.00	.287	.287
4	11185.0	.60	.10	1.00	.308	.308
5	4360.0	.35	.10	1.00	.367	.367
6	952.0	.20	.10	1.00	.387	.387
7	369.0	.20	.10	1.00	.401	.401
8	339.0	.15	.10	1.00	.436	.436
9	357.0	.15	.10	1.00	.486	.486
10	334.0	.15	.10	1.00	.685	.685
11	399.0	.10	.10	1.00	.900	.900
12+	1201.0	.10	.10	1.00	1.122	1.122

Table 5.14

Effects of different levels of fishing mortality on catch, stock biomass and spawning stock biomass.

PLAICE IN THE KATTEGAT (Option 2)

Year 1986					Year 1987					Year 1988	
fac-tor	ref. F	stock biomass	sp.stock biomass	catch	fac-tor	ref. F	stock biomass	sp.stock biomass	catch	stock biomass	sp.stock biomass
1.0	.27	21	12	4	.0	.00	23	13	0	24	16
					.1	.03			0	23	16
					.2	.06			1	23	15
					.4	.11			2	22	15
					.6	.17			2	21	14
					.8	.23			3	21	13
					1.0	.29			4	20	12
					1.2	.34			4	19	12
					1.4	.40			5	19	11
					1.6	.46			5	18	11
					1.8	.51			6	18	10
					2.0	.57			6	17	10

The data unit of the biomass and the catch is 1000 tonnes.
The spawning stock biomass is given for 1 January.
The reference F is the mean F for the age group range from 5 to 9.

Table 5.15 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

CATCH IN NUMBERS UNIT: thousands

	1978	1979	1980	1981	1982	1983	1984	1985
2	356	246	62	2212	4	87	1024	175
3	6443	3327	1937	8354	842	6192	10207	4758
4	12771	12331	9242	7800	7667	8053	11657	22505
5	10928	12828	7272	3269	9184	8959	4784	8198
6	7090	5935	3748	1005	4814	2643	1997	2179
7	410	1939	1902	346	1561	493	441	790
8	16	65	794	80	658	189	90	191
9	17	2	77	28	253	66	31	146
10	16	1	1	6	95	33	15	88
11+	5	1	1	0	16	2	12	31
TOTAL	44052	36675	25036	25698	25074	26717	30258	39061

Table 5.16 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

MEAN WEIGHT AT AGE OF THE STOCK UNIT: kilogram

	1978	1979	1980	1981	1982	1983	1984	1985
2	.238	.228	.255	.220	.253	.278	.261	.217
3	.201	.249	.270	.258	.270	.263	.290	.290
4	.285	.256	.310	.300	.275	.291	.306	.306
5	.333	.294	.370	.360	.309	.357	.380	.340
6	.410	.388	.450	.430	.375	.435	.442	.428
7	.551	.451	.600	.540	.535	.592	.571	.550
8	.668	.664	.648	.660	.705	.705	.836	.761
9	.869	.983	.856	.850	.789	.900	1.084	.875
10	1.107	1.732	.856	.950	.891	.953	1.256	.932
11+	.995	1.285	.856	1.000	.840	1.420	1.522	1.257

Table 5.17 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

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

	1978	1979	1980	1981	1982	1983	1984	1985	1979-83
2	.012	.008	.002	.093	.000	.001	.027	.004	.021
3	.205	.136	.075	.289	.042	.185	.146	.150	.145
4	.485	.653	.592	.425	.415	.594	.547	.480	.536
5	.995	1.168	.915	.580	1.156	1.080	.760	.830	.940
6	.925	1.077	1.256	.260	1.375	1.179	.656	.850	1.030
7	.966	.618	1.157	.299	.712	.411	.540	.520	.640
8	.722	.337	.490	.108	1.219	.150	.109	.420	.461
9	.898	.159	.742	.025	.506	.321	.050	.230	.350
10	.100	.100	.100	.100	.100	.100	.100	.100	.100
11+	.100	.100	.100	.100	.100	.100	.100	.100	.100
(3- 9)U	.742	.593	.747	.255	.775	.560	.398	.497	

Table 5.18 VIRTUAL POPULATION ANALYSIS

PLAICE IN THE SKAGERRAK (PART OF FISHING AREA IIIA)

STOCK SIZE IN NUMBERS UNIT: thousands

BIOMASS TOTALS UNIT: tonnes

ALL VALUES ARE GIVEN FOR 1 JANUARY

	1978	1979	1980	1981	1982	1983	1984	1985	1986
2	30648	31315	38622	26253	42558	87400	40696	40956	0
3	36461	27393	28101	34888	21653	38504	79001	35850	36892
4	34779	26875	21626	23587	23644	18792	28962	61789	27920
5	28001	19376	12656	10823	13952	14129	9385	15172	34596
6	12253	9371	5450	4589	6695	3973	4340	3971	5986
7	690	4396	2888	1404	3200	1531	1106	2039	1536
8	33	238	2144	821	942	1420	918	583	1097
9	30	14	154	1188	667	252	1106	745	347
10	177	11	11	66	1048	364	165	971	536
11+	55	11	11	0	177	22	132	342	1075
TOTAL NO	143126	119001	111663	103619	114536	166389	165811	162418	
SPS NO	112478	87685	73041	77366	71978	78988	125115	121462	
TOT.BIOM	41735	32361	34470	30095	33921	49162	50886	48602	
SPS BIOM	34441	25221	24699	24320	23153	24865	40264	39714	

Figure 2.1 COD - Kattegat.

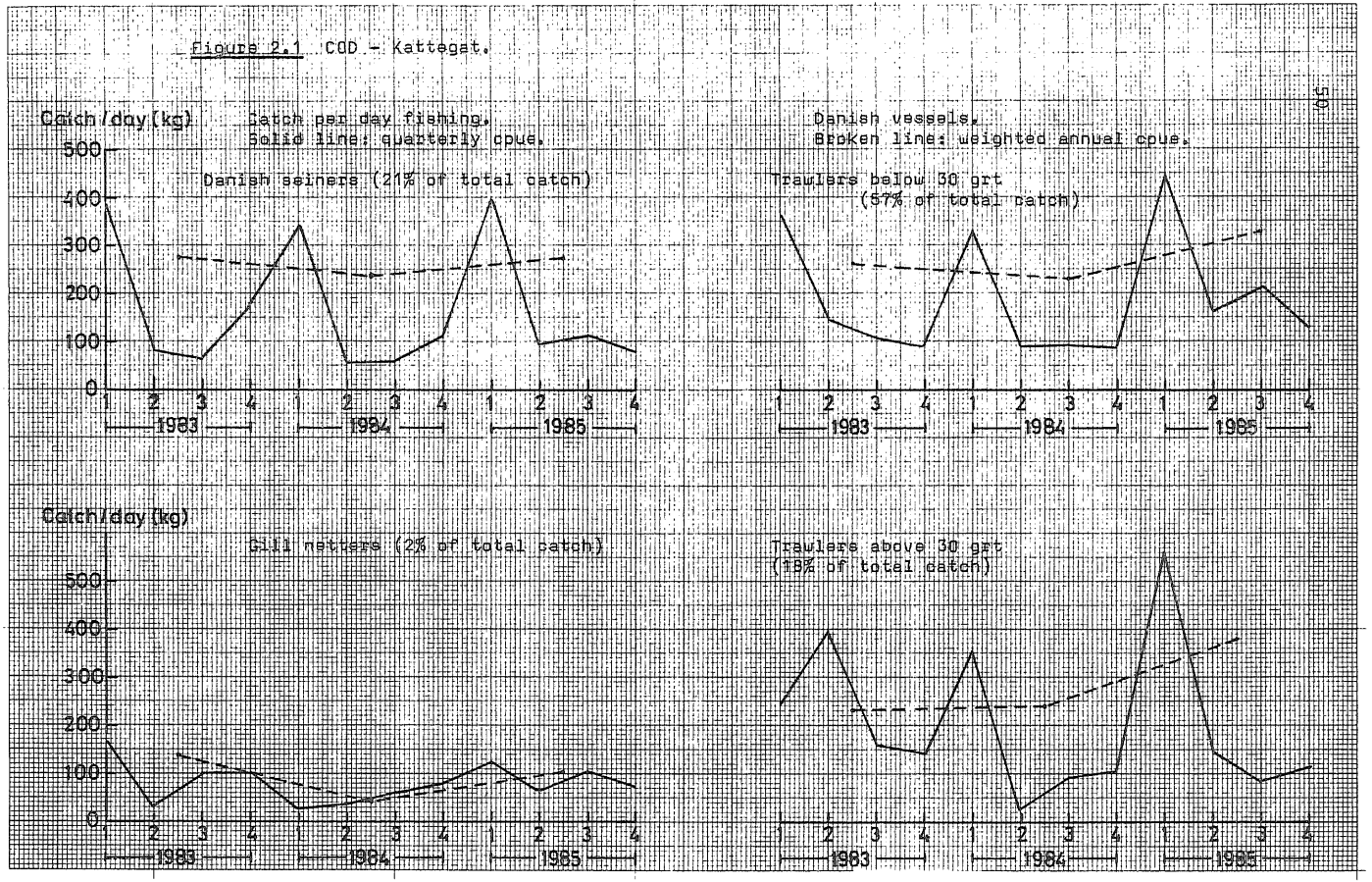


Figure 2.2 COD - Kattegat.
Catch per hour, Swedish vessels.

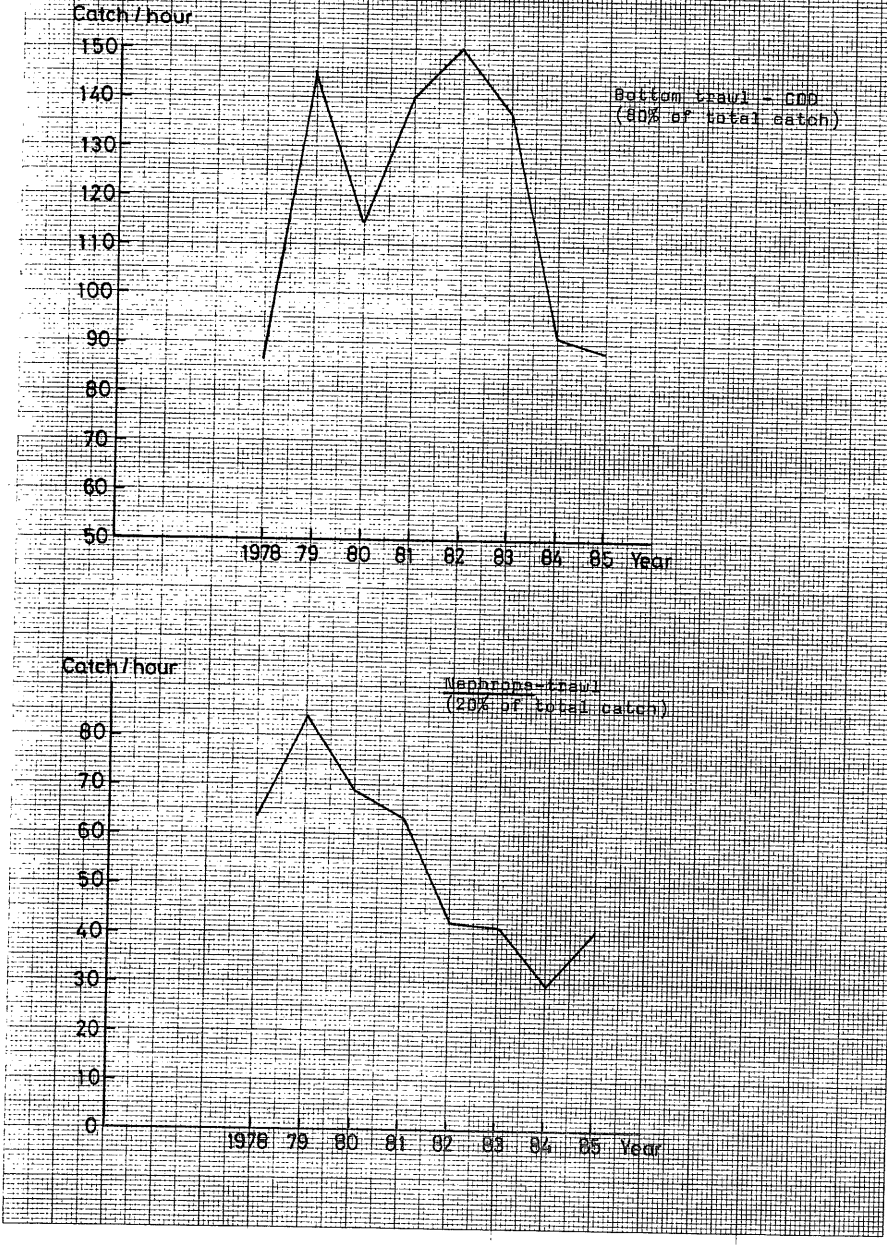
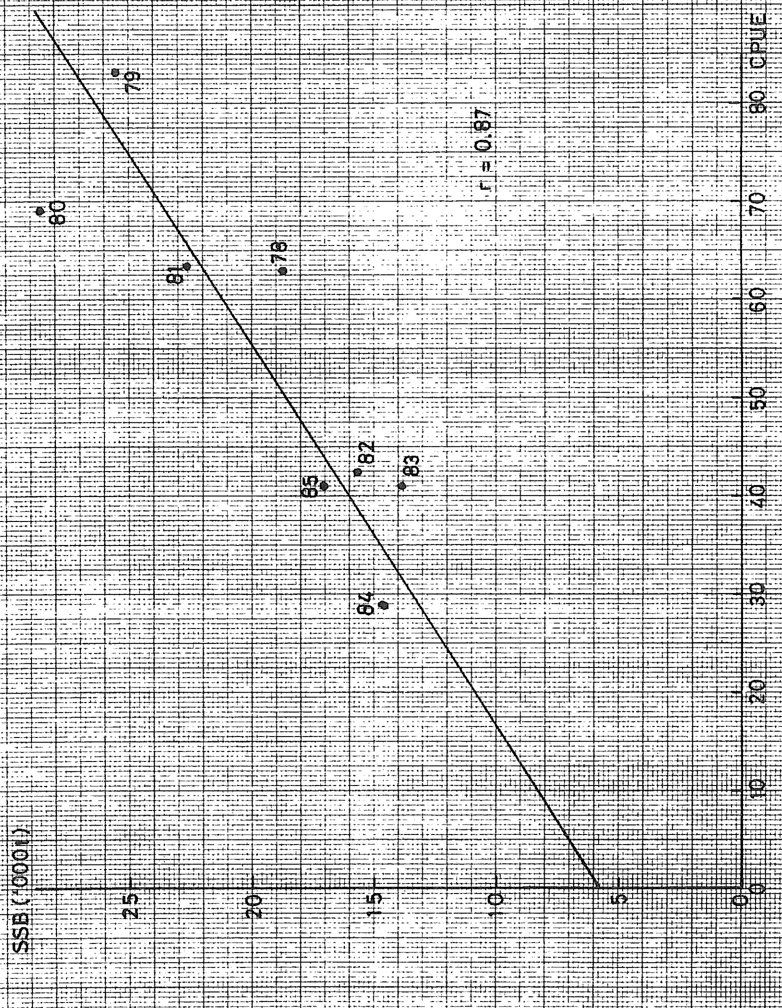


Figure 2.3 COD - Kattegat.
Cpue vs. spawning biomass.

Nephrops trawl (Sweden)



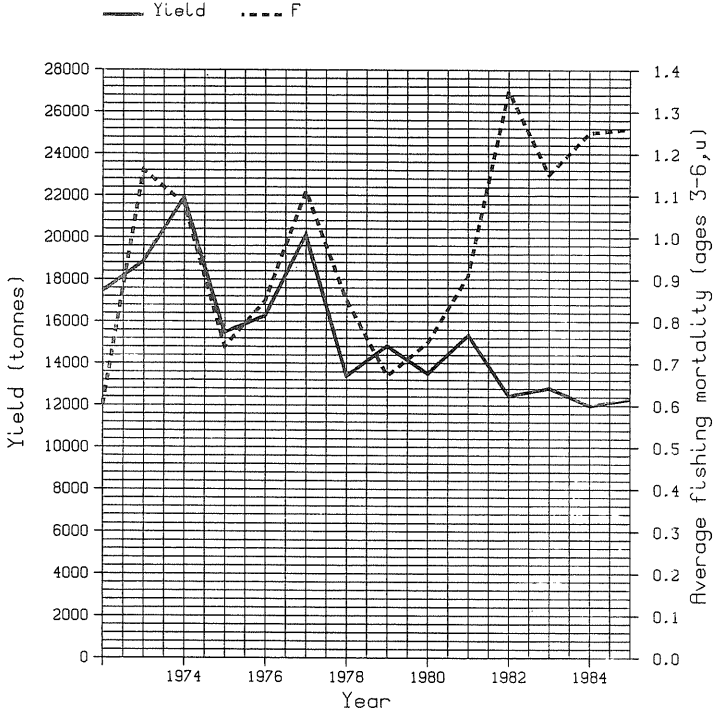
FISH STOCK SUMMARY

STOCK: Cod in the Kattegat

16-4-1986

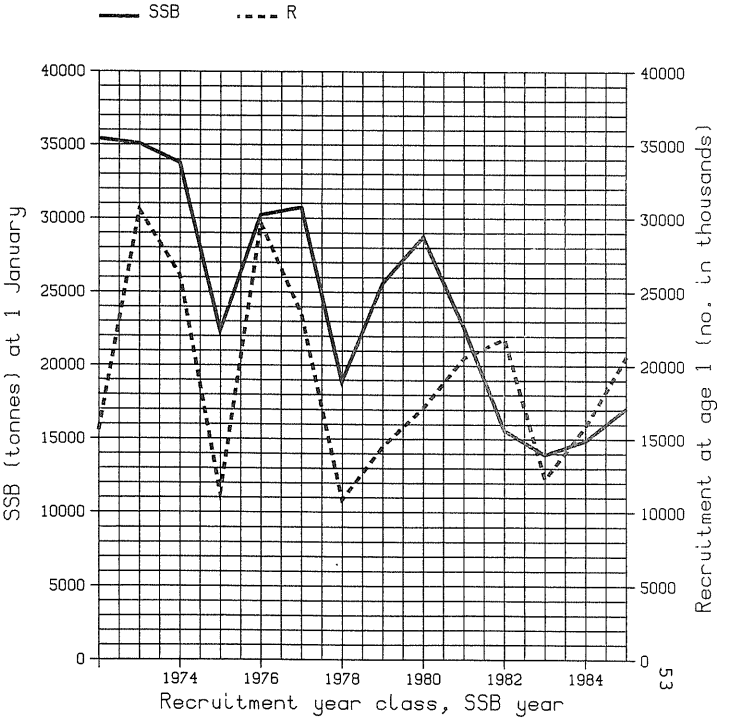
Figure 2.4

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

cont'd.

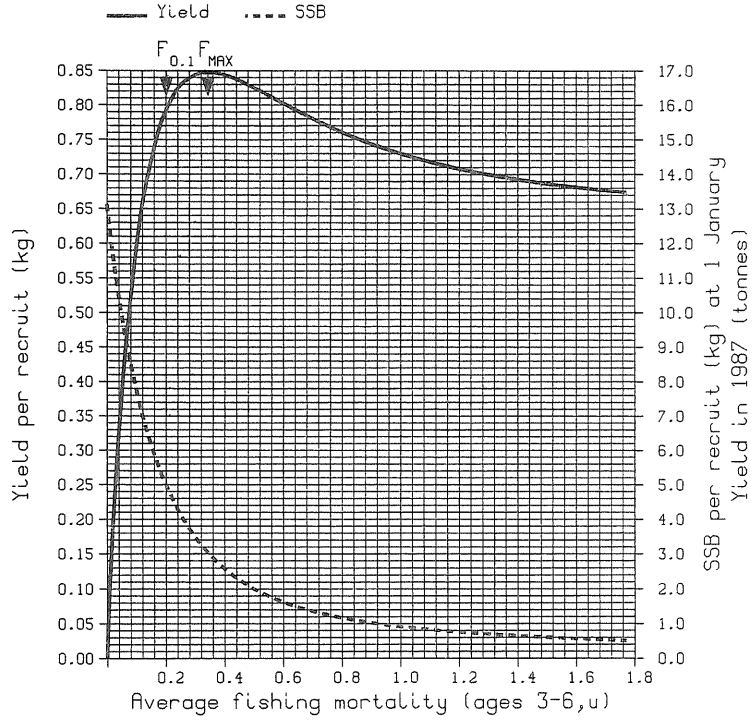
FISH STOCK SUMMARY

STOCK: Cod in the Kattegat

16-4-1986

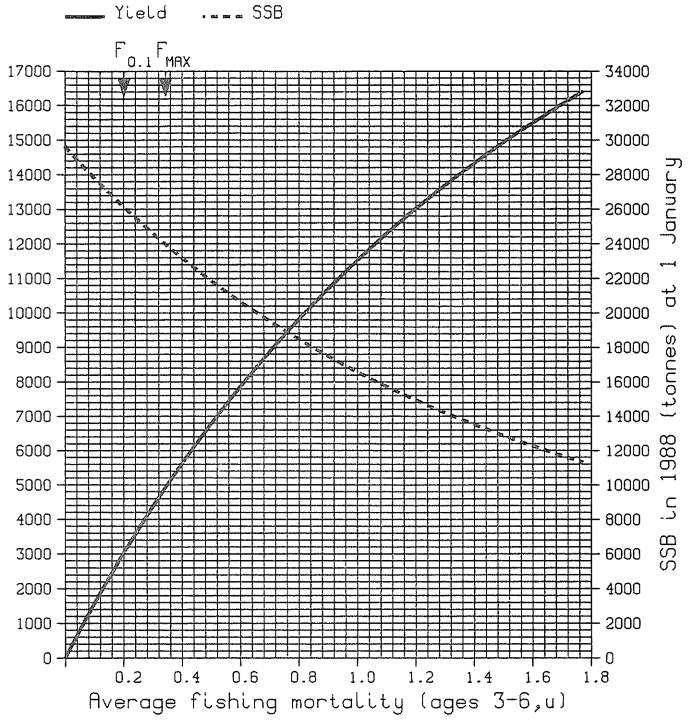
Figure 2.4 cont'd.

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

Figure 2.5 COD - Skagerrak.
Catch per day fishing. Danish vessels.

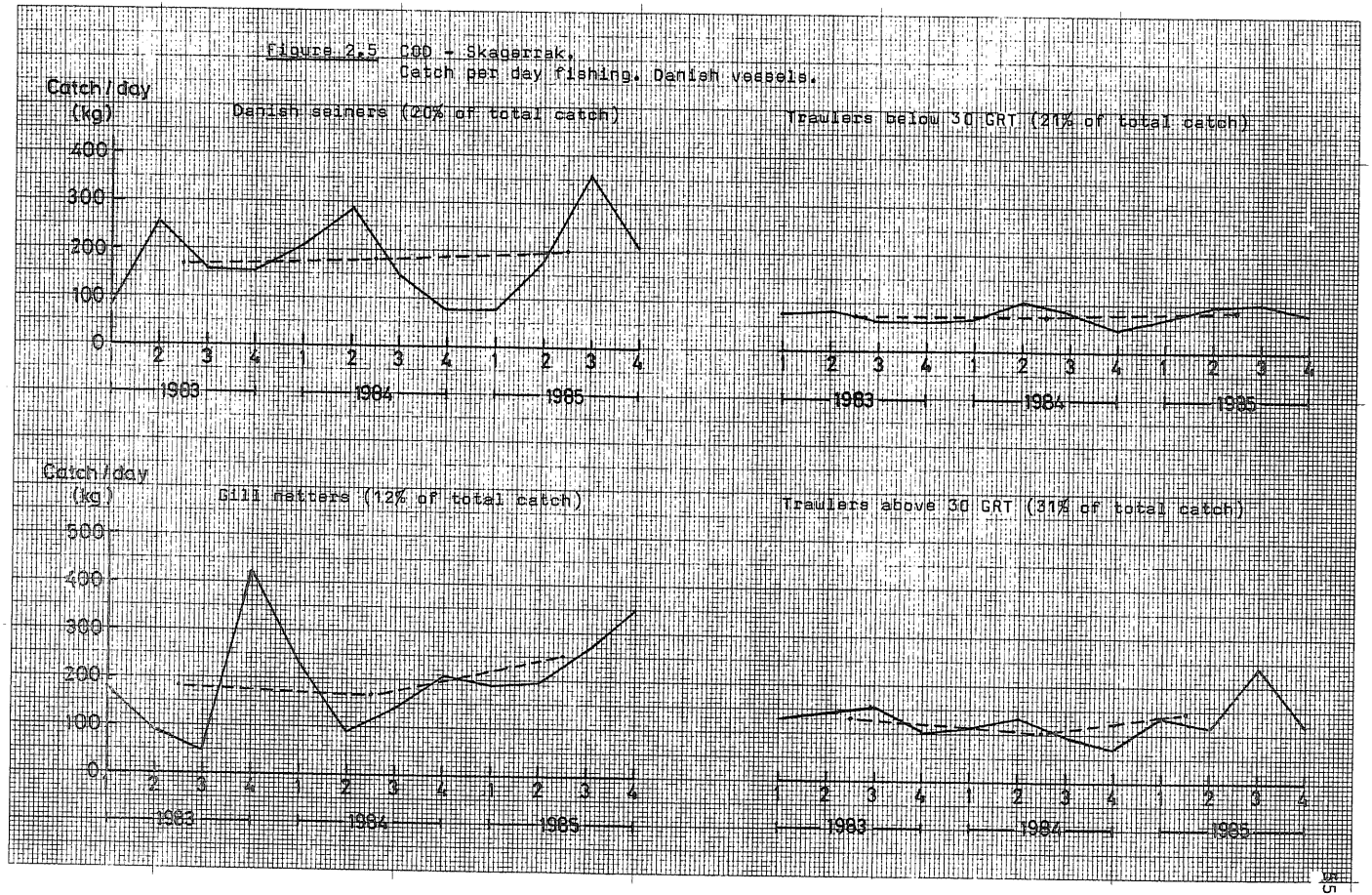
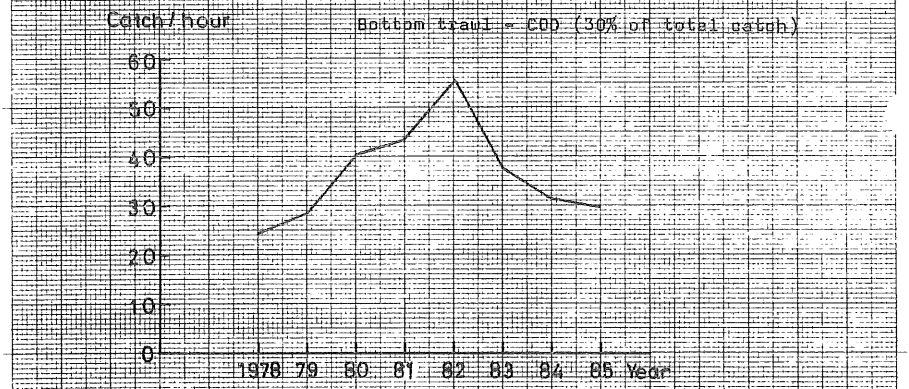


Figure 2.6 COD - Skagerrak.
Catch per hour. Swedish vessels.



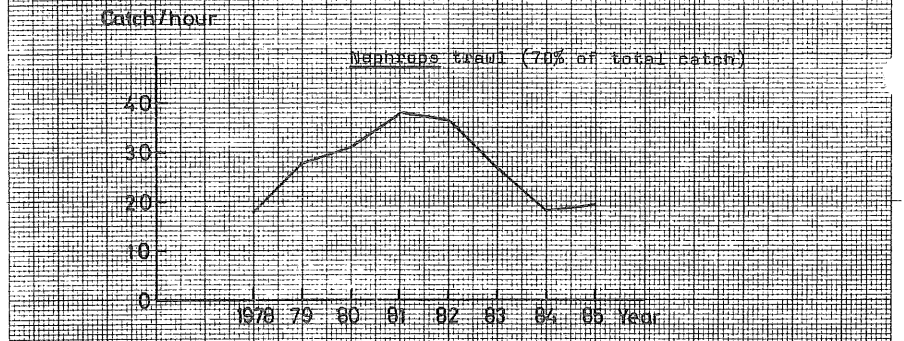
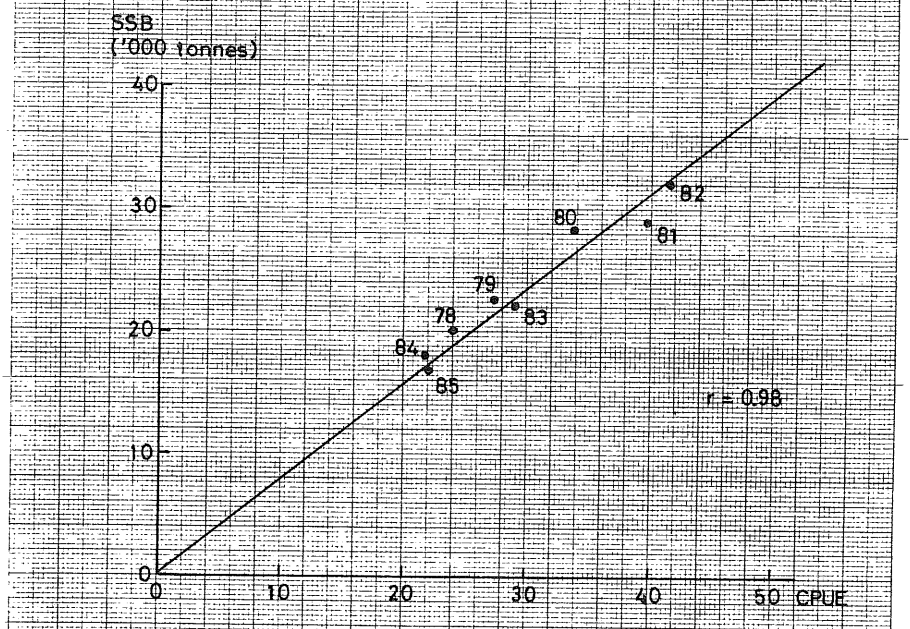


Figure 2.7 COD - Skagerrak. Combined Swedish cpue.

Cpue vs. spawning biomass



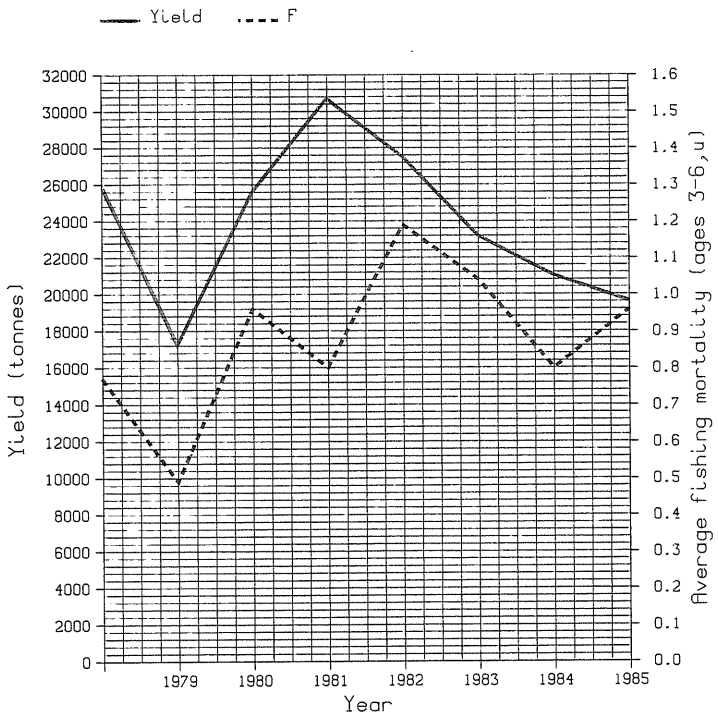
FISH STOCK SUMMARY

STOCK: Cod in the Skagerrak

16-4-1986

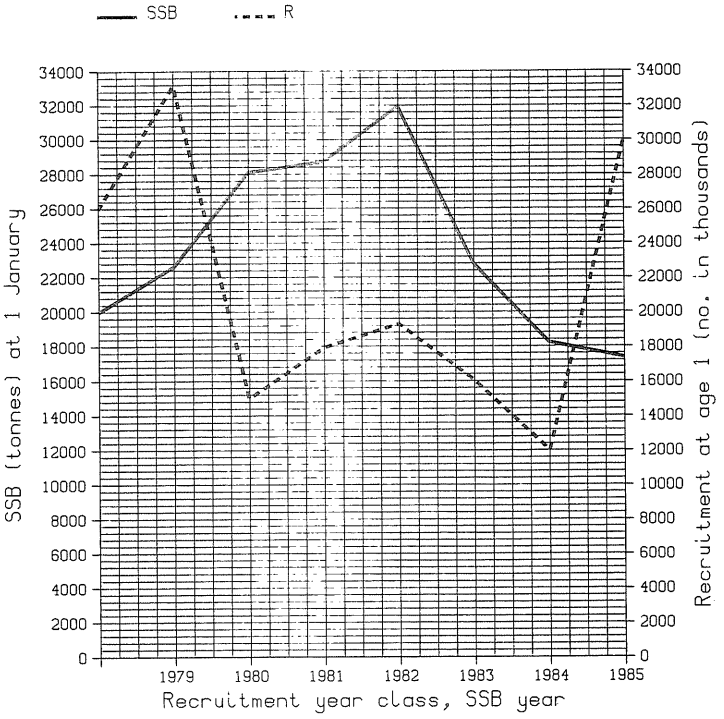
Figure 2.8

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

cont'd.

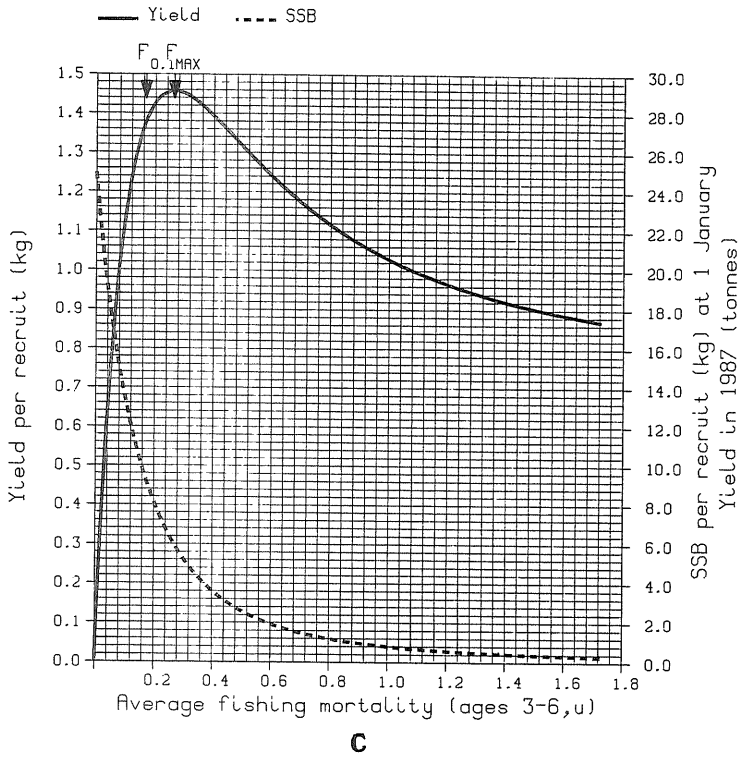
FISH STOCK SUMMARY

STOCK: Cod in the Skagerrak

16-4-1986

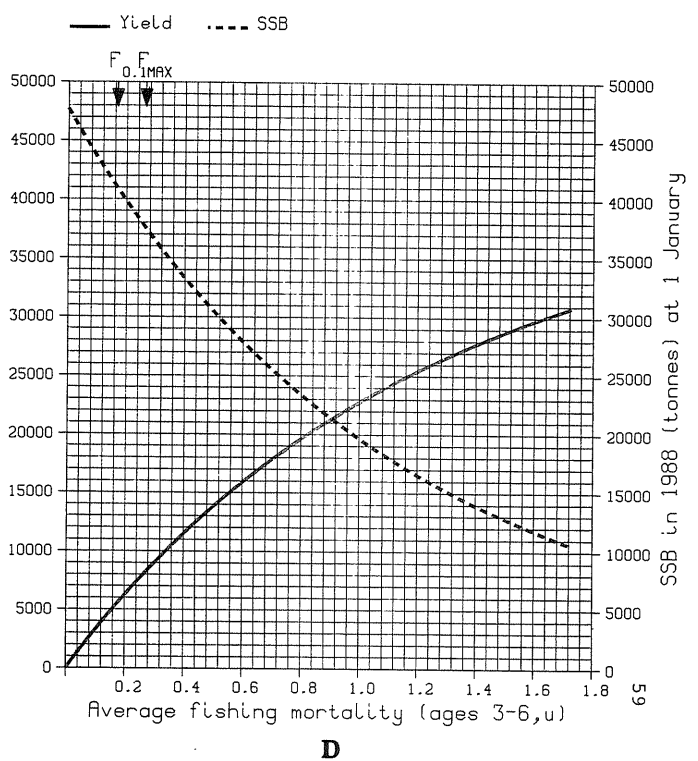
Figure 2.8 cont'd.

Long-term yield and spawning stock biomass



C

Short-term yield and spawning stock biomass



D

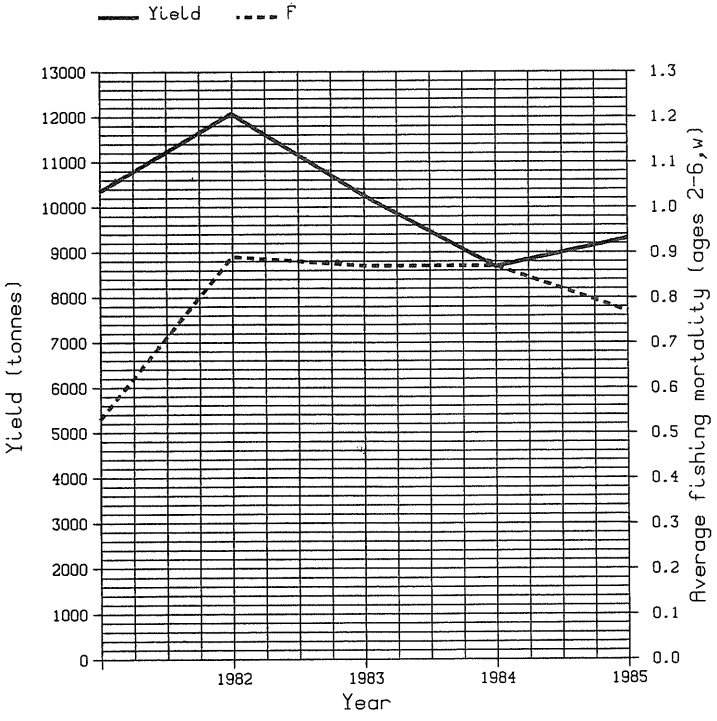
FISH STOCK SUMMARY

STOCK: Haddock in IIIa

16-4-1986

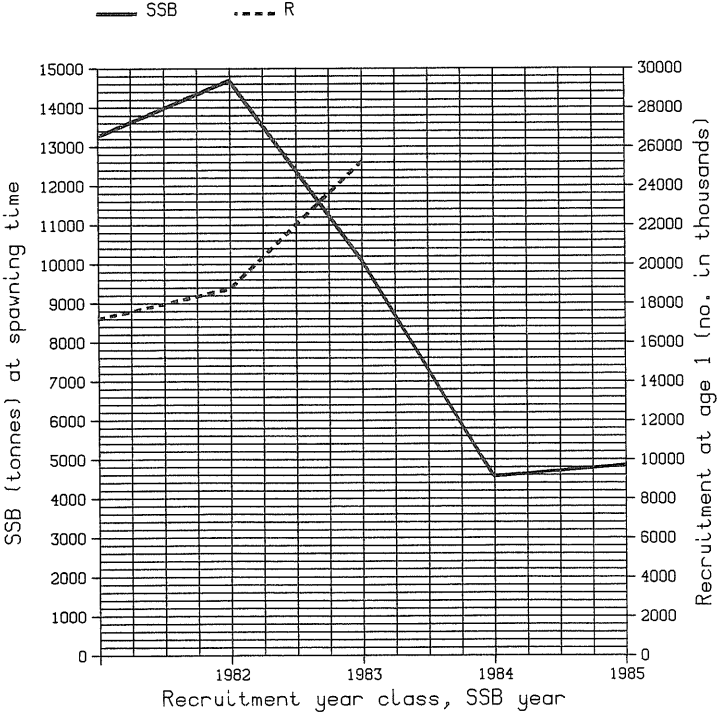
Figure 3.1

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

Figure 5.1 Mean weight (g) of PLAICE in the Kattegat by sex and year, 1980-85.

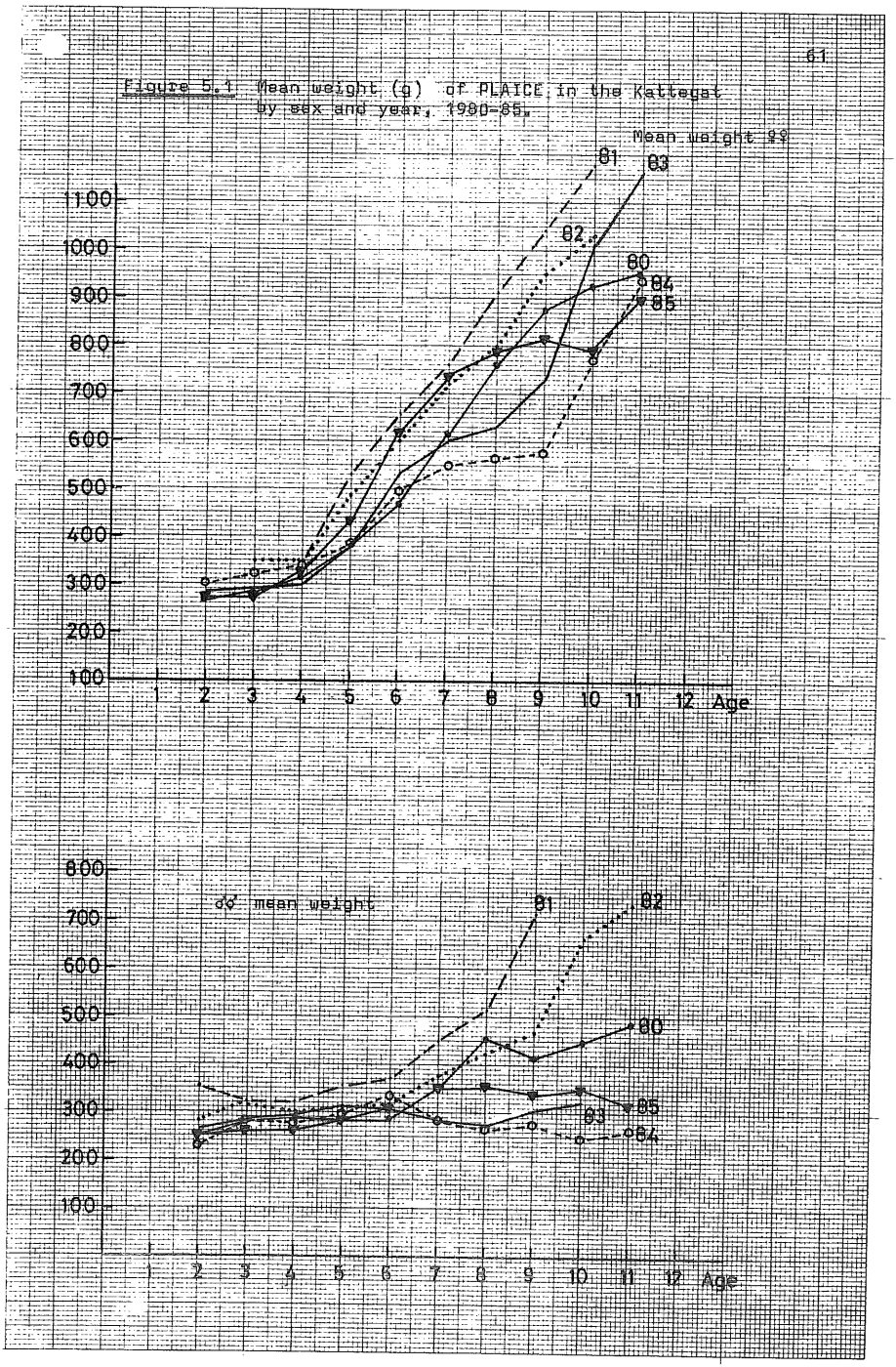


Figure 5.2. Kattegat PLAICE.
Plot of VPA 1-group versus young plaice survey index (year class indicated).

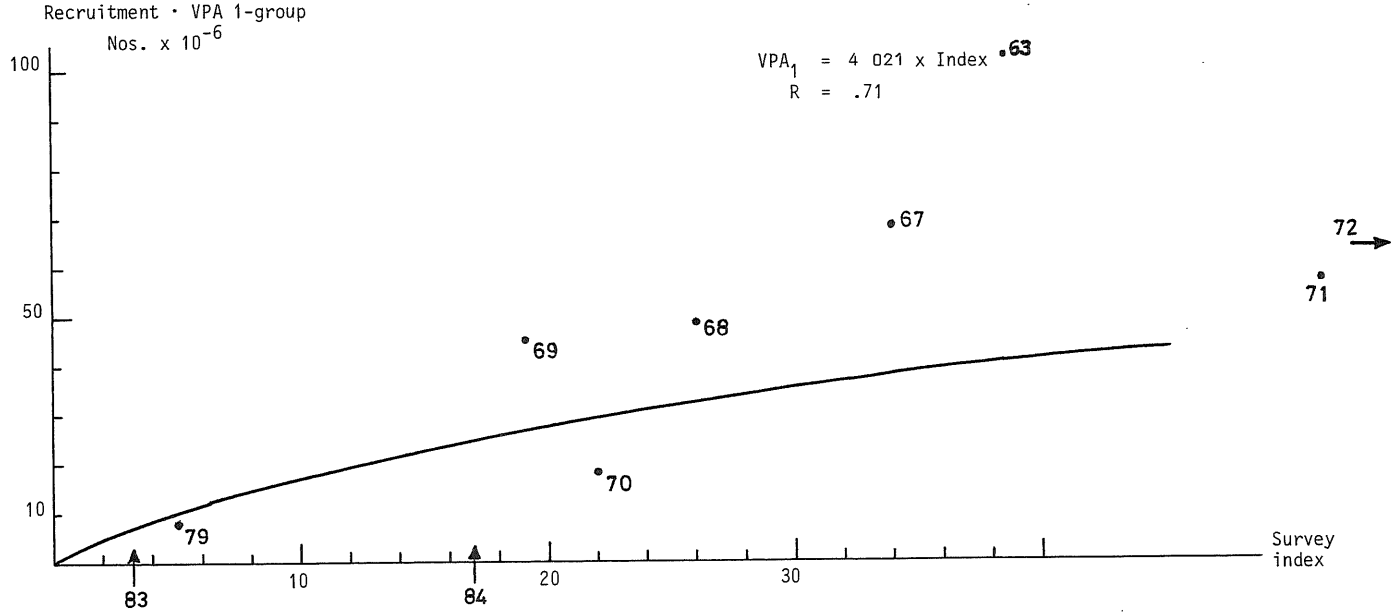
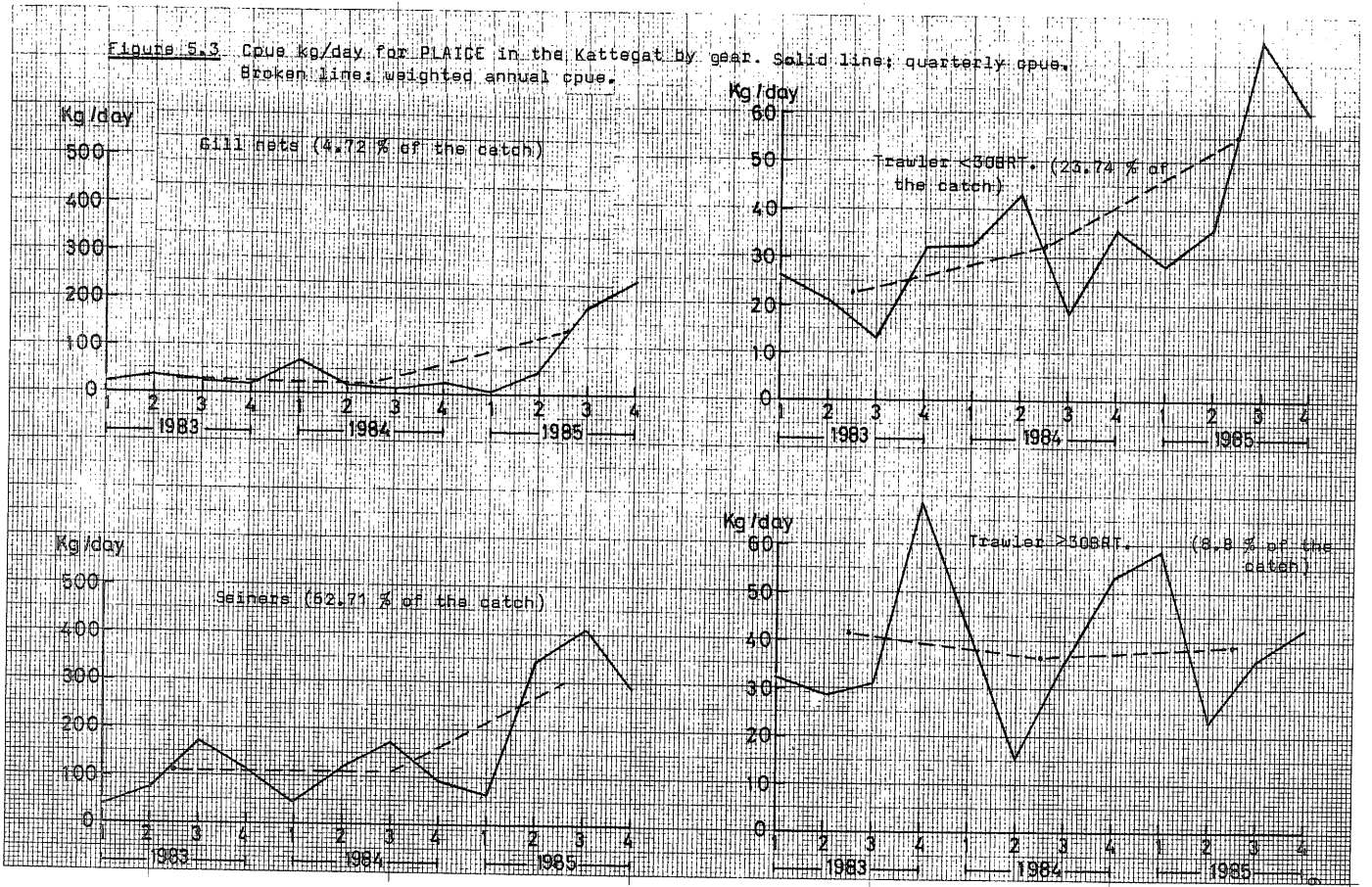


Figure 5.3 Cpue kg/day for PLAICE in the Kattegat by gear. Solid line: quarterly cpue. Broken line: weighted annual cpue.



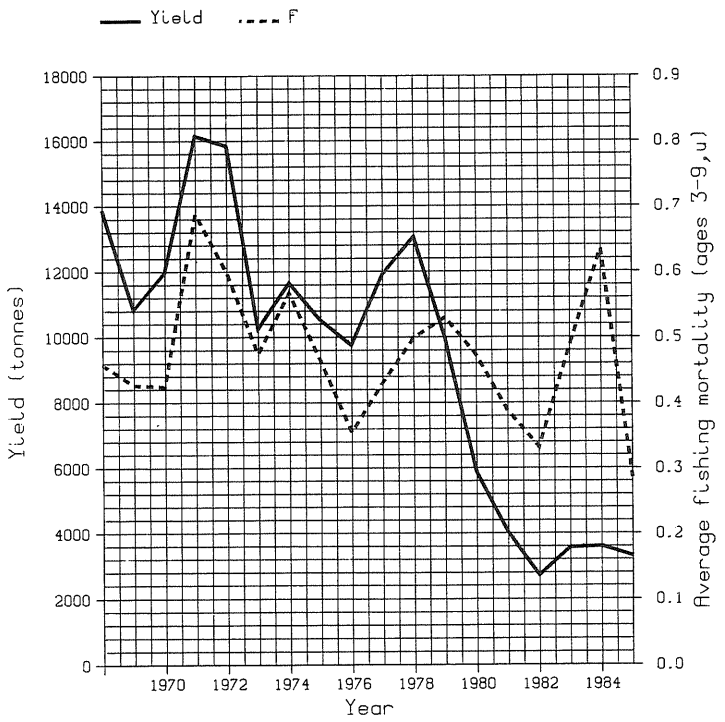
FISH STOCK SUMMARY

STOCK: Plaice in the Kattegat

16-4-1986

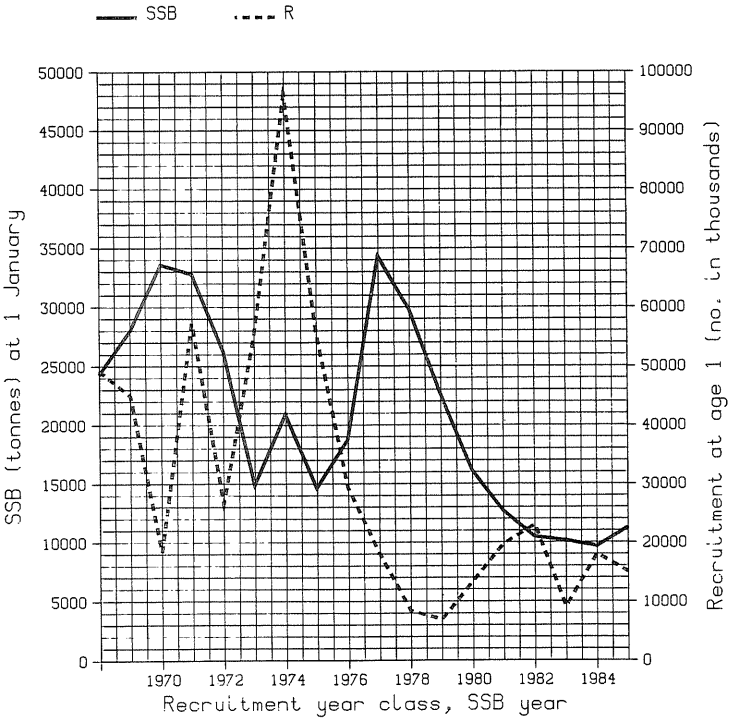
Figure 5.4

Trends in yield and fishing mortality (F)



A

Trends in spawning stock biomass (SSB) and recruitment (R)



B

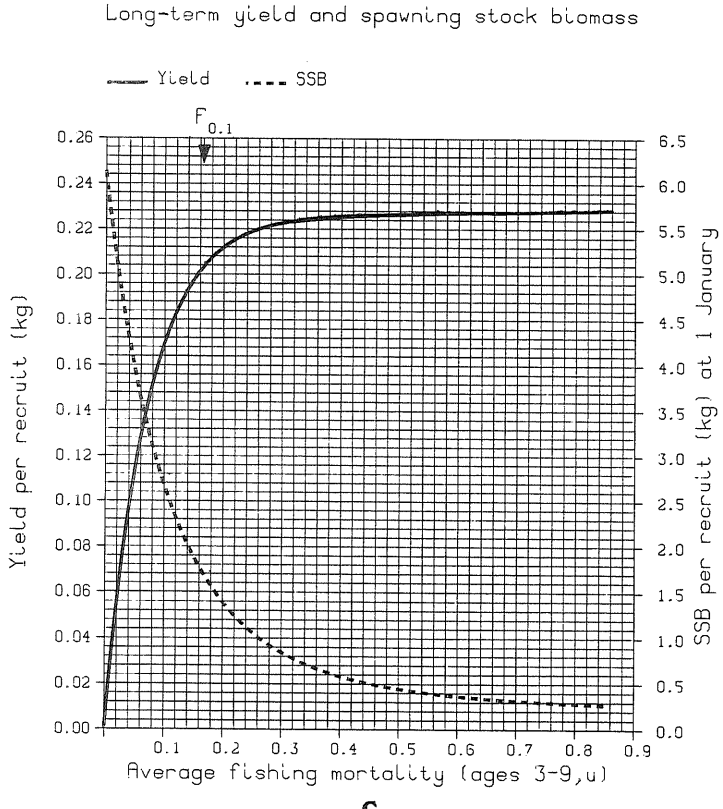
contd.

FISH STOCK SUMMARY

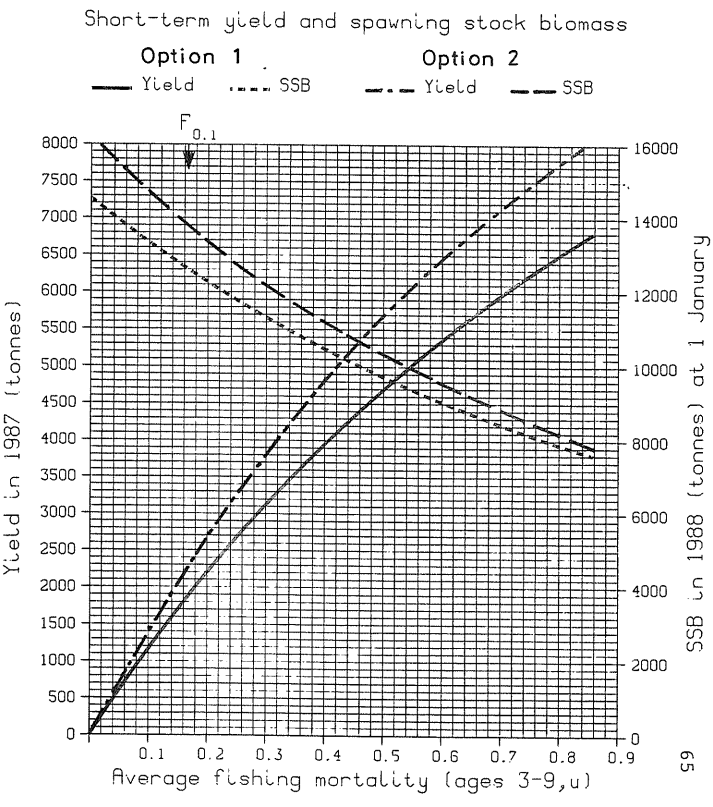
STOCK: Plaice in the Kattegat

16-4-1986

Figure 5.4 cont'd.



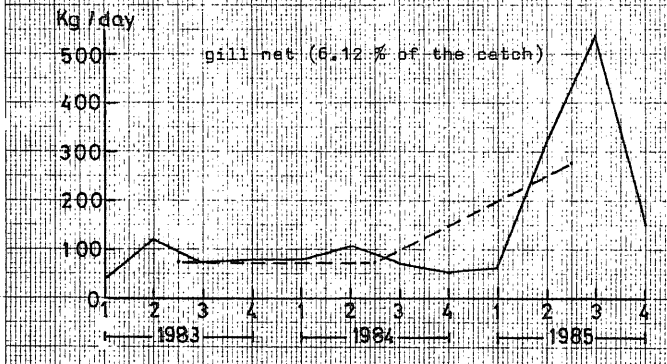
C

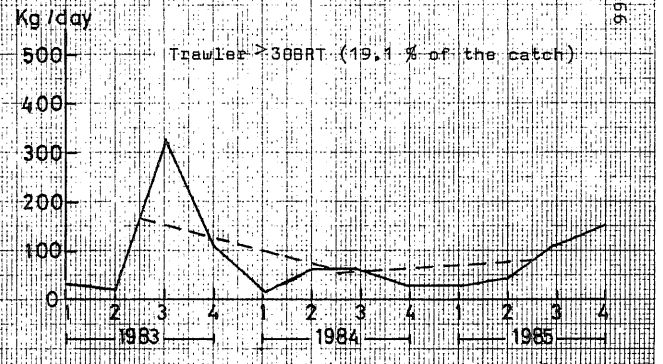


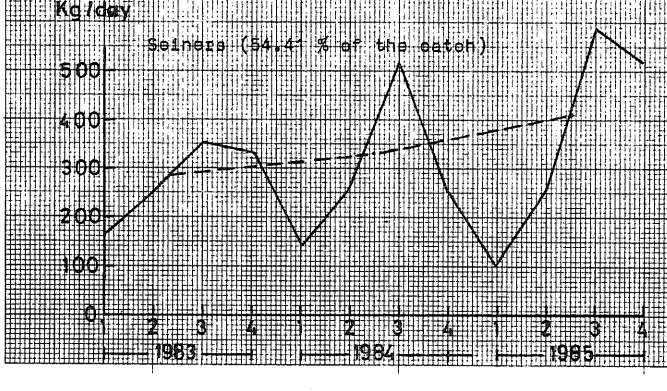
D

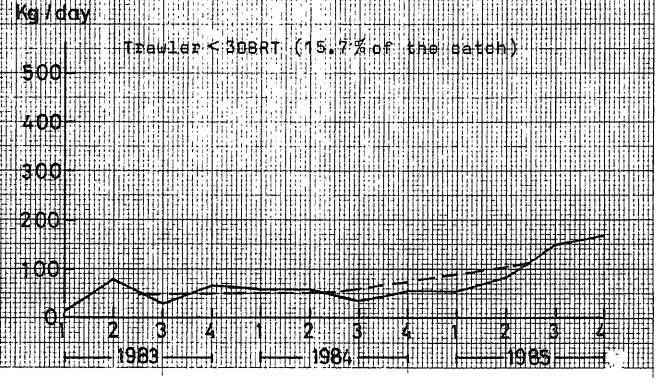
Figure 5.5 Cpue kg/day for PLAICE in the Skagerrak by gear.

Solid line: quarterly cpue.
Broken line: weighted annual cpue.









FISH STOCK SUMMARY

STOCK: Plaice in the Skagerrak

16-4-1986

Figure 5.6