

Fol. 41 Assess

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REPORT OF THE ARCTIC FISHERIES WORKING GROUP

Copenhagen, 24 August - 2 September 1993

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2 INTRODUCTION

2.1 Terms of Reference

At the 80th Statutory Meeting of ICES in 1992 it was decided (C.Res.1992/2:8:13) that:

"The Arctic Fisheries Working Group (Chairman: Mr K. Sunnanå, Norway) will meet at ICES Headquarters from 24 August - 2 September 1993 to assess the status of and provide catch options for 1994 for the stocks of cod, haddock, saithe, redfish and Greenland halibut in Sub-areas I and II, taking account of biological interactions between cod and capelin as far as possible".

2.2 Other Requests

The Atlanto-Scandian Herring and Capelin Working Group have, in a letter of 14 August from the Chairman, Mr S.H. Jakupsstovu, requested that alternative estimates of the stock size of immature cod using natural mortalities of 0.1 and 0.3 be presented by the Arctic Fisheries Working Group. This is to help the Atlanto-Scandian Herring and Capelin Working Group to calculate the amount of capelin consumed by cod.

He also requested that the weights at age for cod are updated as far back in years as possible and that the incorrect weight at age due to problems with age readings in some later years are corrected.

These requests are also stated in the report of the Atlanto-Scandian Herring and Capelin Working Group and further transmitted to the Arctic Fisheries Working Group in a letter from Dr F. Serchuk of 14 December 1992 and a telefax by the ICES Fishery Secretary of 13 August 1993.

3 NORTH-EAST ARCTIC COD (SUB-AREAS I AND II)

3.1 Status of the Fisheries

3.1.1 Landings prior to 1993 (Tables 3.1-3.3 and 8.1, Figure 3.1A)

The final reported landings in 1991 amounted to 269,158 t (Table 3.1), excluding 26,589 t of Norwegian coastal cod (Table 8.1). The provisional reported figures for 1992 are 378,057 t excluding 40,695 t of Norwegian coastal cod.

During 1992 it became apparent that there was a considerable amount of overfishing of North-East Arctic cod. Estimates of this for 1992 were available to the Working Group and were derived using a combination of catch rate data (log book inspections) and the total number of fishing days (Norwegian Coast Guard observations). Based on this information the Working Group estimate of overfishing for 1992 was 130,000 t leading to a revised total catch of 508,057 t. The Working Group concluded that it was likely, based on anecdotal information, that some level of overfishing also occurred during 1990 and 1991. While no data similar to 1992 were available to provide estimates, the Working Group decided that overfishing levels for 1990 and 1991 of 25,000 t and 50,000 t respectively would be appropriate. The revised catches for 1990-1992 are as follows:

Year	Report landings	Revised landings with overfishing
1990	187,000 t	212,000 t
1991	269,158 t	319,158 t
1992	378,057 t	508,057 t

The agreed TAC of North-East Arctic cod of 356,000 t for 1992 was exceeded by 152,000 t and the total, quota including 40,000 t of Norwegian coastal cod, was exceeded by about the same amount. This is about 143,000 t more than expected by the Working Group last year. Table 3.2 shows that an increase in landings took place in all three areas with the largest increases occurring in Division IIb and Sub-area I. The nominal catch by country is given in Table 3.3. As usual the reported catches of Russia and Norway comprise the largest portion of the total catch (90%) in 1992.

3.1.2 Expected landings in 1993

The final agreed TAC of North-East Arctic cod for 1993 is 500,000 t. According to the agreement between Norway and Russia, Norway is allowed to take an additional 40,000 t of Norwegian coastal cod. From earlier experience and provisional reports it is expected

that the total reported landings of cod will be about 540,000 t including about 40,000 t of Norwegian coastal cod. If the same level of overfishing that occurred in 1992 also occurs in 1993, the total catch of North-East Arctic Cod in 1993 could be as high as 630,000 t.

3.2 Status of Research

3.2.1 Fishing effort and catch per unit effort

Data on catch per unit effort which were included in last year's report were not updated for this assessment. It was concluded by the Working Group that management measures which limited the amount of fishing effort during the early 1990s, causing trends in catchability, would render these data ineffectual as indices of stock abundance.

3.2.2 Survey results (Appendix I - Tables A1-A13)

The tables of survey results were updated with data from the last year. Also, the Russian trawl and acoustic survey data for 1990 (Tables A8 and A9) were updated as a result of the re-reading of the otoliths from these surveys. The abundance estimates from the Norwegian Svalbard Bottom Trawl survey for 1990 and 1991 have been slightly revised (Table A4).

The Norwegian bottom trawl survey in January-March in the Barents Sea probably underestimated the numbers of 1- and 2-year old cod during 1991 and 1992. Maps of distribution indicate that cod of these ages were distributed during these years at the edge of the survey area (Nakken, 1993, Work.doc.). To accommodate this expanding distribution the survey area was extended in 1993. The results of this extended coverage (Table A3) indicate that more than 75 % of the age 1 and 2 cod were found outside the traditional survey area. Cod of ages 3 and 4 were also distributed in the extended survey area, but to a lesser extent than 1- and 2-year old cod.

In the Norwegian acoustic survey the target strength (TS) for cod, haddock and redfish is now assumed to be 20 log L-68.0 (previously 21.8 log L- 74.9 was used for cod and haddock) (Ona, 1992, Work.doc.; Foote, 1989). The abundance estimates for 1991-1993 based on this new TS value and rock-hopper gear are given in Table A1 This table also shows the abundance estimates based on the old TS value and bobbins gear for 1981-1993, with rock-hopper to bobbins conversion for 1989-1993. Before the next Working Group meeting, the time series should be recalculated back to 1981 using the new TS value and converting from bobbins to rock-hopper for the years before 1989. Such recalculations should also be made for the Norwegian bottom trawl survey data for 1981-1982, which have not yet been back-calculated from bobbins to rock-hopper gear.

Results of a Norwegian trawler survey are given by age in Table A5. The survey was conducted in 1992 as in previous years. The results generally indicate that total abundance has increased from 1989-1990 to 1991-1992 by about 50%.

The 0-group index (Table A13) in 1992 was 2.94, which is the highest value recorded since the 0-group survey started in 1965.

In general, population trends estimated from all survey time series indicate high abundance in the early- to mid-1980s followed by a rather rapid decline until 1989 or 1990. Increases have subsequently occurred with abundance estimates for the most recent years approaching those from the mid-1980s.

The length and weight-at-age data from the Russian trawl survey in November-December 1990 (Tables A10 and A11) have been revised following the re-reading of otoliths from this survey.

3.2.3 Age readings

As mentioned in last year's report, the Russian age readings from the second half of 1990 were in error because of a new and inexperienced age reader. As a result of joint meetings between Russian and Norwegian scientists held in Bergen these data have now been revised (Bogstad et. al., 1993 Work.doc). The revised age composition in the Russian landings for 1990 was used to revise the numbers at age in the 1990 landings. The ageing for the Russian surveys conducted during 1990 has also been revised and these data were included in the current assessment of this stock.

3.3 Data Used in the Assessment

3.3.1 Catch at age (Table 3.12)

For 1991, revised age compositions for Norwegian catch together with final total landings were used to revise the numbers at age in the 1991 landings. For 1992, age compositions for all areas were available from Norway and Russia. From the UK (England and Wales), the age compositions from Divisions IIa and b were available. Germany provided age compositions from Divisions IIa and b while Spain provided an age composition from Division IIb. Age compositions of the total landings were calculated separately in Sub-Area I, Division IIa and IIb by using the age compositions provided and raising the landings from other countries in Division I by Norwegian trawl, in Division IIa using UK (England and Wales) trawl and in Division IIb using Spanish trawl data.

To account for overfishing, the total age compositions for 1990, 1991 and 1992 were simply adjusted by the ratio of the total catch (including overfishing) to the total

reported catch. The appropriate data to determine the age composition of the catch in excess of that reported is currently not available, however, implications of using the most appropriate age compositions should be investigated. This could be very important if most of the overfishing occurs in areas that traditionally contained large numbers of small cod.

The age composition of the catch in 1992 is made up of several year classes (1983-1989) with those of 1987 (age 5) and 1988 (age 4) contributing about 40% of the catch in numbers. The 1983 year class, which made up 29% of the catch in numbers in 1991 only contributed 11% in 1992.

3.3.2 Weight at age (Tables 3.4 - 3.6)

The mean weight at age in the catch (Table 3.5) is calculated as a weighted average of the weight in the catch from Norway and Russia (Table 3.4). The time series weights are used for the older age groups for the year classes prior to 1978. The weight at age in the Russian catches in 1990 has been increased due to the re-reading of the Russian otoliths for the second half of 1990. For 1993, the weight at age has been calculated using the arithmetic average of the Norwegian and Russian weights in the first half of the year, multiplied by the factors 1.29, 1.20, 1.14, 1.16, 1.12, 1.08 for age groups 3-8 respectively. These factors are the averages of the ratio of final year-end weights and those predicted using data from the first half of the year averaged over the last three years.

In the time series used by the Working Group, the weights at age in the stock and in the catch are constant up to 1982. The maturity ogive is also assumed to be constant for the same period with knife-edge maturation at age 8. Sum of products checks for this period indicate large deviations from 100% (Table 3.12). This data deficiency also causes problems in a multispecies context, as pointed out by the Atlanto-Scandian Herring and Capelin Working Group (Anon, 1993).

Stock weights used from 1985 to 1993 for ages 3 to 8 are averages of values derived from Norwegian surveys in January-February for the years 1985-1993 (Table A7) and Russian surveys during 1984-1992 (Table A11) to give representative values at the beginning of the year for ages 3-8 (Table 3.6). For the older age groups the time series weights have been used, except for the year classes of 1982 and later, where survey weights have been derived in the same way for ages 9 and older as was the case for the younger ages.

3.3.3 Maturity at age (Table 3.7)

As in 1992, only Russia provided a maturity ogive. During the 1989 to 1992 period there was a trend toward earlier maturation. For 1993 this trend appears to have stopped with the 1993 ogive somewhat similar to those from 1990-1991.

3.3.4 Data for tuning (Table 3.8)

Tuning was conducted for years beginning in 1981 with only survey data used in the analyses. The following surveys were used (Table 3.8):

- 1) Norwegian Barents Sea Trawl Survey, January - March (Table 3.8e)
- 2) Norwegian Svalbard Area Trawl Survey, September - October (Table 3.8a)
- 3) Russian Trawl Survey, Autumn (Table 3.8b)
- 4) Norwegian Acoustic Survey, January - March (Table 3.8d)
- 5) Russian Acoustic Survey, Autumn (Table 3.8c)
- 6) Norwegian Trawler survey, October - November (Table 3.8f)

Surveys that were conducted during winter were shifted by one year and allocated to the end of the previous year. This was done so that data from the 1993 surveys conducted during the winter could be included in the assessment. For the Russian surveys and the Norwegian Svalbard survey ages 3-8 were included in the tuning. For the Norwegian Barents Sea Trawl Survey and the Norwegian Acoustic survey ages 4-9 were included shifted one year earlier and one age younger. For the Norwegian Trawler survey ages 3-10 were used. The Norwegian trawler index was not used in the ADAPT tuning.

As mentioned above (Section 3.2.1) CPUE from the commercial fishery was not included in the tuning because the introduction of management measures which limited the amount of fishing effort during the early 1990s causing trends in catchability, would render these data ineffectual as indices of stock abundance.

3.3.5 Recruitment indices (Table 3.9)

There were 16 indices of recruitment available for review: the Russian bottom trawl index by area, the Norwegian Barents Sea and Svalbard area trawl surveys as well as the Norwegian Barents Sea acoustic survey all for ages 1 to 3. In addition, there is also an index of recruitment from the International 0-group survey. In general these indices indicate that the size of the 1990s' year classes are above the average recruitment for the past 20 years.

3.4 Methods used in the assessment

3.4.1 VPA and tuning

Tuning of the VPA was carried out using both Extended Survivors Analysis (XSA) and ADAPT. Preliminary Laurec-Shepherd analyses were also examined. However, the Working Group considered the XSA and ADAPT techniques to be more appropriate. The Norwegian commercial trawler survey was included in the final XSA tuning to provide stability for fishing mortalities at older ages.

In 1992 the Working Group also used the XSA method together with Laurec-Shepherd and ADAPT. Some difficulties in setting the input F values not estimated by the tuning data were noted. This year a new method of shrinking the input F-values to the average of preceding ages for F_{old} and for preceding years for F_{new} were included in the VPA module of IFAP (the ICES Fisheries Assessment Package). The recommended default settings were shrinking to 5 ages and 5 years using a SE of 0.5 for the mean. Trial runs for cod revealed that shrinking to 5 years did not pick up the large drop in fishing mortality that had occurred during the last years of the 1980s. Trial runs only shrinking to the previous year and the 2 previous years gave better results, although shrinking to only one year gave rather fluctuating F_s on the older ages. Weakening the shrinkage and using the 2 previous years gave a smoother fishing pattern and it was also possible to make the input fishing pattern relatively flat for the recruited ages.

It was, however, not possible to give different strength to the shrinkage of the F_{old} values and the F_{new} values, or to leave the F_{new} values unshrunk while shrinking the F_{old} values.

Comparing the results from ADAPT with the trial runs of XSA shows that the VPA estimates are close to what the Working Group feels is the trend of the data included in the tuning. It also seems that strong trends in the final year of the surveys that are not reflected in the catches do not influence the result to the same extent as with the Laurec-Shepherd method. In Appendix II figures are given showing the survey indices raised by the q estimated in the tuning plotted together with the VPA populations for different ages. These plots show to what extent the trend in the surveys is reflected in the VPA.

The recruiting year class in the final year may be poorly estimated, but this may be overcome by allowing the regression technique of the RCT3 program to be included in the tuning. This is done by allowing q to be dependent on stock size for ages younger than a given age.

When q was allowed to be dependent on stock size, the XSA did not converge to the criteria set by the program.

Inspections of the output revealed that the F_s were stable to the 4th decimal in most cases and it was accepted that they were converged in these cases.

The final XSA analysis used F estimates shrunk towards the mean of the final 2 years and 5 oldest ages. As mentioned, this was done to accommodate the large drop in fishing mortality that occurred between 1989 and 1990 as the result of management measures that led to reduced fishing effort. The standard error of the mean to which the estimates were shrunk was set at 2.0. This level was chosen as it resulted in an approximately flat fishing pattern on older ages as well as some stability in fishing mortality at older ages.

A retrospective analysis of XSA using the above parameters gave consistent results through successive assessment periods. The results are given in Figure 3.2. Comparisons of retrospective analysis with the assessments conducted in 1991 and 1992 indicate similar results. The XSA analysis and that of ADAPT gave very similar results. The Working Group decided to use the XSA analysis (Table 3.11) for the final VPA with the ADAPT analysis included in Appendix III.

3.4.2 Recruitment (Table 3.10)

The 16 recruitment indices described above (Section 3.3.5) were included in the RCT3 analysis (Table 3.10). It was noted that the age 1 and 2 data from the 1991 and 1992 Norwegian trawl and acoustic surveys may have been underestimated because of an expanding cod distribution (Nakken, 1993, Work.doc.). The analysis was conducted with these data both included and excluded. The results of both these analyses were similar and it was decided to keep all of the data for the final recruitment analysis.

3.5 Results of the Assessment

3.5.1 Fishing Mortality and VPA (Tables 3.13-3.18)

The average age 5-10 fishing mortalities for the years 1981 to 1989 were in the range 0.72 to 1.02. The lowest of these F_s occurred during 1989 and the highest in 1987. In 1990 fishing mortality dropped to 0.23 as a result of management measures brought into effect to control the amount of fishing effort. Age 5-10 F has been increasing since 1990 as catches increased with the value for 1992 being 0.39. Full recruitment to the commercial fishery for this stock normally occurred at age 7 or 8. However, the current assessment indicates that full recruitment occurred at a much younger age (5). The fishing mortalities and stock numbers, are given in Tables 3.13-3.14. A summary of landings, fishing mortality and biomass since 1946 is given in Table 3.15.

In order to illustrate what impact the assumed overfishing in 1990 - 1992 may have had on the stock and the quota settings, an XSA tuning was also made excluding the unreported catches from the input. The summary of this VPA is given in Table 3.16. It is clear that the changes to the stock level are less than the increase in the catches, indicating that the survey data used in the tuning reflect the trend in the stock even if there are unreported catches. However, adding the estimate of overfishing to the catch-at-age data gives an increase in F from 0.27 to 0.39.

The VPA indicates that the 1988 year class (age 3 in 1991) is slightly stronger than the short-term mean of about 300 million fish while the 1989 year class (age 3 in 1992) is approximately the size of the long-term mean of 600 million fish.

Compared to last year's assessment, this year the stock size and the spawning stock is estimated to be slightly higher. The average F in 1990 is very similar in both assessments, whereas the average F in 1991 estimated this year is higher than in last year's assessment. The retrospective runs shown in Figure 3.2 do not include the new tuning data introduced in this year's final assessment.

As an overall impression the assessments are very similar and reflect the same stock situation. The Working Group feels that the changes in the management of NE Arctic Cod have been monitored with high accuracy in the last few years bearing in mind that the methods available to the Working Group have not been designed for this situation.

Comparing the predicted weights in the stock and catches for 1993 used in last year's assessment to the ones calculated in this year's assessment gives values that are approximately 30% higher for ages 4 - 8 in the stock this year and approximately 20% higher in the catch this year for the same ages.

3.5.2 Recruitment (Table 3.10)

The results from the RCT3 program showed lower recruitment than the XSA when q was independent of stock size for all ages. However, in the final XSA q was allowed to be dependent on stock size for the 3 year olds, and the Working Group concluded that the estimates from the final XSA analysis for the 1988 and 1989 year classes were appropriate.

The size of the 1990 to 1992 year classes from the RCT3 analysis are 702, 547 and 672 million respectively. The estimates used for all year classes from 1989 to 1992 are close to the long-term mean of 600 million fish for this stock.

The 1990-1992 year classes have all been strong at the 0-group stage, and they also seem to be strong at ages 1-3. As the 1984-1986 year classes, which were also strong at the 0-group stage, turned out to be poor when they recruited to the fishery, the correlation between the 0-group index and the VPA estimate at age 3 is now relatively poor. The strong 0-group indices in the last few years therefore, do not lead to very high estimates of the strength of their respective year classes.

One of the reasons why the 1984-1986 year classes "disappeared" may have been cannibalism by older cod. A review of this is given in Bogstad *et al.* (1993). The increase in cannibalism in the period 1985-1987 coincided with the collapse of the Barents Sea capelin stock, which led to large changes in the diet of cod and a substantial decrease in individual growth (Mehl, 1989; Mehl and Sunnanå, 1991; Bogstad and Mehl, 1992). Although the capelin stock is expected to decline in the near future, large amounts of young herring which are expected to be present in the Barents Sea in the coming years could provide enough food for the cod stock. The cod-capelin-herring system is still insufficiently understood, and a change in the geographical distribution of cod and herring will have to occur for cod to feed mainly on herring. If herring provide sufficient food for cod in the next few years it is unlikely that a decrease in individual cod growth like that observed in the 1986-1988 period will occur in the near future. According to Bogstad *et al.* (1993), the increase in cannibalism in 1985-1987 was due both to an increased quantity of young cod and to the lack of other food.

3.5.3 State of the stock

From an average level of about 1 million t in the 1980s, the total stock biomass has increased rapidly to 2.5 million t in 1993. Total biomass is currently similar to that of the mid-1970s, which is close to the long-term arithmetic average. However, the high stock size in the late 1940s are most probably overestimates due to incorrect weight at age data.

This stock has a high spawning stock biomass, only exceeded by the levels in the 1940s. The spawning stock increased from a very low level of 180 000 t in 1989 to 1 million t in 1992 and this level is maintained in 1993. The spawning stock estimate may, however, be considered more uncertain than the total stock estimate due to earlier maturation and uncertainties in the estimation of the maturity ogive. In 1994 the spawning stock will be reduced to about 900 000 t and the 1983 year class will represent 30% whereas the 1984 and 1985 year classes will represent 15% each of the spawning stock biomass.

Individual growth has decreased slightly. However, the size at age in the stock is still above the average level.

3.6 Prediction of Catch and Stock Biomass

3.6.1 Data used in the prediction (Table 3.17)

The stock number at age is taken from the final VPA (Table 3.14) and the recruitment of the 1990-1992 year classes from the RCT3 analysis (Table 3.10). The fishing pattern is the average pattern of fishing mortalities in the last 3 years from the XSA analysis rescaled to the 1992 level (Table 3.13). The maturity ogive is taken as the average of the 3 years 1991-1993 and is used for 1994 onwards. The recruitment of the 1993 and later year classes is set at the long-term average of 600 million individuals at age 3.

Two catch levels have been assumed for 1993 giving two sets of prediction tables. One is without any overfishing of the agreed TAC of 500 000 t and the other is with the addition of an assumed 130 000 t overfishing. These two levels of fishing in 1993 are obtained using average F_s of 0.30 and 0.39, the latter being the status quo level.

For the medium-term projection (1995-1998) three different scenarios were chosen to give an indication of the uncertainty of the predictions. Two biological reference points, F_{low} and F_{med} were given in each scenario. These scenarios consider changes in weight at age, i.e. different growth, as the only source of uncertainty. The scenarios are as follows: weight at age equal to the average for the years 1991-1993, i.e. high growth (Table 3.17a); weight at age equal to the average of the years 1983-1993, i.e. medium growth (Table 3.17b); and weight at age equal to the average of the years 1987-1990, i.e. low growth (Table 3.17c). The various weights are taken from Tables 3.5 and 3.6. For 1994 the average of the 1993 weights and the scenario weights are used (Table 3.17). From 1995 onwards the scenario weights are used. Slight adjustments were made to the weights to avoid inconsistencies in the growth pattern.

For the management option table the weights at age in the stock and in the catches are set at the same values as explained above and the management option tables are given for the three different levels of growth.

3.6.2 Biological reference points

The yield per recruit analysis using the same fishing pattern and stock parameters as in the management option table resulted in estimates of $F_{0.1} = 0.12$ and $F_{max} = 0.23$. This is a considerable change from last year and is caused by the shift to younger ages in the recent fishing pattern used in the analysis. Jakobsen (1992) gives the values of $F_{low} = 0.32$, $F_{med} = 0.46$ and $F_{high} = 0.78$. The present exploitation level is $F_{92} = 0.39$ and is to be used as status quo level.

3.6.3 Projections of catch and biomass (Tables 3.18-3.20, Figure 3.1D)

The management options are given in Table 3.20. In Figure 3.1D the catch level in 1994 and spawning stock biomass level in 1995 are plotted against the fishing mortality in 1994.

Including overfishing in 1993 the status quo catches in 1994 will vary from 599,000 t to 685,000 t under different assumptions of growth. Without overfishing the status quo catches will vary from 640 000 t to 732,000 t.

In Table 3.19, the results of the three growth scenarios for the medium-term predictions are given for the biological reference points F_{low} and F_{92} and, for F_{med} , with and without the assumption of overfishing in 1993. It should be noted that these scenarios are not assessments, but calculations. The aim of these calculations is to demonstrate the uncertainty introduced in long-term predictions because of the large changes in growth experienced in this stock. The catches in the table must, therefore, not be taken as options for long-term strategies. Detailed prediction tables are given for medium growth and F_{92} (Table 3.20).

In the medium term the stock will increase to 3.1 million t in 1998 with high growth and decrease slightly to 2.2 million t with low growth assuming status quo fishing mortality.

3.7 Comments to the assessment and the predictions.

The stock situation from last year's assessment is confirmed in this assessment. Despite the substantial revisions to the assessment that have occurred during the past it is believed by the Working Group that the assessment is now reflecting the stock situation. This also shows that the observations from a number of surveys carried out in the Barents sea and the Svalbard area provide useful and, as an overall picture, correct information about the stock. The problems of getting effort and CPUE data from the fisheries caused by the introduction of stronger restrictions in the fisheries may therefore not be essential to the assessment.

Several uncertainties pointed to in earlier assessments have been overcome, especially age reading and survey methods, although work is still needed to improve the methods and the time series used in the assessment.

Concerning the impact of the decline in the capelin stock on the development of the cod stock there is no information available to the Working Group as to what extent herring will provide the necessary food for the cod stock. Under these conditions the Working Group will not make

any assumptions about future growth reductions or recruitment failures caused by lack of food other than what is considered to be normal variation. However, the Working Group will point to the fact that other stocks, such as redfish and shrimp, do not show any increase in biomass and that the present overall food supply may lower the upper limit of cod biomass that can be supported in the ecosystem compared to earlier periods.

Considering the request to evaluate different stock levels of immature cod to help the Atlanto-Scandian Herring and Capelin Working Group in estimating the consumption of capelin by cod, the Working Group feels that this may best be achieved by one of the members of the Arctic Fisheries Working Group attending the meeting of the Atlanto-Scandian Herring and Capelin Working Group and this has already been arranged.

Concerning the request to update the time series on weight at age in the catches the members of the Working Group are asked to bring any available data to the next year's Working Group meeting.

3.8 Unreported Catches

Concerning the inclusion of unreported catches in the assessment of the stock, the Working Group feels that it is very important to have more data available about this situation. This year the inclusion of overfishing was based on summary reports and for next year a detailed description of the calculations should be given to the Working Group. Catches in excess of the TAC should be reported to the Working Group and preferably be accompanied by data about the age distribution.

With the present strong recruitment the overfishing may not do much harm to the total stock in the near future, but the impact on the spawning stock may be more severe if continued overfishing takes place. The low quotas given in recent years in order to rebuild the spawning stock should not be allowed to be replaced by a regime of overfishing that could lead to a new decline in the spawning stock.

The Working Group will also point to the problem of increased availability of small individuals due to the strong recruiting year classes. The Working Group has been given anecdotal information that substantial amounts of small fish are caught and discarded in some areas and the age distribution of the reported catches also shows that young fish are caught in the fisheries.

The lack of reliable data on the total catches will make future assessments of the cod stock very uncertain and will undermine the basis for setting TACs. Effort should be made to ensure that all catches are reported and complemented by biological data and that overfishing of the agreed TACs will be reduced to a minimum.

4 NORTH-EAST ARCTIC HADDOCK (SUB-AREAS I AND II)

4.1 Status of the Fisheries

4.1.1 Landings prior to 1993 (Tables 4.1-4.3 and Figure 4.1A)

The final landings reported for 1991 was 33,605 t which is close to the figure used in last year's assessment. This figure exceeded the agreed TAC of 28,000 t by 20%.

The provisional landings for 1992 are 53,355 t which is close to the figure estimated at last year's meeting (54,000 t) and 15% below the agreed TAC of 63,000 t.

The increase in catch from 1991 to 1992 was particularly marked in Division IIb (131%), but there was also a substantial increase in Sub-area I (52%) and Division IIa (56%).

4.1.2 Expected landings in 1993

Based on the information for the first part of the year, the Working Group has estimated the expected landings in 1993 to be around 73,000 t, which is close to the agreed TAC of 72,000 t.

4.2 Status of Research

4.2.1 Fishing effort and CPUE

As indicated in last year's report, there is at present no directed trawl fishery for haddock and no commercial CPUE-data are included in the assessment

4.2.2 Survey results (Appendix I, Tables B1-B8)

Norway provided indices from the 1992 Svalbard bottom trawl survey (autumn), the 1992 Svalbard - Barents Sea acoustic survey, the 1993 Barents Sea bottom trawl and acoustic survey (winter). Russia provided indices from the 1992 trawl and acoustic survey (autumn) in the Barents Sea. Updated values using a new target strength (TS) for haddock and the method described in Section 3.2.2. are given in Appendix I, Tables B4-B6.

As for younger cod (see Section 3.2.2), and expanding distribution of younger haddock has recently been detected in the Barents Sea. To accommodate this wider distribution the area covered by the Norwegian bottom trawl survey was extended in 1993. The results for both the traditional (1993) and extended coverage (1993+) are presented in Appendix I, Table B1.

All the surveys show continued recruitment at average level and the 1990 year class is confirmed to be strong.

The updated weights at age in the Russian trawl acoustic survey in late autumn and the Norwegian bottom trawl survey in early winter were used in calculating weights at age in the stock.

The weights at age show a slight decrease from the 1992 Norwegian survey, but the Russian survey shows a maintained large weight age of the fish.

4.3 Data Used in the Assessment

4.3.1 Catch in numbers at age (Table 4.12)

A revised age composition in the Norwegian landings together with final total landings were used to revise the numbers at age in the 1991 landings.

Age compositions of the catches for 1992 were available from Norway and Russia in Sub-area I, from Norway, Russia and UK (England and Wales) in Division IIa and from Germany and Norway in Division IIb. The catches of other countries were distributed in ages using an average Norwegian and Russian age composition in Sub-area I, the UK (England and Wales) age composition in Division IIa and the German age composition in Division IIb.

4.3.2 Weight at age (Tables 4.4-4.6)

There seems to be a reasonable correspondence between the Norwegian and Russian weights at age in the catches in recent years (Table 4.4). In general the Norwegian weights at age for ages 3 and 4 are higher and for the older ages the Russian weights are higher. The mean weights at age in the catch were calculated as weighted averages of the weights in the catch from both countries.

For 1993, only Russian weights at age in the catch were available for the first half of the year. These weights at age for ages 3-5 have been adjusted by a factor calculated by dividing the mean weights in the first half of the year by the updated mean weights for the entire year. For ages older than five years the half year weights were maintained. The calculated factors are: 1.235 for age 3, 1.158 for age 4 and 1.06 for age 5.

Weights at age are available from the Russian autumn survey since 1984 representing weights at age from 1 January 1985. These weights correspond fairly well with the old time series and are therefore used as weights at age in 1985 and 1986 for ages up to 7 years.

Few fishes of older ages were found on the surveys in the 1980s. The first year class showing up as older fish is the 1982 year class and it was decided to allow this year class to update the weights and lengths at age for the older fish in Appendix I. Tables B.7 and B.8. The weights at age in the stock are calculated as the

unweighted average of Norwegian and Russian weights from surveys up to the 1982 year class. For the older fish the old time series is used. For ages 8 to 10 it was decided to update the 1993 mean weights at age in the stock with the corresponding mean weights at age in the catch, because these are lower than those coming from the old time series.

4.3.3 Maturity at age (Table 4.7)

A maturity ogive was available from Russia for 1993 and is given in Table 4.7.

4.3.4 Surveys for tuning (Table 4.8)

The following surveys are included in the data for tuning:

Name	Place	Season	Ages	Years
Russian bottom trawl	Total area	Autumn	3 - 7	1983-92
Russian acoustic	Total area	Autumn	3 - 7	1985-92
Norway bottom trawl	Barents Sea	Winter	4 - 8	1983-93
Norway acoustic	Barents Sea	Winter	4 - 8	1981-93

As in last year's assessment surveys conducted in the winter were shifted to the year before and the ages correspondingly shifted.

No commercial CPUE series were included in the tuning.

4.3.5 Recruitment indices (Table 4.9)

The recruitment indices from the autumn Russian bottom trawl survey (ages 0+, 1+, and 2+), the summer International 0-group Survey (age 0), the winter Norwegian Barents Sea bottom trawl survey (ages 1, 2 and 3) and the winter Norwegian Barents Sea acoustic survey (ages 1, 2 and 3), were updated for 1992 and are given in Table 4.9.

4.4 Methods Used in the Assessment

4.4.1 VPA and tuning (Table 4.11, Appendix III, Tables 5-7 and Figure 4.2)

The evaluation of ADAPT and XSA given in Section 3.4.1 is also valid for haddock. However, trial runs with XSA indicated that somewhat stronger shrinkage could be used than for cod.

Tuning of the VPA was carried out using both Extended Survivors Analysis (XSA) and Adaptive Framework (ADAPT).

The final VPA (Table 4.11) was run using the XSA shrunk towards the mean of the final 2 years and 5 older ages. This was done to accommodate the large drop in fishing mortality that occurred between 1989 and 1990. The input standard error for the mean was 0.7, trying to simulate a flat exploitation pattern for fully recruited ages. The catchability dependent on stock size was chosen for age 3. Although this analysis did not converge, the results are very similar to those from choosing no dependence on the stock size at age 3 and made the estimate of the 1989 year class more consistent with that from the RCTR3 program. This problem of non-convergence of the iterations when using q dependent on stock size for age 3 also appears in the cod analysis. The results of this analysis and those coming from ADAPT (Appendix III, Tables 5-7), were very similar.

A retrospective analysis (Figure 4.2), using the same input to the XSA gave consistent results through successive assessment periods. This analysis showed a fairly good consistency with last year's assessment. However, the assessment made by the Working Group in 1991 gave a severe underestimate of F , as also pointed out in last year's reports.

4.4.2 Recruitment (Table 4.10)

The analysis of recruitment is carried out using the 1993+ indices (extended area) for the Norwegian Barents Sea series because the Working Group felt that they are more representative of year class abundances than the 1993 indices from the traditional survey area.

As in last year's report, because of the tendency of the C-type regression to overestimate the recruitment for haddock, it was decided to use a P-type regression and not to shrink the estimates towards the mean (Table 4.10).

4.5 Results of the Assessment

4.5.1 Fishing mortality and VPA (Tables 4.13-4.17)

Since 1980 the peak in the average fishing mortality for ages 4-7 occurred in 1981 (0.6) and fishing mortality had decreased to half this level in 1984, increasing again to the 1981 level in 1987-1988 and dropping in 1990 to 0.3. Subsequently fishing mortality increased and reached 0.45 in 1992. There appear to have been no trends in the fishing pattern since 1985.

4.5.2 Recruitment (Table 4.10)

The RCT3 estimates for the 1989-1992 year classes are 99, 254, 149 and 92 million respectively (Table 4.10). The 1989 year class was estimated to be stronger (164) in the VPA, and this has been used in the prediction.

4.5.3 State of the stock

The spawning stock biomass has doubled since 1984 but still remains below the long-term average. An increase can be expected in the near future, mainly due to the recruitment of the strong 1989 and 1990 year classes. However, fishing mortality steadily increased from 1989 to 1992 reaching the value of 0.45, which is above F_{med} (0.35). The estimated catches indicate that F will probably remain at the same level during 1993.

4.6 Prediction

4.6.1 Input data for the prediction (Table 4.16)

The stock numbers at age are taken from the final VPA (Table 4.14) and the recruitment at age 3 of the 1990-1992 year classes from the RCT3 analysis (Table 4.10). From the 1992 year class onwards the recruitment is set at the long-term geometric mean of 89 million. The fishing pattern was taken from the XSA as the mean pattern of the last 3 years, but corrected for ages 8-11 because the noise produced a very unlikely figure for these ages. The maturity at age is taken as the average of the most recent 3 years (1991-1993) and is used for 1994 onwards.

As in last year's report, three different scenarios were chosen to give an indication of the uncertainty of the future change in growth. The scenarios are the following as regards weights at age in the catch and in the stock from years 1995 and onwards:

- equal to the mean of those for 1983-1986 for high growth (first scenario);
- equal to the mean of those for 1983-1992 for the medium growth (second scenario);
- and, equal to the mean of those for 1987-1990 for low growth (third scenario).

In all cases 1994 was considered as a transition year and the average of the 1993 value and the values in the respective scenarios was applied (Table 4.16)

4.6.2 Biological reference points

The yield per recruit analysis using the same fishing pattern and stock parameters as in the management option table resulted in estimates of $F_{0.1} = 0.1$ and $F_{max} = 1.16$. Jakobsen (1992) gives the values of $F_{low} = 0.02$, $F_{med} = 0.35$ and $F_{high} = 1.11$.

4.6.3 Projections (Tables 4.17-4.19 and Figure 4.1c)

The management options are given in Table 4.17 and the catch levels in 1994 and spawning stock biomass in 1995 are plotted against the fishing mortality F , in 1994 (Figure 4.1d).

In Table 4.18 the results of the three growth scenarios for medium-term predictions are given for the reference points F_{med} and F_{93} . It should be noted that these scenarios are not assessments, but calculations. The aim of these calculations is to demonstrate the uncertainty introduced in long-term predictions because of the large changes in growth experienced in this stock. The catches in the table must therefore not be taken as options for long-term strategies.

Detailed prediction tables for *status quo* F are given in Table 4.19.

4.7 Comments to the Stock Assessment

Although there are no reports on overfishing of haddock, the close connection between the cod and haddock fisheries suggests that overfishing might also have affected the reliability of the catch statistics for haddock, e.g. through misreporting by species.

The fishing mortality has stabilized above F_{med} in the last two years but both the total stock and the spawning stock biomass are expected to increase during 1994 with fishing at the current level of F . This is due to the recruitment of the relatively good 1989-1991 year classes.

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

5.1 Status of the Fishery

5.1.1 Landings prior to 1992 (Tables 5.1 and 5.2, Figure 5.3A)

Revised landings as reported to ICES for 1991 were 108,297 t, an increase of 12,449 t from 1990 (Table 5.1). Provisional reports of landings in 1992 give a total of 124,904 t compared to 115,000 t expected by last year's Working Group which corresponded to the target TAC set by the Norwegian authorities. The increase from 1991 is due to the trawl fishery which reached its highest level since 1984 (Table 5.2).

5.1.2 Expected Landings in 1993

The Norwegian authorities have set quotas for other countries and for purse seine and trawl in the Norwegian fishery in order to limit the total landings to 132,000 t. However, the most recent estimate of Norwegian landings in 1993 is 130,000 t. This indicates that the total landings will be close to 138,000 t.

5.2 Status of Research

5.2.1 Fishing Effort and Catch-per-unit-effort (Tables 5.3 - 5.5)

Table 5.3 shows the number of vessels of different size categories that have taken part in the purse seine fishery for saithe since 1977, with corresponding catches and catch per vessel. On the basis of these data, indices of effort have been calculated. The unit of effort is number of vessels of 20-24.9 m. This category has in the most recent years accounted for more than half of the purse seine landings and constitutes most of the typical saithe purse seiners. A decrease in purse seine effort of 16% is indicated from 1991 to 1992 (Table 5.5).

Table 5.4 gives catch, effort and catch per unit effort for Norwegian trawlers since 1976, including only those hauls where the effort has almost certainly been directed towards saithe, i.e., days with more than 50% saithe on trips with more than 50% saithe. Indices of total Norwegian trawl effort are given in Table 5.5 and show an increase from 1991 to 1992 of 19%.

Catches from the two gear categories have on the average been at the same level (Table 5.2). The fleets are assumed to represent equal shares of the total effort and together they represent a relatively constant proportion of the total landings. Using 1977-1990 as reference period and multiplying the trawl indices by 2.75 raises them to the same level as the purse seine indices. The indices are then added to give a combined effort index which should reflect the main trends in total effort (Table 5.5). A slight increase (4%) is indicated from 1991 to 1992 and the level has been fairly stable since 1988.

5.2.2 Survey results

An annual acoustic trawl survey for saithe in October-November along the Norwegian coast has been conducted since 1985. Indices of abundance of immature saithe are obtained (Appendix I - Table C1) and are used in the VPA tuning. The survey clearly indicates improved recruitment, starting with the 1988 year class. For the 1988 and 1989 year classes this is also evident from the catch-at-age data (Table 5.8). Expansion of the survey area and changes in the survey design as more experience has been gained have probably affected the consistency of the time series and it may still take a few years before the usefulness of the survey can be fully explored.

5.3 Data Used in the Assessment

5.3.1 Catch at Age (Table 5.8)

The age composition of Norwegian landings in 1991 was revised, but the changes were small. Data for 1992 were available from Germany and Norway, accounting for

98% of the total landings. Landings by other countries were assumed to have the same age composition as those of Germany.

5.3.2 Weight at age (Table 5.9)

A constant set of weight-at-age data is used for all years in the period 1960-1979. For subsequent years, annual estimates of weight-at-age in the catches are used. Weight-at-age in the stock is assumed to be equal to weight-at-age in the catch.

5.3.3 Maturity at age

No maturity ogive is available for this stock. As in all the previous assessments, knife-edge maturity at age 6 has been assumed.

5.3.4 Tuning data

In the VPA tuning, the catch-per-unit effort from Norwegian purse seiners for ages 3-7 and trawlers for ages 3-8 are used together with the survey data on ages 3-5 (Table 5.6).

5.3.5 Recruitment indices

The indices from the 0-group (post-larvae) survey which was carried out from 1985 to 1992 have failed to give any indication of the improved recruitment and the survey has therefore been stopped. The area coverage and sampling has been considered satisfactory and probably the year class strength at recruitment to the fishery is not established until after the post-larval stage. Reliable recruitment indices are crucial for the predictions, but at present no solution to this problem is apparent.

5.4 Methods Used in the Assessment

5.4.1 VPA tuning

For the first time, Extended Survivors Analysis (XSA) was used for the assessment. A number of retrospective analyses were made, varying the parameters for shrinkage. In periods of clear trends in fishing mortality, reducing the number of years for shrinkage gave a better fit, but in periods of changing trends adding more year to the shrinkage gave a better performance. Comparing the first estimate of fishing mortality with converged values showed no clear difference between the number of years chosen for shrinkage. However, comparing the first and the second estimate, a crude measure of the stability in the assessment from one year to the next, revealed that the correspondence improved with the number of years (from 1 to 5 years was tried). In recent years, the fishery has been regulated and this appears to have stabilized the fishing mortality. It was therefore

decided to use the default value of 5 years for the shrinkage.

The shape of the exploitation pattern on the oldest ages has been a recurring problem in the assessment of this stock, probably caused by inadequate sampling. The catch-at-age data (catch-curve analysis) indicate a slightly dome-shaped pattern, which is not unreasonable considering that most of the oldest fish are taken by gill-nets. Varying the number of ages used in the shrinkage showed that a dome-shaped pattern could be simulated by reducing the number of ages, but this created more instability in the assessment. In this case also it was decided to use the default value of 5 age groups for the shrinkage. One consequence of this is that fishing mortality on the oldest ages is somewhat higher than in previous assessments, and the spawning stock estimates are accordingly lower. It is possible that the SSB estimates are for this reason biased downwards, but as long as the natural mortality cannot be reliably estimated, the absolute level of SSB will be uncertain in any case.

The tuning diagnostics are given in Table 5.7. One notable difference from the earlier Laurec-Shepherd tuning diagnostics is the large standard error on the intercept for the trawl fleet at ages 3 and 4. The implications of this are not clear and considering that the proportion of these age groups caught by trawlers is considerable in most years, it was decided not to exclude them from the analysis.

Only the lack of reliable recruitment estimates and the relatively quick recruitment to the fishery, the size of the recruiting year classes will be very important for the predictions. The retrospective analysis showed that the year class strength is not reasonably well established in the VPA before age 4. Thus, the stock size at age 3 in the last VPA year has often been poorly estimated. Since this is one of the four age groups used for estimating the reference F , this will increase the standard error of that estimate. Unfortunately, age 3 is also the dominant age group in the catches and leaving that age group out of the reference F estimates means that little weight is given to the purse seine fishery's impact on the overall exploitation. Furthermore, the historical series of F_{4-6} is more variable and it was agreed that this problem should be further investigated before any change in the procedure is made.

5.5 Results of the Assessment

5.5.1 Fishing mortalities and VPA

Fishing mortalities, stock numbers and stock biomasses from the XSA are given in Tables 5.10-5.12 and Figures 5.3A and B. The fishing mortality ($F_{3,6}$) in 1992 is 0.42 and the historical time series of fishing mortalities is in good agreement with last year's assessment. For the

reason given in a previous section, the estimates of SSB are reduced. For the years in the tuning this reduction has been about 15% on average. However, in the early 1960s there are large reductions in SSB which will affect both the mean and the maximum values used in the ACFM report. The discrepancy is caused by the input to the Laurec-Shepherd analysis last year when the exploitation pattern was forced to be dome-shaped and this demonstrates how vulnerable the estimates of SSB in these early years are to the input F for the oldest age. A retrospective analysis of the fishing mortality estimates is given in Figure 5.1.

An assessment using ADAPT was also carried out and the results are given in Appendix III - Tables 8-11. The fishing mortality of 0.46 was slightly higher than from XSA and the stock numbers in the last year were all within 30% of the XSA estimates. The ADAPT assessment was well within the range of variation seen in the retrospective runs with XSA.

The 1988 year class is now established as being of above average strength, but the estimate is considerably reduced from last year's assessment. The 1989 year class appears as the strongest in the VPA series, but the retrospective analysis shows that this estimate cannot be regarded as reliable.

5.6 Prediction of Catch and Biomass

5.6.1 Data used in the predictions (Table 5.13)

Input to the prediction is shown in Table 5.13. For weight at age in the catch and stock and for the exploitation pattern, the average for 1990-1992 is used. In last year's assessment this procedure gave a good approximation to the weights observed in 1992. The exploitation pattern is scaled to the 1992 level so that this level corresponds to an F-factor of 1.

The estimates of recruiting year classes up to the 1988 year class from the VPA were accepted. The 1989 year class is not reliably estimated from the VPA, but both survey data and catch figures indicate that it is above average. There are still doubts about the reliability of the survey and leaving the survey out of the tuning reduces the 1989 year class to a level much closer to the 1988 year class. For the predictions the 1989 year class was therefore assumed to be at this level, i.e. 360 million. Although the survey indicates that the 1990 year class is also abundant, the long-term geometric mean recruitment of 255.5 million was used for the 1990 and subsequent year classes. It should be noted that reducing the size of the 1989 year class from the level estimated by XSA implies a slightly higher estimate (0.44 compared to 0.42) of $F_{3,6}$ in 1992.

5.6.2 Biological reference points

Yield and SSB per recruit were based on the parameters in Table 5.13. The calculations gave $F_{0.1}=0.14$ and $F_{max}=0.26$ (Figure 5.3C). Because of the change in exploitation pattern, F_{low} , F_{med} and F_{high} were also recalculated (Figure 5.2), giving the values $F_{low}=0.20$, $F_{med}=0.34$ and $F_{high}=0.50$, a slight increase (0.03-0.04) for all three, compared to last year's estimate.

5.6.3 Projection of catch and biomass (Tables 5.14-5.16)

The management option table (Table 5.14) shows that the expected catches in 1993 will give a slight increase in fishing mortality to 0.44. The *status quo* catch in 1994 ($F_{94}=F_{92}$) is 158,000 t compared to catches at F_{med} of 132,000 t. SSB will increase from 67,000 t in 1993 to 124,000 t in 1994 and further to 185,000 t and 169,000 t at F_{med} and *status quo* F, respectively. Prediction tables for each of the biological reference points and for *status quo* F are given in Table 5.15. The catch in 1994 and SSB in 1995 for various levels of F in 1994 are shown in Figure 5.3D.

5.7 Comments on the Stock Assessment

As stated in last year's report, the data from the commercial fleets have limitations and the reliability of the survey is not yet established. However, the retrospective XSA runs indicate that the assessment may be more stable than in the past, providing that large and real changes in fishing mortality do not occur. With the current regulations there is a good possibility that this will be achieved. Uncertainty about recruitment will, however, affect the predictions also in the future.

5.8 State of the Stock

There is improved recruitment to the stock which is expected to recover from a long period with SSB at a historical low level. Current fishing mortality is above the biological optimum and sustained exploitation at this level may bring the SSB back down towards the historical minimum in periods of poor recruitment. In the short term, however, the stock is evaluated as not being in danger of recruitment overfishing.

6 REDFISH IN SUB-AREAS I AND II

6.1 Status of the Fisheries

6.1.1 Landings prior to 1993 (Tables 6.1-6.6, Figure 6.2A)

Nominal catches by country for Sub-areas I and II combined are presented in Table 6.1. The nominal

catches by country for Sub-area I and Divisions IIa and IIb separately are shown in Tables 6.2-6.4. The total catch in 1992 was 32,889 t, this is a 47% decrease compared to 1991, and is the smallest catch since 1969.

The landings of 3,187 t from Sub-area I in 1992 were at the average level of the 1980s. Landings in Division IIa declined from 100,163 t in 1983 to 27,729 t in 1987, but show an increase to 52,460 t in 1991. In 1992 a sudden decrease in the landings occurred to only 50% of the level of the previous year before. This decrease is accounted for by a decrease in both the Norwegian and the Russian landings. Landings in Division IIb have been very variable during the last decade, but the landings in 1992 decreased by 43% compared to the year before.

The national landings statistics of redfish for Russia, Germany, Norway, and Spain are split into species by the respective national laboratories. For other countries, the Working Group has split the landings into *Sebastes mentella* and *Sebastes marinus* on the basis of reports from their different fleets to the Norwegian fisheries authorities. The total landings of *S. mentella* declined progressively from 115,383 t in 1982 to only 10,518 t in 1987, but showed an increase to 45,179 t in 1991. The sudden decrease in the total redfish landings in 1992 is accounted for by a 64% decrease in the *S. mentella* catches to 16,195 t, which is 3,805 t less than expected in the last year's prediction. Revised landings of *S. marinus* showed a decrease from a level of 23,000-30,000 t in 1984-1990 to 17,443 t in 1991. This lower level was more or less maintained in 1992 (16,694 t) and the landings were 4,694 t more than expected.

The redfish population in Sub-area IV (North Sea) is believed to belong to the North-East Arctic stock. The landings from Sub-area IV have been about 1,000-2,000 t per year (Table 6.6). Historically these landings have been *S. marinus*, but in the most recent years Norwegian trawlers have also caught *S. mentella* along the northern slopes of this Sub-area. The catches are not included in the assessment.

6.1.2 Expected landings in 1993

On the basis of reports of landings from the first seven months of the year, landings expected for the whole of 1993 are estimated to decrease for *S. mentella* compared to 1992 and to be at nearly the same level for *S. marinus*, i.e. 13,000 t and 15,000 t for the two species, respectively.

Although higher quotas of cod and haddock have reduced the pressure on the redfish stocks, CPUE in the Russian fishery for *S. mentella* decreased up to 1992, and the higher value for a time-limited fishery in 1993 does not reflect the reduced adult stock since the level shown by different surveys points to a stock reduction.

It is expected that the Russian landings of *S. mentella* will be about the same level as in 1992, i.e., 4,000 t. It is more difficult to foresee the Norwegian landings in the second half of the year, but a reduction to a level of about 8,000 t is likely. Provided the expectations for 1993 hold, then the landings of *S. mentella* will be 5,000 t less than the recommended and accepted TAC of 18,000 t.

Regarding *S. marinus*, the catches have decreased compared to those in the most recent years, but it is expected that the catch in 1993 will be close to the 1992 level of 16,000 t. Provided that the expectations for 1993 hold, then the landings of *S. marinus* will be 4,000 t more than the recommended and accepted precautionary TAC of 12,000 t.

6.2 Status of Research

6.2.1 Fishing effort and catch-per-unit-effort (Tables 6.7-6.9)

Catch-per-hour-trawling data for the *S. mentella* fishery in 1992 were available for the Russian PST vessels fishing in ICES Divisions IIa and IIb and accounting for 20% of the total international trawl catch (Table 6.7). There is an increase from 1987 to 1990, while a 40% decrease is observed from 1990 to 1992. An increase in 1993 may not reflect a corresponding increase in the stock due to a low effort in the Russian fishery limited to the historically best fishing season in April/May. Estimates of total effort are based on Russian PST units raised to total international catch, showing an increase from 1987 to 1991, but a decline in 1992.

The Norwegian trawl fishery, accounting for 69% of the total *S. mentella* landings, takes place in other areas along the continental slope with only part of it overlapping with the Russian fishing grounds. Length- and age-compositions of the landings have also shown differences which point to different parts of the stock being harvested by the two countries. Catch-per-hour-trawling data from this fishery were presented as a short series restricted to only one (but the same) trawler that has long experience in the Norwegian fishery for *S. mentella* (Table 6.8). Dependence on area and time, also this series shows a decrease of about 40% in the CPUE since 1990. The Norwegian fishery for *S. mentella* first reached a noticeable level in 1986-1987 (1,500 t), but increased from 4,623 t in 1989 to 10,173 t in 1990 and 30,036 t in 1991 before it decreased to 11,285 t in 1992.

Data for *S. marinus* were available for Norwegian fresh fish trawlers since 1981 (Table 6.9) from which the total international effort was estimated. This is a new series using GLIM analysis on data from each month and the Norwegian statistical areas 03, 04, 05, 06 and 07, i.e., along the Norwegian coast. Difficulties related to the

splitting of the redfish species in the catches may still be the reason for big fluctuations in the series although typical *S. mentella* grounds have been sorted out. This will be further investigated.

6.2.2 Survey results

The international 0-group fish survey carried out in the Barents Sea in August-September since 1965 does not distinguish between the species of redfish, and the survey design has also improved during the 27 years this survey has been conducted. The indices for the 1980s should, therefore, not be directly compared with those from the 1960s and early 1970s. The great reduction in the abundance of 0-group redfish that was observed during the survey in 1991 was further confirmed by the survey in 1992, and preliminary reports from the ongoing survey this year point to a similar low index for 1993 (Table 6.10).

Apart from a pilot Norwegian survey in April 1992 on the spawning grounds from 62°N to 74°N, the only directed survey towards *S. mentella* are the Russian trawl/acoustic survey on the spawning grounds north of 70°N in March-April. The other investigations on redfish are made during surveys mainly directed for other species.

Since 1981, a stratified random bottom trawl survey has been carried out by Norway in February in the Barents Sea. This has been combined with a synoptic acoustic survey. No age distribution has been presented. In 1993 a 30% decrease is observed for *S. mentella* in the bottom-trawl survey compared to the long-term mean. The promising 1987-1990 year classes (10-19 cm), however, prevent the total index of being very low, but a decrease of *S. mentella* less than 10 cm is also observed. Regarding *S. marinus* an overall tendency of a decrease of fish less than 30 cm is observed.

Since 1981, a stratified random bottom trawl survey has also been carried out by Norway in September in the Svalbard and Bear Island areas, and a combined trawl/acoustic survey is implemented into the 0-group survey covering both the Svalbard and the Barents Sea regions. The abundance indices for *S. mentella* in 1992 showed a great reduction of fish less than 10 cm, indicating weak 1991-1992 year classes previously reported from the 0-group surveys. The abundance indices for *S. marinus* showed a stable or improved situation for the part of the stock covered.

In the years 1986-1990, Russia carried out a trawl/acoustic survey in March-June on the *S. mentella* spawning grounds near Bear Island. The extension of the surveyed area varied from year to year. Results from these years are presented in previous Working Group reports. In 1992 Russia conducted a similar survey in

March-April, covering the area from the Fugloy bank to 76°N and from 12°E to 25°E. The area investigated was larger than in previous years, and the total and spawning biomasses were estimated to 217,000 t (567 million specimens) and 113,000 t, respectively. The results confirmed that the 1982-year class is the strongest in the fishable stock at the moment. In 1993 the same survey was conducted at the same time, and the area investigated was approximately the same although not covering the north-eastern part properly where mostly immature fish younger than 8 years were distributed. Total biomass was estimated to 150,000 t (373 million specimen). A decrease in the extension of the spawning area as well as a decrease in the spawning stock was observed (estimate not presented).

Young redfish are also covered during a Russian bottom trawl groundfish survey in the Barents Sea and Svalbard regions in October-November. These results have been used as the basis for estimating the recruitment in the assessment in recent years (Table 6.11).

6.2.3 Age readings

As a result of the process on harmonizing the international age readings on redfish (e.g., Anon. 1991), all catches of redfish in 1992 was for the first time distributed on age according to otolith readings. A Workshop continuing this work, and also investigating the necessity and possibility of using conversion factors converting long time series on scale readings, is planned to be held in Germany in 1994. All countries involved in redfish fisheries are encouraged to participate and to do related work in advance.

6.3 Data Used in the Assessment

6.3.1 Catch at Age (Tables 6.16 and 6.25)

For the first time, catch in numbers at age of *S. mentella* from Russia was in 1992 based on otolith readings, compared to the historic series using scales. Only small differences were observed when comparing mean-length-at-age from the Russian 1991 scale-based data and the 1992 otolith-based ones, i.e., 0-1.9 cm for ages less than 16 years. General sampling variation may well explain part of this difference. The Norwegian fishery harvests to a large extent bigger (and older) fish than the Russian fishery. The fact that Norway also has taken a greater part of the total catch, lead the Working Group to revise the Norwegian catch-at-age, formerly converted according to the Russian age distribution, back to 1990 using Norwegian otolith readings on the Norwegian landings. Data for 1992 for *S. mentella* were available from Russia and Norway, corresponding to 22% and 70% of the total landings, respectively. The landings from other countries were distributed on age according to the Russian age distribution.

For *S. marinus*, age composition data for 1992 (based on otoliths) were only provided by Norway, accounting for 83% of the total landings. From the German fishery, accounting for nearly 4% of the total, catch-at-length data were available, and these were converted to age by using a Norwegian age-length key for trawl. The landings from other countries were distributed on age according to the combined age distribution from Germany and Norway. Norwegian catch-at-age data based on otoliths are now available back to 1989. Catch-in-numbers-at-age back to 1989 has therefore been revised taking this new information into account for the Norwegian catches.

6.3.2 Weight at age (Table 6.17)

Catch weight-at-age data were available from Russia for *S. mentella* for ages 4-19 in 1992 and from Norway for ages 6-19, both series based on otoliths. The Norwegian weight-at-age was the lower for nearly all ages. The final and further used weight-at-age data in the catches were weighted by the numbers caught at age by these two countries. As in previous assessments weight at age in the stock was taken to be the same as the weight at age in the catch.

Due to the revisions of the catch-in numbers for *S. marinus* back to 1989, weight-at-age has been revised accordingly. The Norwegian and German weight-at-age data were comparable. In 1992, weight-at-age data were available from the Norwegian landings.

6.3.3 Maturity at age (Table 6.13)

Maturity-at-age ogives for *S. mentella* from research vessels, sexes combined, have been made by Russia for several time periods. For 1984-1992 a three-year running average has been used.

A maturity ogive was not available for *S. marinus*, and a knife-edge maturity at age 15 was assumed.

6.3.4 CPUE-data for tuning (Tables 6.14 and 6.26)

Regarding *S. mentella*, trawl effort and the corresponding catch-at-age data were available for Russian PST-trawlers for the years 1982-1992 for ages 9-18 (Table 6.14).

For *S. marinus*, trawl effort and the corresponding catch-at-age data were available for Norwegian trawlers for the years 1986-1992 for ages 12-24 (Table 6.26).

6.3.5 Recruitment indices (Tables 6.10-6.12)

There are large discrepancies between the international 0-group fish survey data and the data from the USSR bottom trawl survey on *S. mentella* concerning ages 1-6 (Table 6.10). However, the strength of the 1963-1972

year classes has been confirmed by later year's assessments.

The data on *S. mentella* from the Russian bottom trawl survey (Table 6.11) were used as input to the recruitment program RCT3. The results which are given in Table 6.12 may mask the relative strength of the year classes to some degree, but the level seems acceptable compared with earlier year classes estimated for a longer time in the VPA.

6.4 Methods Used in the Assessment

6.4.1 VPA and tuning (Tables 6.15 and 6.27)

For *S. mentella* the Extended Survivors Analysis (XSA) was used to tune the VPA to CPUE data (Table 6.15). CPUE data from Russian PST-trawlers (ages 9-18) were used in the tuning. The XSA analysis used survivor estimates shrunk towards the mean F of the final 2 years and 5 ages. The standard error of the mean to which the estimates were shrunk was set to 1.5. The catchability was fixed to be constant and equal to age 15 above age 15.

For *S. marinus* the Extended Survivors Analysis (XSA) was used to tune a trial VPA to CPUE data (Table 6.27). CPUE data from Norwegian trawlers (ages 12-24) back to 1986 were used in the tuning. This XSA analysis used survivor estimates shrunk towards the mean F of the final 5 years and 5 ages. The standard error of the mean to which the estimates were shrunk was set to 0.3, i.e. rather heavy shrinkage. Less shrinkage made the VPA not converge. The catchability was assumed to be dependent of stock size for ages less than 13 and was only fixed to be constant above age 21.

Also this year SHOT forecast for *S. marinus* have been conducted (Table 6.29). In these forecasts the Y/B ratio has been set to make the estimated landings correspond with the actual ones. As input for G-M (G is growth-rate and M is natural mortality, $M=0.1$) the growth rate of the ages 12 to 20 has been calculated. The result was $G-M = -0.05$, i.e. the fishery is based on the recruitment. Since for fish older than about 12 years the natural mortality (if correct) is higher than the growth (dependent on the age reading), fishing more than the recruitment will then reduce the stock.

6.4.2 Recruitment (Table 6.12)

The RCT3 program (default settings) was used to give an estimate of those year classes (1981-1986) not yet reliably estimated by the VPA. Input F s for ages 6-11 were then set manually to give the estimated recruitment at age 6 for the years 1987-1992 running the VPA.

The results from the RCT3 analysis were also conclusive for the input to the prediction regarding the size of the year classes 1987-1989.

6.5 Results of the Assessment

6.5.1 Fishing mortalities and VPA

Sebastes mentella (Tables 6.18-6.22 and Figures 6.1-6.2a)

A retrospective analysis of XSA made a jump when using 1991 as starting year (Figure 6.1). Further backwards, the analysis gave more consistent results through successive assessment periods.

Average fishing mortality (ages 10-15) against total international effort in Russian PST units for the years 1985-1991 indicated a linear relationship.

However, it is the opinion of the Working Group that this assessment is too unreliable to be accepted. Fishing mortalities on the oldest ages, which were estimated by the XSA were very low, and this produced unlikely high stock levels in the 1960s and 1970s. A stock-recruitment plot was made which gave unbelievable low values for the reference points (e.g., $F_{med}=0.03$ and F_{low} is out of range). Yield and spawning stock biomass-per-recruit curves were calculated using the above data (Figure 6.2c). $F_{0.1}$ was estimated to be 0.18 while the F_{max} was 0.58. These values are more than 100% higher than in last year's assessment, and although great revisions of basic input data to the assessment were made this year, it is difficult to accept this when there at the same time are signs of reduction of the fishable stock (CPUE, research surveys).

Only for orientation, Table 6.18 gives the final estimates of fishing mortality, and the corresponding estimates of stock numbers and biomass are given in Tables 6.19-6.21.

A summary of the historic series of landings, fishing mortality, stock biomass and recruitment is given in Table 6.22.

Sebastes marinus (Tables 6.27-6.29 and Figure 6.3)

It is still difficult to run a reliable analytical assessment on this stock. The retrospective analysis shows very little consistency in the assessment going backwards in time, and does therefore not produce any reliable results (Figure 6.3). The SHOT forecast (Table 6.29) for this species is entirely dependent on the recruitment index. However, a recent catch level of less than 20,000 t seems to have stabilized the exploitable biomass.

6.5.2 Recruitment

Sebastes mentella

Due to little information inherent in the fishery statistics and lack of improvement by including the Russian youngfish survey in the tuning, the results from the XSA were considered not to give a reliable estimate of the size of 6 year olds in the stock from 1987 and later. These numbers were therefore corrected as described earlier, and all tables are in addition therefore presented with the recruitment-adjusted VPA output.

6.5.3 State of the stock

Sebastes mentella

The analytical assessment shows that the spawning stock probably is at a historically low level. The most recent Russian survey on spawning grounds also shows a decrease in this part of the stock. Preliminary results from the Norwegian trawl fishery mainly catching adult and mature fish, show a decrease in CPUE which also indicate a reduction. One should also be concerned about the historically low 0-group index (1991-1992) which have been confirmed in the latest trawl/acoustic surveys.

The 1982-year class, in previous Working Groups considered to be strong, and the average 1983-year class do not show up in the catches as would have been expected. By-catches of these year classes in e.g., the shrimp fishery, and predation by other species (e.g. cod) may be the explanation. The result is very low fishing mortalities for these year classes, and based on this year's assessment, these year classes will contribute to an increase of the spawning stock in near future from the present low level.

Strong 1988-1989 year classes are showing up in the surveys. These year classes should not be fished to hard bearing in mind the signs of bad recruitment after 1991. A hypothesis may be that the new fishery starting in the late 1980s by Norwegian trawlers catching adult fish on grounds never harvested before, may have influenced the recent bad recruitment to the stock.

Sebastes marinus

The assessment (SHOT-forecast) have shown that catches of more than 20,000 tonnes over time may have negative impact on this stock. The estimated reduction in exploitable biomass seem to have flattened out or stabilized since the landings were reduced to less than 20,000 tonnes. Indices from surveys on young fish areas in the Barents Sea indicate a stable situation.

6.6 Prediction of Catches and Biomasses

6.6.1 Data used in the prediction (Table 6.23)

Input data used in the catch predictions are shown in Table 6.23. Population numbers in 1993 are those calculated by VPA (adjusted to RCT3 recruitment) for age groups 7 and older. For the 1987-1989 year classes the strength at age 6 has been set equal to 110 millions. The average fishing mortalities (from the recruitment adjusted VPA) for the years 1990-1992, adjusted to the 1992 level, were used as input fishing pattern for the prediction. Some smoothing was conducted on the oldest ages. The maturity ogive is the 1992-1993 average calculated from Table 6.13. Weight-at-age in the catch has been set equal to the average weight-at-age from the catches in 1991 and 1992. Weight-at-age in the stock has been set equal to the weight-at-age in the catch.

6.6.2 Biological reference points

For illustration, results of the catch predictions for *S. mentella* are given in Table 6.24. If the expected catch of 13,000 t in 1993 is taken, the fishing mortality seem to be reduced compared with 1992. Although this assessment is not considered very reliable, catch predictions for 1994 have been made for the biological reference points and for fishing mortality being maintained at the 1992 level, i.e. for F-factors equal 0.26 (F_{med}), 1.0 (F_{92}), 1.3 ($F_{0.1}$) and 4.2 (F_{max}). All factors relates to the 1992 fishing mortality level (F_{10-15}).

6.6.3 Results of projections of catches and biomasses

Although a certain improvement of the *S. mentella* spawning stock seems likely in the near future, due to the uncertain assessment, the results should be treated with caution.

6.7 Comments to the results of assessment and predictions

Regarding *S. mentella*, the stock situation together with the input data and the analytical XSA should be more extensively investigated to reveal the causes for the inconsistencies compared to previous assessments. This year's assessment has been exposed to both rather comprehensive revisions of the catch-at-age data as well as a new (XSA) assessment approach. However, the fact that the catch-at-age data now are based on using the same age reading method is promising for the future. Research surveys will also help evaluating often difficult fishery statistics.

Regarding *S. marinus*, a longer time series of catch-at-age from the Norwegian fishery composing nearly 90% of the total catch will hopefully improve the assessment. Multiplicative models analysing changes in CPUE in sub-

areas in fishery or research surveys should be further investigated.

7 GREENLAND HALIBUT IN SUB-AREAS I AND II

7.1 Status of the Fisheries

7.1.1 Landings prior to 1993 (Tables 7.1 - 7.4, Fig. 7.2A)

Nominal catches by country for Sub-areas I and II combined are presented in Table 7.1. The nominal catches by country for Sub-area I and Divisions IIa and IIb separately are shown in Tables 7.2-7.4. Revised landings for 1991 were 29,583 t. The preliminary figure of total catch in 1992 is 8,437 t, which is about 30 % of the 1991 level. This is 1,437 t more than expected by last year's Working Group. Nominal catches decreased in both sub-areas, due to strong regulations of the fishery. The highest proportion of the catch was taken in Division IIa.

The fishery in 1992 was regulated by forbidding a directed international trawl fishery, forbidding a directed long-line and gill-net fishery by vessels larger than 27.5 meters, leaving the only directed legal fishery to be a restricted near-coastal long line and gill net fishery by smaller vessels. The legal by-catch in the trawl fishery for other species should not exceed 10% in weight in each haul.

In the later years, some fishery on Greenland halibut has taken place in the northern part of Division IVa. In the period 1986-1990, the catch in Division IVa was around 30 t each year, but it increased to 225 t in 1991 and 511 t in 1992. These fish are outside the areas of management, and therefore not restricted by any TAC regulations. Although there is a continuous distribution of this species from the southern part of Division IIa along the continental slope towards the Shetland area, little is known about the stock structure, and the catch taken from this area has therefore not been added to the catch from Subareas I and II.

7.1.2 Expected landings in 1993

Based upon reported catches from the first seven months of the year, it is estimated that the 1993 total catch will be about 11,500 t. It is expected that Norway will take 10,000 t and Russia 1,000 t of the total catch. The recommended and agreed TAC will therefore probably be overfished by about 4,500 t. The catch from Division IVa is expected to be at the same level as in 1992, i.e. 500-600 t.

From 1 July 1992, Norway and Russia have agreed that the by-catch of Greenland halibut in the shrimp fishery should not exceed 3 specimens per 10 kilos of shrimp. From 1 January 1993, Norway and Russia have made use of sorting-grid mandatory for all shrimp fishery in the jurisdiction areas of the two countries. Together, these restrictions should reduce the by-catch of small Greenland halibut in the shrimp fishery substantially.

7.2 Status of research

7.2.1 Fishing effort and catch-per-unit-effort (Table 7.5)

Effort and catch-per-unit-effort (CPUE) data for 1992 were only available for Norwegian trawlers. The effort decreased to less than 20% of the 1991 level, which was the highest recorded. This decrease is due to the severe restrictions on the fishery introduced in 1992. The catch-per-unit-effort (CPUE) increased by more than 50%, to the highest level recorded since 1982. A similar increase was observed in the catch rate of seven years and older fish (CPUE 7+).

The Norwegian CPUE-series include only days with more than 80% Greenland halibut on trips with more than 10% Greenland halibut in the catches. Despite that only a by-catch of Greenland halibut of up to 10% in weight in each haul was the legal limit, CPUE estimates derived using the mentioned procedure produced catch-rates from 36% of the total amount landed by trawlers. In many cases the legal by-catch has been taken in more or less directed hauls for this species.

In order to continue the Norwegian trawl CPUE-series at times when the directed trawl fishery was forbidden, two Norwegian trawlers were in addition contracted for conducting a regular fishery restricted for 15 days in May/June 1992 and 15 days in October 1992. The results showed a similar level of the CPUE as that coming out from analysing the catch-rates from the restricted commercial fishery.

The Working Group discussed the difficult problem of how much of the changes in CPUE should be allocated to stock changes vs. changes in catchability. It is, however, clear that an increase in CPUE from 0.24 to 0.40 from one year to the next is not reflecting similar changes in the stock. Thus, the CPUE data from 1992 should probably not be used in the assessment.

7.2.2 Survey results (Appendix I Tables A12, E1-E3)

The index for 0-group Greenland halibut in the International 0-group survey in the Barents Sea and Svalbard area since 1970 showed a sudden drop in 1988 and has in the last three years been at the lowest level ever recorded (Table A12). Since the survey design was

improved at the end of the 1970s, the survey has been conducted at the same time and following the same procedures every year, although the timing of this survey with regard to Greenland halibut may not be optimal. The fact that five consecutive bad year class indices of this stock have never been observed before, gives cause for concern about the recruitment.

In the Norwegian bottom trawl survey in the Svalbard area there is a strong decrease in the abundance of 1-5 year old fish (Table E1).

Also indices (on length) from the Norwegian bottom trawl survey in February 1990-1993 (Table E2) show a decrease of fish less than 40 cm.

The total number of fish (72 millions) and the total biomass (76,700 tonnes) estimated by the Russian survey in 1992 are somewhat higher than in 1991 (Table E3). Fish 4-7 years old (36-55 cm) dominated in the survey area, as in previous years. Also in this survey there is a decrease in numbers of fish younger than 4 years.

The surveys thus all indicate that the 1989-1992 year classes are weak.

7.3 Data Used in the Assessment

7.3.1 Catch at age (Table 7.8)

The catch-at-age data for 1991 were updated by revising the Norwegian age composition due to more samples available and adjusting the catches of other countries. Catch-at-age data for 1992 were available for the Norwegian and Russian fisheries. The catch by other countries was assumed to have the same age distribution as the Norwegian and Russian fisheries combined.

7.3.2 Weight at age (Table 7.9)

A constant set of weight-at-age data is used for all years in the period 1970-1978. For subsequent years annual estimates, weighted by the numbers caught at age by those countries which provide weight-at-age data, are used. The mean weight at age in the catch in 1992 (Table 7.9) was calculated as a weighted average of the weight in the catch from Norway and Russia. A final SOP check showed good fit with the nominal catch. The weight-at-age in the stock is set equal to the weight at age in the catch for all years.

7.3.3 Maturity at age (Tables 7.10 and E4)

The spawning stock biomasses for 1983-1987 were calculated by application of an average maturity ogive derived from Russian data for the period 1983-1987. As explained in the Working Group report for 1990, the same ogive was applied to the period 1970-1982. For

1988 and 1989 a three-year running average has been used. As no maturity ogive for 1991 has been provided, the average of the 1989 and 1990 ogives was adopted for 1990-1992. The 1992 maturity ogive indicate a much later maturation than in the years before, and the data are not consistent with the 1990 data for some year classes. However, due to a more limited time of sampling it was decided not to make use of the 1992 data on maturity ogive in the assessment. During the period 1984-1992 the Russian data on maturity have been collected at different times of the year. According to the Russian scientists the best time of the year to sample such data on Greenland halibut is in August-February. In 1992 these data were sampled in October-December, only, and this may be part of reason for the discrepancy with the 1990 data.

7.3.4 CPUE-data for tuning (Table 7.6)

Abundance indices from the Norwegian Svalbard bottom trawl survey for ages 3-7 in 1984-1992 and trawl effort data and the corresponding catch-at-age data for ages 6-12 for Norwegian trawlers in 1979-1992 were used in the tuning.

7.3.5 Recruitment indices (Tables A12 and E1)

There were four sets of recruitment indices available for review: The indices for ages 1-3 from the Svalbard bottom trawl survey (Table E1) and the 0-group index from the International 0-group survey (Table A12). All the indices seem to indicate low recruitment in the last few years, as the last five 0-group indices are the lowest ever recorded.

7.4 Methods used in the assessment

7.4.1 VPA and tuning (Table 7.7)

The Extended Survivors analysis (XSA) was used to tune the VPA to survey and CPUE data. The XSA analysis that was used by the Working Group used survivor estimates shrunk towards the mean of the final 2 years and 5 ages. The standard error of the mean to which the estimates were shrunk was set at 2.0. The catchability was assumed to be independent of stock size for all ages but was not fixed to be constant above a certain age. When the dubious CPUE figure for 1992 was included in the tuning, the results did not seem to be reliable. When only the survey was included in the tuning, the VPA did not converge. It was thus decided to revise last year's assessment with 1991 as the last year in the VPA, and then use the catches in 1992 to calculate the fishing mortalities in that year. The diagnostics of the tuning are given in Table 7.7.

7.5 Results of the Assessment

7.5.1 Fishing mortalities and VPA (Tables 7.11-7.13, Fig 7.1)

The fishing mortality ($F_{6,10}$) was relatively high in 1970-71 (0.41) and then showed a declining trend until 1981, when it was only 0.13. Then it showed an increasing trend until 1991, when it reached 0.39. The $F_{6,10}$ in 1992 was calculated to be 0.14 when the catches in 1992 were applied to the stock in the beginning of that year. The $F_{6,10}$ in 1991 (0.39) is lower than the value from last year's assessment (0.55) when the Laurec/Shepherd tuning method was used on the same data (except for minor changes in the catch-at-age and weight-at-age in 1991). The results of a retrospective analysis using the XSA in the same way as mentioned above back to 1985 is given in Figure 7.1, together with the 1991 assessment. This analysis show the method to be fairly consistent.

A summary of the historic series of landings, fishing mortality, stock biomass and recruitment from 1970-1991 is given in Table 7.13.

7.5.2 Recruitment (Tables A12, E1-E3)

The 4 recruitment indices available were included in the RCT3 program. The recruitment of this stock seems to have been quite stable, and a reliable estimate of year-class size from the VPA is not available for any of the latest year classes for which a low 0-group index were recorded. Thus, the RCT3 program gave a bad and variable statistical fit between the survey indices and the VPA, and the mean therefore contributed very much to the final estimates.

The indices of age groups 2-4 from the 1992 Svalbard survey are much lower than in any year before (3, 17 and 26 % of the lowest level previously observed, respectively). The 1-group index from this survey in 1992 is also the lowest ever recorded, and the 0-group indices of the 1989-1992 year classes is also less than half of any of the indices in the 1978-1987 period, when the recruitment was stable. This should indicate that the recruitment of the year classes 1988 and later will be much lower than the level experienced in the period 1978-1987. A value of 10 million individuals as recruitment at age 3 was thus chosen for the year classes 1988 and later. This level is only about 40% of the lowest level experienced in the period 1978-1987, but is still higher than most of the surveys indicate.

7.5.3 State of the stock

The spawning stock size decreased from 90,000 - 110,000 t in the period 1976-1983 to below 70,000 t in 1988 and the following years. This is the lowest level experienced in the relatively short (from 1970) time

series. The low recruitment observed in the recent years indicate that this spawning stock biomass is below the level needed to ensure a normal recruitment. The total biomass of the stock has been relatively stable (around 130,000 t) since 1982.

7.6 Predictions of Catches and Biomasses

7.6.1 Data used in the prediction (Table 7.14-15)

Input data used in the short-term prediction for 1993 are shown in Table 7.14. Population numbers in 1993 are those calculated by applying the 1992 catch-at-age to the final VPA for age groups 4 and older (Table 7.15).

The exploitation pattern used is the 1992 pattern, but smoothed by reducing the high value at age 10 (0.36) to the level of age groups 9 and 11 (0.11). This pattern was chosen because the regulations introduced in 1992 will continue also in 1993. The maturity ogive is the average of the 1989 and 1990 ogives. Weight at age in both the catch and the stock has been set equal to the weight at age in the catch averaged for the years 1991 and 1992.

7.6.2 Biological reference points (Figure 7.2C)

Yield and spawning stock biomass-per-recruit have been calculated using the data which are input to the prediction, and the results have been plotted in Figure 7.2 C. The values of $F_{0.1}$ and F_{max} are 0.05 and 0.13, respectively, which are much lower than the values found last year. This change is due to the shift the fishing pattern caused by the restrictions. Using the stock-recruitment plot from last year's assessment the values of F_{low} , F_{med} and F_{high} have been taken as 0.07, 0.23 and 0.32, respectively.

7.6.3 Results of projections of catches and biomass (Tables 7.16-7.17, Fig. 7.2D)

If the expected catch of 11,500 t in 1993 is taken, the fishing mortality will be 0.11 compared to 0.14 in 1992 (Table 7.16). The spawning stock biomass will then increase to 85 thousand tonnes in 1994, which will be the highest level since 1984. Medium-term predictions from 1994 to 1998 were run using the same input as in the short-term prediction, for no fishing and a status quo F (0.14). The results are given in Table 7.17 and Figure 7.2D. When fishing at F status quo the spawning stock biomass will be reduced from 85 thousand tonnes in 1994 to 66 thousand tonnes in 1998, while the spawning stock biomass will increase to 144 thousand tonnes if no fishing is conducted.

7.7 Comments to the Results of the Assessments and Predictions

The stock is at a low level. The spawning stock biomass will increase from 1992 to 1994, but is still low. This increase is due to the regulations introduced. However, the poor recruitment will probably lead to a drop in the spawning stock biomass in the coming years if fishing is continued at status quo F , as indicated by the medium-term prediction. The Working Group recommends that the fishing mortality should be kept at as low a level as possible in order to avoid a severe decline in spawning stock biomass and hopefully to rebuild the stock.

8 COASTAL COD IN SUB-AREAS I AND II

New Norwegian data from an acoustic trawl survey along the northernmost coast of Norway during the autumn 1992 (SUB-AREAS I and II: statistical areas 03, 04 and 05, Figure 8.1) (Eliassen *et al.*, 1993) are included in the evaluation of the coastal cod stock in addition to the SHOT forecast.

8.1 Historical background

The hypothesis of the existence of a Coastal cod stock which can be separated from the North-East Arctic cod stock by differences in the otolith structure was given by Rollefsen (1933).

The main background for the introduction of the Norwegian Coastal cod and the Murman cod to the ICES' Arctic Fisheries Working Group in the 1960's and 1970's was an increased understanding of the existence of such stocks in Norway and Russia in addition to the North-East Arctic Cod stock. In 1970 the Arctic Fisheries WG (Anon, 1970) said: "However, there is a second cod population living in Norwegian waters which is distinguished by characteristics of their otolith structure. ... Mature (Arcto-Norwegian) cod are caught as far south as the southern part of Division IIa, but outside the spawning season few Arcto-Norwegian cod, if any, are found south of Vestfjord, north of Vestfjord, and especially in the northern part of Division IIa and along the Finnmark coast both types are found throughout the year, with the proportion of coastal cod decreasing towards the open sea. ... The group also noted that although coastal cod populations do occur along the USSR coast of Sub-area I, their catches are included in the statistics for the Arcto-Norwegian cod". From 1980 the procedure of submitting the catches of Coastal cod changed. Catches taken at all times of the year (included the spawning season) in statistical areas 06 and 07 (South of Vestfjord to Møre) were completely excluded from the catch-statistics of the North-East Arctic cod.

The present definition of the Coastal cod is "to assume that all cod south of 67°N are Coastal cod and during the last half of the year the area is extended North to about 70°N (Anon., 1991). On this basis the Norwegian landings of Coastal cod use the landings from the Division IIA, statistical areas 05 and 00 (in Quarter 3 and 4), 06 and 07 (all year), and these landings can be followed back to 1960 (Anon., 1971), but were excluded from the landings used in the assessments of the North-East Arctic cod stock (Table 8.1A). This definition excludes all Coastal cod in area 04 and 03 (from Tromsø at 70°N and north-eastwards). On the other hand more recent research gives evidence for an existence of Coastal cod North-East of Tromsø. This is the tagging experiments of cod both in the fjords off Finnmark (10,000 tagged) and Troms (10,000 tagged), the 1992 acoustic investigations and the different types of the ring structures of the otoliths in the Coastal and the North-East Arctic cod (Jakobsen, 1987; Eliassen *et al.*, 1993)

In 1974 USSR gave statistics for the Murman cod (Table 8.1B) for the period 1960-1974 for the Division I (Anon., 1975). Those landings were, like the Norwegian Coastal cod, reported to be in addition to the North-East Arctic Cod stock. In the assessments for 1974 the VPA's for the North-East Arctic Cod stock were run without additional Norwegian Coastal cod landings, but the Arctic Fisheries Working Group chose to include the Murman cod landings as an option, and from this year the Murman cod landings were included in the USSR/Russian landings of cod.

In 1975, as a result of: firstly) the Arctic Fisheries Working Group discussions on the Norwegian Coastal Cod and the Russian Murman Cod (Anon., 1975); and secondly) the introduction of an international quota scheme; Norway and Russia were allowed to fish coastal cod, within limits. Respectively, Russia was allocated 40,000 t of Murman Cod, and this amount is withdrawn from the North-East Arctic Cod stock TAC before the TAC is further allocated Russia, Norway and "Other Countries". On the other hand Norway was allocated a 40,000 t quota of Coastal cod which is added to the Norwegian North-East Arctic Cod quota. These two quotas levels have been given yearly up till today. The reason for this differentiation in the technicalities of calculating those two coastal quotas is based upon Anon. (1976) who is saying: "The Norwegian coastal cod have for a long time been treated as a separate unit stock both from a genetical and management point of view. Since the Murman cod type cannot at this stage be treated as an independent unit for management purposes (Anon., 1975), the catches of Murman cod are included in the USSR landings data for 1974 and 1975 which were used for assessment of the North-East Arctic cod stock".

In the period 1977-1989 the Arctic Fisheries Working Group refer to the Murman Cod and the Norwegian

Coastal cod by including the first stock in the North East Arctic cod landings and exclude the second.

In the Arctic Fisheries Working Group in 1990 the Coastal cod was discussed and it was recommended to "clarify the status of these cod categories in relation to the assessment of the North-East Arctic cod stock" (Anon., 1990). Thus, in 1991 the landings of Norwegian Coastal cod for the period 1980-1989 were given (Table 8.1A). In April 1990 it was arranged a Russian(PINRO)-Norwegian(IMR) meeting to discuss the problems of the existence of Coastal cod stocks, and the protocol says: "It was agreed that there is no evidence available of complete reproductive isolation between different cod groups dwelling North of 62°N. Norwegian and Murman coastal cod probably represents ecological (geographical) forms of one and the same integral stock". This was confirmed at the ACFM meeting in 1992. The same procedure of including Murman Cod and excluding the Norwegian Coastal cod landings was kept.

During the most recent years Russia has gradually increased the investigations on the Murman Cod as well as Norway has carried out more research on the Coastal Cod, and the two parties are cooperating in this research.

8.2 Data from Landings (Table 8.1)

During the 1980s and up till today we have had an *ad hoc* collection of the commercial cod landings in the actual areas and a separation into Coastal and North-East Arctic cod types, and only "when it was reason to suspect North-East Arctic cod in the catches" (Anon., 1991). On the other hand all catches in the fjords and near coastal areas are included in the Norwegian catches and are used in the North-East Arctic cod stock assessments, except from the catches in Division IIA, statistical areas 05 and 00 (Quarter 3 and 4), 06 (all year) and 07 (all year) (Table 8.1), which are used in the SHOT forecast for the Coastal cod.

8.3 Survey Results

8.3.1 Length and weight in the stock (Tables 8.2 and 8.3)

The length and weight of the Coastal cod is based on data from the acoustic and trawl (276 hauls) survey 1992 (Tables 8.2 and 8.3). There are two main tendencies in the length-weight material for the Coastal cod: a general increase in both length and weight from the inner fjords to the slope, and similarly going from West to the North-East. The length of the North-East Arctic cod caught in fjords tended to be larger than the Coastal cod in the same area, except in Varangerfjord and for Coastal cod in the shelf areas.

8.3.2 Maturity ogives (Table 8.4)

The maturity ogives from the Coastal cod are given for the various statistical areas (Table 8.4). The data are from the survey in 1992. Some of the Coastal cod started to mature at an age of 3 years, both in the fjords and at the shelf areas. 50 % maturity was reached between ages of 4-6, and 100 % maturity at 6-9 years. This is lower than for the North-East Arctic cod.

8.4 Stock assessment

8.4.1 The acoustic trawl survey (Tables 8.5-8.9)

The distribution of the Coastal cod is based upon the 1992 survey. The cod otolith material was aged and separated into Coastal and North-East Arctic Cod types (4,037 otoliths) and the age readings of this material is calibrated with IMR, Bergen. The analysis of the otolith material indicate that the fjords and inner coastal areas have a significantly larger proportion of the Coastal type cod than the outer coastal zone.

The total biomass of cod in the investigated area was estimated to be 112,500 t, and 78,000 t of this was estimated to be Coastal cod (Tables 8.5-8.7). The spawning stock biomass of the Coastal cod was calculated to be about 52,000 t (Tables 8.8 and 8.9).

8.4.2 The SHOT forecast (Table 8.10)

The SHOT forecast for the Coastal cod was first used in 1992 (Shepherd, 1991; Anon., 1992) after a discussion on the most appropriate way of solving the assessment problem. Simply including the Coastal cod in the assessment of the North-East Arctic cod by raising the catch-at-age to the total landings would lead to errors of an unknown degree in the estimates. This is because of the absence of adequate catch-at-age data and tuning data on the coastal cod, and it would disturb the historical time-series of the N-E Arctic cod.

The Working Group feels now that the assessments of the North-East Arctic cod and the Norwegian Coastal cod should be made separately, and the results combined to give a total TAC.

The results of the SHOT forecast are given in Table 8.10. The SHOT forecast was made using the landings of Norwegian Coastal cod from 1980 to 1992 (Table 8.1). This year the Working Group used the growth rate for the ages 3-7 calculated from the 1992 acoustic trawl survey (Table 8.3): $G = 0.41$, which is similar to the $G = 0.42$ from the North-East Arctic cod used in 1992. The natural mortality was set to $M = 0.20$. The yield to biomass ratio was calculated using input F values to adjust the estimated landings to be equal to the reported

landings. No recruitment indices were available and the series were set to 1.0.

Under these assumptions both the estimated exploitable biomass and the yield from the Coastal cod seem to increase during the first part of the 1990s. The SHOT forecast calculated to be 47,000 t in 1993 and 51,000 t in 1994. The F-values in 1993 and 1994 are kept at a low level in this SHOT forecast, and this may be too low in a situation with an increased fishery on the North-East Arctic cod for 1993.

8.5 Comments on the Stock Situation and the Assessments

The SHOT-forecast was made using no recruitment data, and in the future both the SHOT forecast and other assessments of the coastal cod should be made using data from recruit surveys in the coastal areas.

The 1992 survey material strengthens the hypothesis of the existence of a Coastal cod stock in the Counties of Troms and Finnmark. The future investigations on the Coastal cod should be combined with sampling the commercial catches according to areas, both for separating the Coastal and the North-East Arctic Cod stocks, as well as for splitting the catch data into the different coastal areas where the fish were actually taken. More extended sampling in the coastal areas has been recommended previously by the Arctic Fisheries Working Group. The sampling especially needs to be improved South of Vestfjord because the spawning stock of North-East Arctic cod are increasing, and extending its distribution.

The coastal cod survey estimates may represent a minimum estimate of the biomass. The estimates are based on the acoustic integration method and were combined with a substantial numbers of pelagic and demersal trawl hauls. This method has some major limitations: i) it can be difficult, if not impossible to take trawl hauls close to or at the bottom along steep slopes. A significant part of the fjords and near coastal bottom areas contain such slopes. This is partly solved by trawling at plain plateaus at different depths; ii) The acoustic method has also problems in getting precise registrations along the slopes due to side-lobes and the blind zone of the beams. Both problems affect the sampling methods and the slopes may hide some fish which may be unregistered. Methods to solve those problems should be looked upon.

Though a survey programme is started for coastal cod, the area coverage is varying each year. During the 1992 survey the areas of Finnmark and Troms Counties were given priority, while the 1993 survey is allocated further South to Nordland County. Principally, it is recommended that the Coastal cod should be sampled every

year along its distribution, alternatively each second year.

Before further assessments are done, based on the acoustic trawl surveys, results from a larger area of the coast should be available, such as the 1993 acoustic trawl survey which is in progress in Nordland County.

9 RECOMMENDATIONS

9.1 Methods Standardization

The experience of the Working Group in the recent years is too much time is spent on discussing methods, assessment procedures and technicalities during the meeting. This has also been the case at this year's meeting, since both new computer programs and new assessment procedures were presented to the Working Group. It is obvious to the Working Group that some of the recommended and default procedures and input parameters to the assessments are not suitable for many of the demersal stocks in Sub-areas I and II. Standardization of procedures and input parameters for each stock in these sub-areas would reduce unwanted year to year changes in the assessments.

Last year the Working Group recommended that a workshop should be arranged as soon as possible on standardization of assessment procedures for Arctic demersal stocks. This year the Working Group has received an invitation from the Spanish members in the Group to hold such a meeting in Spain, at the Instituto Español de Oceanografía. The Working Group recommends that steps are taken to ensure that a workshop on these subjects be arranged.

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Table 3.1 North-East Arctic COD. Total nominal catch (t) by fishing areas. (Data provided by Working Group members.)

Year	Sub-area I	Division IIa	Division IIb	Total catch
1961	409,694	153,019	220,508	783,221
1962	548,621	139,848	220,797	909,266
1963	547,469	117,100	111,768	776,337
1964	206,883	104,698	126,114	437,695
1965	241,489	100,011	103,430	444,983
1966	292,253	134,805	56,653	483,711
1967	322,798	128,747	121,060	572,605
1968	642,452	162,472	269,254	1,074,084
1969	679,373	255,599	262,254	1,197,226
1970	603,855	243,835	85,556	933,246
1971	312,505	319,623	56,920	689,048
1972	197,015	335,257	32,982	565,254
1973	492,716	211,762	88,207	792,685
1974	723,489	124,214	254,730	1,102,433
1975	561,701	120,276	147,400	829,377
1976	526,685	237,245	103,533	867,463
1977	538,231	257,073	109,997	905,301
1978	418,265	263,157	17,293	698,715
1979	195,166	235,449	9,923	440,538
1980	168,671	199,313	12,450	380,434
1981	137,033	245,167	16,837	399,037
1982	96,576	236,125	31,029	363,730
1983	64,803	200,279	24,910	289,992
1984	54,317	197,573	25,761	277,651
1985	112,605	173,559	21,756	307,920
1986	157,631	202,688	69,794	430,113
1987	146,106	245,387	131,578	523,071
1988	166,649	209,930	58,360	434,939
1989	164,512	149,360	18,609	332,481
1990	62,272	99,465	25,263	187,000
1991	70,970	156,966	41,222	269,158
1992 ¹	120,711	171,586	85,760	378,057

¹Provisional figures.

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

Year	Sub-area I		Division IIa		Division IIb		Others
	Trawl	Others	Trawl	Others	Trawl	Others	
1967	238.0	84.8	38.7	90.0	121.1	-	-
1968	588.1	54.4	44.2	118.3	269.2	-	-
1969	633.5	45.9	119.7	135.9	262.3	-	-
1970	524.5	79.4	90.5	153.3	85.6	-	-
1971	253.1	59.4	74.5	245.1	56.9	-	-
1972	158.1	38.9	49.9	285.4	33.0	-	-
1973	459.0	33.7	39.4	172.4	88.2	-	-
1974	677.0	46.5	41.0	83.2	254.7	-	-
1975	526.3	35.4	33.7	86.6	147.4	-	-
1976	466.5	60.2	112.3	124.9	103.5	-	-
1977	471.5	66.7	100.9	156.2	110.0	-	-
1978	360.4	57.9	117.0	146.2	17.3	-	-
1979	161.5	33.7	114.9	120.5	8.1	-	-
1980	133.3	35.4	83.7	115.6	12.5	-	-
1981	91.5	45.1	77.2	167.9	17.2	-	-
1982	44.8	51.8	65.1	171.0	21.0	-	-
1983	36.6	28.2	56.6	143.7	24.9	-	-
1984	24.5	29.8	46.9	150.7	25.6	-	-
1985	72.4	40.2	60.7	112.8	21.5	-	-
1986	109.5	48.1	116.3	86.4	69.8	-	-
1987	126.3	19.8	167.9	77.5	129.9	1.7	-
1988	149.1	17.6	122.0	88.0	58.2	0.2	-
1989	144.4	19.5	68.9	81.2	19.1	0.1	-
1990	51.4	10.9	47.4	52.1	24.5	0.8	-
1991	58.9	12.1	73.0	84.0	40.0	1.2	-
1992 ¹	100.2	20.5	79.5	92.1	84.8	1.0	-

¹Provisional.

Table 3.3 North-East Arctic COD. Nominal catch (t) 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	United Kingdom	USSR/Russia ²	Others	Total all countries
1961	3,934	13,755	3,921	8,129	268,377	-	158,113	325,780	1,212	783,221
1962	3,109	20,482	1,532	6,503	225,615	-	175,020	476,760	245	909,266
1963	-	18,318	129	4,223	205,056	108	129,779	417,964	-	775,577
1964	-	8,634	297	3,202	149,878	-	94,549	180,550	585	437,695
1965	-	526	91	3,670	197,085	-	89,962	152,780	816	444,930
1966	-	2,967	228	4,284	203,792	-	103,012	169,300	121	483,704
1967	-	664	45	3,632	218,910	-	87,008	262,340	6	572,605
1968	-	-	225	1,073	255,611	-	140,387	676,758	-	1,074,084
1969	29,374	-	5,907	5,543	305,241	7,856	231,066	612,215	133	1,197,226
1970	26,265	44,245	12,413	9,451	377,606	5,153	181,481	276,632	-	933,246
1971	5,877	34,772	4,998	9,726	407,044	1,512	80,102	144,802	215	689,048
1972	1,393	8,915	1,300	3,405	394,181	892	58,382	96,653	166	565,287
1973	1,916	17,028	4,684	16,751	285,184	843	78,808	387,196	276	792,686
1974	5,717	46,028	4,860	78,507	287,276	9,898	90,894	540,801	38,453	1,102,434
1975	11,309	28,734	9,981	30,037	277,099	7,435	101,843	343,580	19,368	829,377
1976	11,511	20,941	8,946	24,369	344,502	6,986	89,061	343,057	18,090	867,463
1977	9,167	15,414	3,463	12,763	388,982	1,084	86,781	369,876	17,771	905,301
1978	9,092	9,394	3,029	5,434	363,088	566	35,449	267,138	5,525	698,715
1979	6,320	3,046	547	2,513	294,821	15	17,991	105,846	9,439	440,538
1980	9,981	1,705	233	1,921	232,242	3	10,366	115,194	8,789	380,434
<u>Spain</u>										
1981	12,825	3,106	298	2,228	277,818	14,500	5,262	83,000	-	399,037
1982	11,998	761	302	1,717	287,525	14,515	6,601	40,311	-	363,730
1983	11,106	126	473	1,243	234,000	14,229	5,840	22,975	-	289,992
1984	10,674	11	686	1,010	230,743	8,608	3,663	22,256	-	277,651
1985	13,418	23	1,019	4,395	211,065	7,846	3,335	62,489	4,330	307,920
1986	18,667	591	1,543	10,092	232,096	5,497	7,581	150,541	3,505	430,113
1987	15,036	1	986	7,035	268,004	16,223	10,957	202,314	2,515	523,071
1988	15,329	2,551	605	2,803	223,412	10,905	8,107	169,365	1,862	434,939
1989	15,625	3,231	326	3,291	158,684	7,802	7,056	134,593	1,273	332,481
1990	9,584	592	169	1,437	88,737	7,950	3,412	74,609	510	187,000
1991	8,981	975		2,613	126,226	3,677	3,981	119,427 ³	3,278	269,158
1992 ¹	11,588	1,947		3,911	161,413	6,217	6,120	182,315	4,546	378,057

¹Provisional figures.

²From 1991.

³With Baltic countries

Table 3.4 North-East Arctic COD. Weights at age (kg) in Norwegian and Russian landings.

Norway

Year	Age													
	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1984	1.16	1.47	1.97	2.53	3.13	3.82	4.81	5.95	7.19	7.86	8.46	7.99	9.78	10.64
1985	0.76	1.47	1.90	2.49	3.32	4.21	5.01	5.94	7.10	8.20	8.92	9.73	9.85	9.26
1986	(1.2	1.24	1.94	2.53	3.36	4.54	5.60	5.94	6.73	8.20	8.76	9.94	7.80	8.23
1987	0)	0.92	1.45	2.24	3.04	4.17	5.33	6.62	6.99	8.33	8.58	9.58	8.27	10.67
1988	0.56	0.55	0.82	1.36	2.38	3.75	5.84	7.05	8.55	11.28	11.63	14.10	-	-
1989	0.54	0.86	1.06	1.34	1.96	3.22	5.07	8.09	9.45	11.60	10.54	-	18.61	17.11
1990	0.36	1.62	1.73	1.95	2.54	3.42	5.07	8.18	10.48	14.16	17.85	-	14.34	-
1991	1.19	1.47	1.86	2.34	3.00	3.66	4.60	6.02	8.97	11.75	17.32	-	-	-
1992	1.05	1.14	1.93	2.64	3.13	4.14	5.03	5.86	7.37	11.63	12.97	-	15.30	-
1993 ¹	-	1.02	1.77	2.46	3.33	4.32	5.40	5.93	6.81	7.75	-	-	-	-

Russia

Year	Age													
	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1984	0.22	0.76	1.30	2.04	2.90	4.12	5.56	8.76	13.55	14.95	14.85	19.52	19.31	22.37
1985	0.29	0.77	1.23	1.75	2.64	3.93	5.35	6.72	9.87	9.00	13.72	15.10	15.20	19.25
1986	0.22	0.63	1.15	1.75	2.44	4.09	6.19	8.15	10.31	11.73	17.29	-	27.30	-
1987	0.24	0.41	0.92	1.51	2.14	2.95	5.62	7.13	11.17	10.90	12.29	-	-	-
1988	0.11	0.48	0.82	1.33	2.07	3.04	4.93	7.08	9.68	-	17.50	22.10	-	-
1989	0.22	0.46	0.87	1.25	1.84	2.71	4.34	6.59	9.14	12.47	14.32	13.60	-	-
1990 ¹	0.34	0.77	1.33	1.86	2.27	3.31	4.36	7.20	9.34	8.53	12.87	-	-	-
1991	0.24	0.54	0.98	1.79	2.62	3.69	5.19	7.41	11.17	15.38	13.78	-	15.40	19.40
1992	0.26	0.92	1.40	2.14	3.24	4.62	5.81	7.49	10.16	17.45	19.00	-	23.00	-
1993 ²	-	0.67	1.23	1.85	2.46	3.96	5.70	6.76	7.93	11.55	18.35	-	-	-

¹Revised.

²Weights from the period January-June.

Table 3.5. Cod in the North-East Arctic (Fishing Areas I and II)

Mean Weight of Catch (Kilograms)

(WECA)

Year	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15
1946	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1947	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1948	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1949	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1950	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1951	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1952	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1953	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1954	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1955	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1956	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1957	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1958	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1959	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1960	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1961	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1962	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1963	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1964	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1965	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1966	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1967	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1968	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1969	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1970	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1971	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1972	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1973	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1974	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1975	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1976	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1977	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1978	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1979	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1980	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1981	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1982	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1983	-1.00	-1.00	0.90	1.46	2.19	2.78	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1984	-1.00	-1.00	1.35	1.84	2.43	3.11	3.84	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1985	-1.00	-1.00	1.25	1.56	2.14	3.19	4.18	5.06	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1986	-1.00	-1.00	0.97	1.61	2.21	2.99	4.31	5.73	6.82	7.70	9.25	10.85	12.50	13.90	15.00
1987	-1.00	-1.00	0.65	1.10	1.92	2.56	3.44	5.41	6.69	7.70	9.25	10.85	12.50	13.90	15.00
1988	-1.00	-1.00	0.52	0.82	1.34	2.27	3.48	5.38	7.06	8.90	9.25	10.85	12.50	13.90	15.00
1989	-1.00	-1.00	0.52	0.90	1.27	1.91	3.01	4.89	7.68	9.36	10.57	10.85	12.50	13.90	15.00
1990	-1.00	0.85	1.10	1.53	1.89	2.36	3.38	4.75	7.89	10.14	13.24	16.94	12.50	13.90	15.00
1991	0.09	0.34	0.96	1.49	2.06	2.74	3.68	4.80	6.50	9.51	11.75	17.32	18.50	13.90	15.00
1992	0.07	0.26	0.98	1.57	2.36	3.20	4.43	5.51	6.35	8.30	11.63	12.97	12.50	15.30	15.00

Table 3.6.

Cod in the North-East Arctic (Fishing Areas I and II)

Mean Weight of Stock (Kilograms)

(WEST)

Year	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10	Age 11	Age 12	Age 13	Age 14	Age 15
1946	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1947	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1948	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1949	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1950	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1951	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1952	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1953	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1954	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1955	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1956	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1957	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1958	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1959	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1960	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1961	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1962	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1963	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1964	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1965	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1966	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1967	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1968	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1969	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1970	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1971	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1972	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1973	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1974	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1975	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1976	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1977	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1978	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1979	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1980	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1981	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1982	-1.00	-1.00	0.65	1.00	1.55	2.35	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1983	-1.00	-1.00	0.36	1.01	1.63	2.53	3.45	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1984	-1.00	-1.00	0.53	1.20	1.90	2.91	3.97	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1985	-1.00	-1.00	0.46	0.91	1.71	2.94	4.17	5.04	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1986	-1.00	-1.00	0.32	0.93	1.57	2.52	3.83	5.30	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1987	-1.00	-1.00	0.21	0.50	1.25	2.12	3.46	5.22	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1988	-1.00	-1.00	0.19	0.36	0.70	1.58	2.70	4.30	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1989	-1.00	-1.00	0.30	0.51	0.86	1.47	2.62	4.70	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1990	-1.00	-1.00	0.40	0.68	1.16	1.72	2.66	4.51	6.17	7.70	9.25	10.85	12.50	13.90	15.00
1991	-1.00	-1.00	0.48	1.14	1.73	2.47	3.28	4.38	7.37	7.70	9.25	10.85	12.50	13.90	15.00
1992	-1.00	-1.00	0.44	0.83	1.59	2.59	3.78	5.02	6.75	10.85	9.25	10.85	12.50	13.90	15.00

Table 3.7 North-East Arctic COD. Basis for maturity ogives (percent) used in the assessment. Norwegian and Russian data.

Year	Percentage mature							
	Age							
	3	4	5	6	7	8	9	10
<u>Norway</u>								
1982	-	5	10	34	65	82	92	100
1983	5	8	10	30	73	88	97	100
<u>Russia</u>								
1984	-	5	18	31	56	90	99	100
1985	-	1	10	33	59	85	92	100
1986	-	2	9	19	56	76	89	100
1987	-	1	9	23	27	61	81	80
1988	-	1	3	25	53	79	100	100
1989	-	-	2	15	39	59	83	100
1990	-	2	6	20	47	62	81	95
1991	-	3	1	23	66	82	96	100
1992	-	1	8	31	73	92	95	100
1993	-	3	7	21	56	89	95	99

Table 3.8a

Cod in the North-East Arctic (Fishing Areas I and II)
Norwegian Svalbard Bottom Trawl Survey (code: FLT28) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1983	1	10.7	9.5	2.4	1.9	1.0	1.3
1984	1	7.3	4.3	4.7	1.8	0.4	0.4
1985	1	99.1	28.4	13.6	5.4	1.0	0.4
1986	1	297.0	42.8	15.3	2.6	1.0	0.3
1987	1	141.0	125.0	17.1	5.4	0.5	0.1
1988	1	33.2	31.8	37.1	9.5	0.6	0.6
1989	1	15.4	12.8	11.9	19.2	3.2	0.4
1990	1	8.6	14.6	23.4	16.5	20.0	2.0
1991	1	25.3	8.5	13.9	16.0	13.5	19.0
1992	1	105.0	56.0	16.2	7.3	5.7	3.3

Table 3.8b

Cod in the North-East Arctic (Fishing Areas I and II)
Russian Trawl/Acoustic survey (code: FLT29) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1982	1	14.1	5.1	1.3	3.6	0.7	0.2
1983	1	5.6	7.3	4.7	2.0	0.8	1.1
1984	1	16.2	8.6	5.0	3.1	1.1	0.4
1985	1	30.3	40.5	18.8	4.9	1.9	0.6
1986	1	56.5	16.1	10.6	3.0	0.8	0.3
1987	1	5.9	42.6	5.4	3.1	0.6	0.1
1988	1	7.7	7.8	19.0	2.5	0.6	0.1
1989	1	3.4	8.8	11.8	15.5	11.4	2.6
1990	1	3.8	4.4	6.6	6.0	11.3	1.8
1991	1	12.7	5.0	6.1	7.5	8.9	6.0
1992	1	48.5	18.2	6.9	5.3	5.2	4.0

Table 3.8c

Cod in the North-East Arctic (Fishing Areas I and II)
Russian acoustic survey (code: FLT30) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1985	1	422.0	255.0	83.0	44.0	50.0	21.0
1986	1	980.0	444.0	183.0	56.0	62.0	19.0
1987	1	170.0	738.0	99.0	67.0	42.0	20.0
1988	1	161.0	106.0	245.0	34.0	10.0	2.0
1989	1	17.0	44.0	56.0	99.0	82.0	20.0
1990	1	29.0	35.0	52.0	46.0	89.0	14.0
1991	1	101.0	43.0	50.0	58.0	70.0	51.0
1992	1	317.0	110.0	45.0	37.0	38.0	29.0

Table 3.8d

Cod in the North-East Arctic (Fishing Areas I and II)

Norwegian Barents Sea trawl survey shifted (code: FLT35) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1980	1	124.0	243.0	270.0	41.0	8.0	3.0
1981	1	86.0	93.0	73.0	74.0	5.0	1.0
1982	1	45.0	65.0	38.0	17.0	10.0	2.0
1983	1	80.0	63.0	46.0	16.0	1.0	0.5
1984	1	510.0	109.0	48.0	20.0	2.0	1.0
1985	1	424.0	225.0	27.0	9.0	0.1	0.1
1986	1	500.0	128.0	37.0	4.0	3.0	0.1
1987	1	74.0	179.0	26.0	6.0	0.5	0.5
1988	1	77.0	56.0	145.0	21.0	3.0	0.5
1989	1	61.0	81.0	73.0	138.0	10.0	2.0
1990	1	108.0	109.0	101.0	55.0	58.0	4.0
1991	1	205.0	67.0	46.0	28.0	15.0	11.0
1992	1	487.0	258.0	47.0	24.0	12.0	6.0

Table 3.8e

Cod in the North-East Arctic (Fishing Areas I and II)

Norwegian Barents Sea trawl survey (shifted) (code: FLT36) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1982	1	45.4	44.1	18.9	6.0	3.9	0.8
1983	1	32.7	25.4	14.4	4.2	0.6	0.3
1984	1	126.0	21.7	8.4	3.3	0.3	0.1
1985	1	173.0	102.0	30.6	7.3	0.8	0.2
1986	1	415.0	61.1	15.4	1.8	0.5	0.1
1987	1	102.0	231.0	25.7	4.8	0.8	0.1
1988	1	73.2	43.3	104.0	11.7	1.0	0.2
1989	1	37.0	43.8	27.0	31.4	1.7	0.5
1990	1	24.6	23.9	21.7	12.2	12.7	0.7
1991	1	62.7	25.0	15.7	9.9	5.2	3.5
1992	1	195.3	91.1	20.4	9.2	5.7	2.9

Table 3.8f

Cod in the North-East Arctic (Fishing Areas I and II)

Norwegian Trawler Survey in October - November (code: FLT40) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9	Catch, age 10
1989	1	433	1575	2105	6648	1624	195	25	2
1990	1	618	1606	2775	2390	5124	624	59	7
1991	1	899	2662	2534	3183	3528	236	4468	391
1992	1	4187	8627	2745	1093	1017	573	907	57

Table 3.9

NORTHEAST ARCTIC COD : recruits as 3 year-olds (inc. data for ages 0,1,2 & 3)																	
16,36,2		(No. of surveys, No. of years, VPA Column No.)															
1957	800	-11	-11	-11	-11	12	16	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1958	929	-11	-11	-11	-11	16	24	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1959	736	-11	-11	-11	-11	18	14	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1960	478	-11	-11	-11	-11	9	19	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1961	342	-11	-11	-11	-11	2	2	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1962	776	-11	-11	-11	-11	7	4	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1963	1598	-11	-11	-11	-11	21	120	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1964	1306	-11	-11	-11	-11	49	45	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1965	171	-11	-11	-11	-11	1	1	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
1966	113	-11	-11	-11	-11	2	1	002	-11	-11	-11	-11	-11	-11	-11	-11	-11
1967	199	-11	-11	-11	-11	1	1	004	-11	-11	-11	-11	-11	-11	-11	-11	-11
1968	409	-11	-11	-11	-11	7	1	002	-11	-11	-11	-11	-11	-11	-11	-11	-11
1969	1027	-11	-11	-11	-11	11	6	025	-11	-11	-11	-11	-11	-11	-11	-11	-11
1970	1837	23	64	60	42	70	85	251	-11	-11	-11	-11	-11	-11	-11	-11	-11
1971	530	7	9	6	3	37	24	077	-11	-11	-11	-11	-11	-11	-11	-11	-11
1972	629	5	4	34	15	54	17	052	-11	-11	-11	-11	-11	-11	-11	-11	-11
1973	621	16	5	15	2	70	5	148	-11	-11	-11	-11	-11	-11	-11	-11	-11
1974	351	1	1	4	1	6	1	029	-11	-11	-11	-11	-11	-11	-11	-11	104
1975	646	60	1	44	1	93	4	090	-11	-11	-11	-11	-11	-11	-11	-11	882, 797
1976	201	1	1	1	1	4	1	013	-11	-11	-11	-11	-11	-11	-11	45	235, 109
1977	142	1	1	2	1	2	1	049	-11	-11	-11	-11	-11	-11	-11	28	14, -11
1978	160	1	2	1	1	1	3	022	-11	-11	-11	-11	-11	-11	-11	16	-11, 58
1979	159	1	1	1	1	1	8	040	-11	-11	-11	-11	-11	-11	-11	-11	73, 71
1980	171	1	1	1	1	1	8	013	-11	-11	23.2	-11	-11	10.7	3	4	17
1981	398	1	1	1	1	4	4	010	-11	17.7	122.0	-11	26.8	7.3	1	15	174
1982	499	1	8	8	13	8	10	059	259.0	366.0	162.0	145.0	113.0	99.1	-11	506	550
1983	952	4	9	11	7	45	41	169	2170.0	647.0	679.0	499.0	452.0	297.0	2382	878	1246
1984	288	1	1	2	8	7	15	155	39.0	403.0	233.0	239.0	181.0	141.0	69	578	126
1985	243	3	10	2	3	4	6	246	562.0	387.0	180.0	40.9	108.0	33.2	625	47	79
1986	159	1	2	1	1	2	5	137	25.3	63.5	37.9	41.5	16.6	15.4	1	23	31
1987	161	1	1	1	1	1	1	017	3.8	12.7	25.8	3.1	2.7	8.6	1	9	32
1988	363	1	1	1	1	7	1	033	7.1	48.9	37.0	3.6	9.4	25.3	-11	58	145
1989	642	1	1	4	1	7	10	038	122.0	212.7	170.4	70.1	101.0	105.0	145	484	490
1990	-11	6	1	4	4	26	72	123	356.7	482.2	313.8	116.0	130.0	-11	277	1004	739
1991	-11	3	6	3	18	-11	-11	230	99.7	304.8	-11	91.8	-11	-11	250	931	-11
1992	-11	10	69	-11	-11	-11	-11	294	423.0	-11	-11	-11	-11	-11	2000	-11	-11
R-1-1	USSR Bottom trawl index, area I, age 1																
R-2B-1	USSR " " " " IIb, age 1																
R-1-2	USSR " " " " I, age 2																
R-2B-2	USSR " " " " IIb, age 2																
R-1-3	USSR " " " " I, age 3																
R-2B-3	USSR " " " " IIb, age 3																
INTOGP	International 0-group survey, Scaled X 100																
N-BST1	Norwegian Barents Sea, Bottom trawl survey, age 1																
N-BST2	Norwegian " " " " " age 2																
N-BST3	Norwegian " " " " " age 3																
N-SVT1	Norwegian Svalbard area " " " " age 1																
N-SVT2	Norwegian " " " " " age 2																
N-SVT3	Norwegian " " " " " age 3																
N-BSA1	Norwegian Barents Sea Acoustic survey age 1																
N-BSA2	Norwegian " " " " " age 2																
N-BSA3	Norwegian " " " " " age 3																

Table 3.10a

Analysis by RCT3 ver3.1 of data from file :

j:\scratch\wg_108\cod_arct\rcrt-dat.rci

NORTHEAST ARCTIC COD : recruits as 3 year-olds (inc. data for ages 0,1,2 & 3)

Data for 16 surveys over 36 years : 1957 - 1992

Regression type = C
 Tapered time weighting applied
 power = 3 over 20 years
 Survey weighting not applied

Final estimates shrunk towards mean
 Minimum S.E. for any survey taken as .20
 Minimum of 3 points used for regression

Forecast/Hindcast variance correction used.

Yearclass = 1988

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-1-1	1.32	4.24	.92	.347	18	.69	5.16	1.056	.020
R-2B-1	1.49	3.82	.95	.334	18	.69	4.86	1.101	.018
R-1-2	.82	4.54	.44	.694	18	.69	5.11	.516	.083
R-2B-2	1.29	4.08	.79	.415	18	.69	4.97	.922	.026
R-1-3	.58	4.59	.31	.826	31	2.08	5.79	.352	.179
R-2B-3	1.10	3.54	.82	.399	31	.69	4.30	1.004	.022
INTOGP	1.67	-.99	1.79	.124	22	3.53	4.90	2.050	.005
N-BST1	.37	3.98	.54	.677	6	2.09	4.76	.792	.035
N-BST2	.72	2.25	1.05	.311	7	3.91	5.07	1.376	.012
N-BST3	.62	2.81	.38	.769	8	3.64	5.06	.489	.092
N-SVT1	.50	3.58	.57	.649	6	1.53	4.35	.912	.027
N-SVT2	.51	3.70	.59	.589	7	2.34	4.90	.810	.034
N-SVT3	.63	3.44	.64	.540	8	3.27	5.50	.788	.036
N-BSA1									
N-BSA2	.46	3.64	.64	.525	12	4.08	5.52	.742	.040
N-BSA3	.49	3.28	.23	.891	13	4.98	5.75	.263	.319
VPA Mean =						5.64	.641	.054	

Yearclass = 1989

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-1-1	1.55	4.11	1.00	.286	19	.69	5.18	1.152	.017
R-2B-1	1.63	3.73	1.04	.271	19	.69	4.86	1.210	.016
R-1-2	.91	4.53	.51	.608	19	1.61	5.98	.587	.067
R-2B-2	1.36	4.05	.84	.362	19	.69	5.00	.978	.024
R-1-3	.59	4.59	.29	.831	32	2.08	5.82	.328	.215
R-2B-3	1.20	3.47	.99	.292	32	2.40	6.34	1.148	.017
INTOGP	1.81	-1.50	1.92	.099	23	3.66	5.14	2.190	.005
N-BST1	.40	4.02	.73	.478	7	4.81	5.96	.932	.027
N-BST2	.75	2.22	1.05	.276	8	5.36	6.23	1.310	.013
N-BST3	.66	2.73	.49	.628	9	5.14	6.11	.607	.063
N-SVT1	.56	3.60	.91	.369	7	4.26	5.98	1.165	.017
N-SVT2	.54	3.73	.70	.462	8	4.62	6.21	.878	.030
N-SVT3	.65	3.43	.62	.519	9	4.66	6.44	.781	.038
N-BSA1	.36	4.35	.80	.403	10	4.98	6.15	.999	.023
N-BSA2	.47	3.63	.63	.509	13	6.18	6.55	.766	.039
N-BSA3	.50	3.29	.22	.891	14	6.20	6.37	.265	.327
VPA Mean =						5.64	.607	.063	

Table 3.10b

Yearclass = 1990

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-1-1	2.31	3.56	1.41	.177	20	1.95	8.04	1.761	.009
R-2B-1	2.31	3.07	1.56	.148	20	.69	4.68	1.809	.008
R-1-2	1.04	4.43	.55	.586	20	1.61	6.10	.631	.069
R-2B-2	1.83	3.63	1.22	.224	20	1.61	6.57	1.410	.014
R-1-3	.69	4.49	.36	.770	33	3.30	6.75	.441	.142
R-2B-3	1.21	3.43	.96	.316	33	4.29	8.64	1.379	.015
INTOGP	2.50	-4.14	2.63	.058	24	4.82	7.92	3.086	.003
N-BST1	.46	3.85	.78	.441	8	5.88	6.54	1.002	.028
N-BST2	.79	2.06	1.02	.291	9	6.18	6.92	1.295	.017
N-BST3	.71	2.50	.52	.612	10	5.75	6.61	.655	.064
N-SVT1	.63	3.40	.96	.344	8	4.76	6.39	1.206	.019
N-SVT2	.57	3.64	.69	.470	9	4.88	6.41	.856	.038
N-SVT3									
N-BSA1	.38	4.32	.80	.435	11	5.63	6.47	1.003	.027
N-BSA2	.46	3.67	.58	.563	14	6.91	6.87	.725	.053
N-BSA3	.50	3.26	.21	.907	15	6.61	6.60	.256	.423
VPA Mean =						5.70		.622	.071

Yearclass = 1991

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-1-1	2.75	3.23	1.52	.158	20	1.39	7.04	1.807	.027
R-2B-1	2.38	2.99	1.64	.138	20	1.95	7.61	2.002	.022
R-1-2	1.09	4.40	.54	.594	20	1.39	5.91	.627	.225
R-2B-2	1.85	3.59	1.25	.217	20	2.94	9.05	1.801	.027
R-1-3									
R-2B-3									
INTOGP	2.74	-5.11	2.93	.048	24	5.44	9.78	3.688	.007
N-BST1	.46	3.85	.80	.435	8	4.61	5.97	.989	.091
N-BST2	.78	2.07	1.01	.295	9	5.72	6.56	1.263	.056
N-BST3									
N-SVT1	.63	3.39	.97	.339	8	4.53	6.26	1.222	.059
N-SVT2									
N-SVT3									
N-BSA1	.37	4.36	.80	.448	11	5.53	6.42	1.003	.088
N-BSA2	.46	3.69	.57	.572	14	6.84	6.84	.723	.169
N-BSA3									
VPA Mean =						5.70		.623	.229

Yearclass = 1992

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-1-1	3.30	2.82	1.61	.145	20	2.40	10.73	2.625	.032
R-2B-1	2.44	2.90	1.73	.128	20	4.25	13.27	3.439	.019
R-1-2									
R-2B-2									
R-1-3									
R-2B-3									
INTOGP	3.05	-6.43	3.34	.038	24	5.69	10.94	4.399	.011
N-BST1	.46	3.84	.81	.427	8	6.05	6.65	1.065	.195
N-BST2									
N-BST3									
N-SVT1									
N-SVT2									
N-SVT3									
N-BSA1	.36	4.40	.79	.463	11	7.60	7.17	1.115	.177
N-BSA2									
N-BSA3									
VPA Mean =						5.71		.624	.566

Table 3.10c

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1962	514	6.24	.23	.14	.35	776	6.66
1963	880	6.78	.28	.31	1.25	1599	7.38
1964	1247	7.13	.31	.37	1.39	1307	7.18
1965	360	5.89	.31	.43	1.95	171	5.15
1966	286	5.66	.31	.30	.91	113	4.74
1967	189	5.24	.40	.38	.94	200	5.30
1968	326	5.79	.35	.36	1.05	409	6.02
1969	553	6.32	.35	.17	.24	1027	6.94
1970	2286	7.73	.42	.51	1.50	1837	7.52
1971	1285	7.16	.36	.23	.44	531	6.27
1972	1080	6.99	.39	.31	.60	629	6.45
1973	817	6.71	.31	.27	.76	621	6.43
1974	308	5.73	.29	.15	.28	352	5.86
1975	570	6.35	.22	.28	1.68	647	6.47
1976	298	5.70	.26	.15	.32	201	5.31
1977	274	5.61	.26	.16	.40	143	4.96
1978	218	5.39	.27	.16	.36	160	5.08
1979	209	5.34	.24	.17	.47	160	5.08
1980	146	4.99	.23	.18	.61	171	5.15
1981	200	5.30	.21	.12	.32	398	5.99
1982	484	6.18	.24	.19	.66	500	6.21
1983	886	6.79	.15	.15	1.01	952	6.86
1984	474	6.16	.13	.12	.82	288	5.67
1985	433	6.07	.14	.13	.98	243	5.50
1986	169	5.13	.18	.09	.26	160	5.08
1987	133	4.89	.17	.11	.42	162	5.09
1988	226	5.42	.15	.11	.54	363	5.90
1989	428	6.06	.15	.09	.38	642	6.47
1990	702	6.56	.17	.12	.48		
1991	547	6.31	.30	.23	.59		
1992	672	6.51	.47	.65	1.90		

Table 3.11

VPA Version 3.1 (MSDOS)
1-Sep-93 09:36
Extended Survivors Analysis
Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY3) Overfishing included.
CPUE data from file /users/ifad/ifapwork/wg_108/cod_arct/FLEET.WB3

Data for 6 fleets over 47 years
Age range from 3 to 14

Fleet,	Alpha,	Beta
FLT28: Norwegian Sva	, .600	, .800
FLT29: Russian Trawl	, .900	, 1.000
FLT30: Russian acous	, .900	, 1.000
FLT35: Norwegian Bar	, .900	, 1.000
FLT36: Norwegian Bar	, .900	, 1.000
FLT40: Norwegian Tra	, .800	, .900

Time series weights :
Tapered time weighting applied
Power = 3 over 20 years

Catchability analysis :
Catchability dependent on stock size for ages < 4
Regression type = C
Minimum of 5 points used for regression
Survivor estimates shrunk to the population mean for ages < 4
Catchability independent of age for ages >= 11

Terminal population estimation :
Survivor estimates shrunk towards the mean F
of the final 2 years or the 5 oldest ages.
S.E. of the mean to which the estimates are shrunk = 2.000
Minimum standard error for population
estimates derived from each fleet = .300
Prior weighting not applied

Tuning had not converged after 110 iterations

Total absolute residual between iterations

Continued

Table 3.11 Continued

09 and 110 = .003

Final year F values

Age	3,	4,	5,	6,	7,	8,	9,	10,	11,	12,	13,	14
Iteration **	.0409,	.1520,	.3734,	.4653,	.3481,	.3767,	.3464,	.4066,	.0658,	.4003,	.5262,	.3573
Iteration **	.0409,	.1520,	.3732,	.4651,	.3478,	.3765,	.3471,	.4068,	.0658,	.4002,	.5263,	.3576

Regression weights

	.482,	.579,	.670,	.751,	.820,	.877,	.921,	.954,	.976,	.990,	.997,	1.000,	1.000
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Fishing mortalities

Age,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992
3,	.031,	.024,	.064,	.020,	.020,	.044,	.020,	.022,	.018,	.027,	.011,	.015,	.041
4,	.128,	.097,	.200,	.195,	.121,	.142,	.172,	.157,	.107,	.119,	.046,	.072,	.152
5,	.353,	.227,	.295,	.307,	.291,	.360,	.458,	.508,	.354,	.202,	.086,	.184,	.373
6,	.622,	.512,	.547,	.481,	.573,	.591,	.778,	.884,	.681,	.359,	.163,	.208,	.465
7,	.671,	.851,	.791,	.773,	1.076,	.996,	1.037,	1.102,	.898,	.637,	.218,	.326,	.348
8,	.700,	1.069,	.998,	1.009,	1.203,	1.112,	1.217,	1.070,	1.049,	.531,	.369,	.294,	.376
9,	.875,	1.240,	1.129,	1.006,	1.213,	1.045,	.954,	1.038,	1.247,	.938,	.155,	.406,	.347
10,	1.091,	1.019,	.688,	.853,	1.011,	.706,	1.081,	1.533,	1.199,	1.660,	.412,	.105,	.407
11,	1.339,	1.097,	.592,	.496,	.828,	.609,	.770,	.907,	1.149,	.522,	1.092,	.130,	.066
12,	.856,	.805,	1.266,	.314,	.744,	.545,	1.507,	1.292,	1.482,	.377,	.294,	.638,	.400
13,	1.698,	1.490,	.469,	1.184,	.416,	.596,	.571,	.888,	1.223,	.072,	.994,	.030,	.526
14,	1.186,	1.144,	.838,	.779,	.851,	.707,	.981,	1.144,	1.272,	.727,	.606,	.263,	.358

XSA population numbers

			AGE										
YEAR,	3,	4,	5,	6,	7,	8,	9,	10,					
1980,	1.42E+05,	1.57E+05,	3.04E+05,	9.56E+04,	3.99E+04,	1.63E+04,	6.65E+03,	5.32E+03,	1.02E+03,	1.52E+02,	3.25E+01,	4.14	
1981,	1.60E+05,	1.13E+05,	1.13E+05,	1.75E+05,	4.20E+04,	1.67E+04,	6.64E+03,	2.27E+03,	1.46E+03,	2.18E+02,	5.28E+01,	4.87	
1982,	1.59E+05,	1.28E+05,	8.38E+04,	7.37E+04,	8.59E+04,	1.47E+04,	4.70E+03,	1.57E+03,	6.71E+02,	4.00E+02,	7.98E+01,	9.74	
1983,	1.71E+05,	1.22E+05,	8.56E+04,	5.11E+04,	3.49E+04,	3.19E+04,	4.43E+03,	1.24E+03,	6.47E+02,	3.04E+02,	9.24E+01,	4.09	
1984,	3.98E+05,	1.37E+05,	8.23E+04,	5.16E+04,	2.59E+04,	1.32E+04,	9.52E+03,	1.33E+03,	4.34E+02,	3.22E+02,	1.82E+02,	2.31	
1985,	4.99E+05,	3.19E+05,	9.94E+04,	5.04E+04,	2.38E+04,	7.22E+03,	3.25E+03,	2.32E+03,	3.95E+02,	1.55E+02,	1.25E+02,	9.81	
1986,	9.52E+05,	3.91E+05,	2.27E+05,	5.68E+04,	2.28E+04,	7.20E+03,	1.94E+03,	9.35E+02,	9.37E+02,	1.76E+02,	7.37E+01,	5.66	
1987,	2.88E+05,	7.64E+05,	2.70E+05,	1.17E+05,	2.14E+04,	6.63E+03,	1.75E+03,	6.13E+02,	2.60E+02,	3.55E+02,	3.19E+01,	3.41	
1988,	2.43E+05,	2.31E+05,	5.35E+05,	1.33E+05,	3.97E+04,	5.81E+03,	1.86E+03,	5.06E+02,	1.08E+02,	8.58E+01,	7.99E+01,	1.07	
1989,	1.59E+05,	1.96E+05,	1.70E+05,	3.07E+05,	5.51E+04,	1.33E+04,	1.66E+03,	4.38E+02,	1.25E+02,	2.81E+01,	1.60E+01,	1.92	
1990,	1.62E+05,	1.27E+05,	1.42E+05,	1.13E+05,	1.76E+05,	2.39E+04,	6.38E+03,	5.33E+02,	6.82E+01,	6.07E+01,	1.58E+01,	1.22	
1991,	3.63E+05,	1.31E+05,	9.93E+04,	1.07E+05,	7.89E+04,	1.16E+05,	1.35E+04,	4.47E+03,	2.89E+02,	1.87E+01,	3.70E+01,	4.78	
1992,	6.42E+05,	2.93E+05,	9.97E+04,	6.77E+04,	7.11E+04,	4.66E+04,	7.07E+04,	7.37E+03,	3.30E+03,	2.08E+02,	8.10E+00,	2.94	

Population estimates for 1993

	0.00E+00,	5.04E+05,	2.06E+05,	5.62E+04,	3.48E+04,	4.11E+04,	2.62E+04,	4.08E+04,	4.01E+03,	2.53E+03,	1.14E+02,	3.92E
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Taper weighted geometric mean of the VPA populations:

	2.97E+05,	2.21E+05,	1.54E+05,	9.56E+04,	4.71E+04,	1.74E+04,	5.56E+03,	1.48E+03,	4.36E+02,	1.42E+02,	5.10E+01,	2.32E
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Standard error of the weighted Log(VPA populations):

	.6236,	.5989,	.5921,	.5513,	.6485,	.9089,	1.1100,	.9528,	1.1499,	1.0730,	1.0826,	.9
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Continued

Table 3.11 Continued

Log catchability residuals.

Fleet : FLT28: Norwegian Sva

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3				-.14	-1.23	.20	-.24	.97	.22	.16	-.23	-.35	-.01
4				-.16	-1.12	-.06	-.17	.56	.36	-.38	.13	-.42	.71
5				-1.13	-.43	.49	-.15	-.18	-.19	-.29	.48	.39	.67
6				-.69	-.69	.44	-.28	-.20	.10	-.26	.45	.51	.36
7				-.43	-.83	.11	.18	-.40	-.98	.18	.56	1.05	.30
8				-.11	-.27	.27	.05	-1.06	.85	-.74	.16	.78	.00
9	No data for this fleet at this age												
10	No data for this fleet at this age												

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-9.0299	-8.9967	-9.0295	-9.3516	-9.1528				
S.E		.5315	.5303	.4532	.6389	.6119				

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.63	10.32	.58	.56	10	-8.93
4	.65	10.20	.29	.83	10	-9.03
5	1.14	8.59	.64	.51	10	-9.00
6	.92	9.23	.44	.67	10	-9.03
7	.65	9.83	.35	.82	10	-9.35
8	.84	9.24	.52	.81	10	-9.15

Fleet : FLT29: Russian Trawl

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3			.81	.08	-.04	.17	-.07	-.41	-.06	-.19	-.13	-.12	.24
4			-.16	.24	.22	.94	-.16	.13	-.41	-.12	-.45	-.33	.24
5			-1.20	.08	.16	1.37	.06	-.74	-.31	.22	-.30	.07	.37
6			.02	-.26	.25	.75	.32	-.28	-.81	-.13	-.27	.06	.41
7			-1.68	-.67	.24	.79	.01	-.15	-.97	1.40	-.16	.50	.09
8			-1.01	-.07	-.02	.90	.31	-.84	-.73	1.21	.10	-.35	.24
9	No data for this fleet at this age												
10	No data for this fleet at this age												

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-9.5886	-9.4073	-9.2368	-9.0925	-9.0527				
S.E		.4034	.6272	.4309	.8187	.6955				

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.68	10.82	.31	.82	11	-9.95
4	.82	10.09	.33	.79	11	-9.59
5	1.47	8.24	.93	.33	11	-9.41
6	1.74	7.64	.66	.46	11	-9.24
7	1.15	8.85	.99	.36	11	-9.09
8	1.00	9.05	.74	.66	11	-9.05

Continued

Table 3.11 Continued

Fleet : FLT30: Russian acous

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3						.20	-.03	-.27	-.41	-.31	-.06	-.23	-.20
4						.54	.92	.74	-.05	-.75	-.62	-.42	-.21
5						.60	.66	-.08	-.01	-.48	-.49	-.08	.00
6						.62	.92	.47	-.52	-.60	-.55	-.22	-.03
7						1.06	1.35	1.09	-1.16	.37	-1.10	-.44	-.92
8						1.37	1.37	1.36	-.83	.16	-.94	-1.30	-.87
9	No data for this fleet at this age												
10	No data for this fleet at this age												

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-7.3464	-7.1542	-6.9121	-6.0892	-5.9607				
S.E		.6353	.4207	.5858	1.0580	1.1675				

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.51	10.10	.28	.86	8	-7.59
4	.53	9.75	.20	.91	8	-7.35
5	1.01	7.11	.46	.67	8	-7.15
6	4.13	-7.57	1.75	.11	8	-6.91
7	-7.93	48.05	5.58	.02	8	-6.09
8	4.18	-5.88	3.69	.09	8	-5.96

Fleet : FLT35: Norwegian Bar

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	.55	.13	-.35	.01	.63	.28	-.26	-.58	-.38	-.14	.29	.00	.13
4	1.07	.41	.02	.03	.40	.29	-.45	-.79	-.80	-.26	.40	-.09	.53
5	.90	.47	.18	.36	.42	-.28	-.69	-1.17	-.28	.03	.43	.09	.29
6	.70	.59	.01	.26	.56	-.20	-.95	-1.17	-.24	.50	.39	-.18	.37
7	.80	.45	.37	-1.05	.24	-2.75	.73	-.93	.04	.67	.87	.42	.33
8	.88	.11	.86	-1.29	.47	-1.32	-1.21	.34	.45	.52	.47	-.17	.21
9	No data for this fleet at this age												
10	No data for this fleet at this age												

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-7.2273	-7.4037	-7.6784	-8.4917	-8.6251				
S.E		.5267	.5425	.5956	1.0408	.7776				

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.79	8.41	.37	.76	13	-7.33
4	1.86	2.91	.88	.33	13	-7.23
5	1.74	4.05	.88	.34	13	-7.40
6	.85	8.25	.52	.56	13	-7.68
7	.54	9.52	.51	.65	13	-8.49
8	.97	8.66	.79	.60	13	-8.63

Continued

Table 3.11 Continued

Fleet : FLT36: Norwegian Bar

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3			.25	-.09	.06	.08	.07	.23	.15	.07	-.26	-.37	-.08
4			.49	-.02	-.36	.36	-.33	.32	-.20	-.02	-.26	-.22	.34
5			.37	.09	-.42	.75	-.67	-.29	.28	-.06	-.21	-.09	.35
6			.03	-.02	-.19	.65	-.69	-.34	.23	.08	-.06	-.16	.46
7			.31	-.68	-.78	.20	-.19	.41	-.18	-.22	.23	.24	.46
8			.97	-.78	-.81	.40	-.19	-.25	.56	.16	-.25	-.29	.51
9	No data for this fleet at this age												
10	No data for this fleet at this age												

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-8.0859	-8.3011	-8.7357	-9.3699	-9.6470				
S.E		.3090	.4075	.3747	.4157	.5375				

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.74	9.22	.21	.91	11	-8.01
4	.83	8.79	.25	.86	11	-8.09
5	1.14	7.79	.49	.64	11	-8.30
6	1.01	8.72	.40	.69	11	-8.74
7	.82	9.62	.33	.83	11	-9.37
8	1.13	9.64	.63	.73	11	-9.65

Fleet : FLT40: Norwegian Tra

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3										-.28	.05	-.38	.61
4										-.65	-.26	.23	.67
5										-.50	-.15	.20	.44
6										.05	-.14	.24	-.15
7										.30	-.07	.45	-.67
8										.51	.95	-1.66	-.20
9										-.21	-1.36	2.43	-.87
10										-.27	-.28	1.36	-.81

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-3.8987	-3.5459	-3.4095	-3.1094	-4.1125	-3.0224	-3.5358		
S.E		.5781	.4116	.1867	.4995	1.1536	1.6918	.9422		

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.72	7.43	.32	.87	4	-5.44
4	.61	7.05	.39	.60	4	-3.90
5	-2.04	28.43	.27	.60	4	-3.55
6	.91	4.12	.20	.94	4	-3.41
7	1.14	1.96	.69	.44	4	-3.11
8	-12.80	92.24	8.93	.02	4	-4.11
9	1.00	3.03	2.07	.46	4	-3.02
10	.88	3.98	1.00	.76	4	-3.54

Table 3.12a

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: JIM1)

At 31-Aug-93 20:34

Overfishing 1990-91-92 included.

Table 1	Catch numbers at age Numbers*10**3						
YEAR,	1946,	1947,	1948,	1949,	1950,	1951,	1952,
AGE							
3,	4008,	710,	140,	991,	1281,	24687,	24099,
4,	10387,	13192,	3872,	6808,	10954,	77924,	120704,
5,	18906,	43890,	31054,	35214,	29045,	64013,	113203,
6,	16596,	52017,	55983,	100497,	45233,	46867,	73827,
7,	13843,	45501,	77375,	83283,	62579,	37535,	49389,
8,	15370,	13075,	21482,	29727,	30037,	33673,	20562,
9,	59845,	19718,	15237,	13207,	19481,	23510,	24367,
10,	22618,	47678,	9815,	5606,	9172,	10589,	15651,
11,	10093,	31392,	30041,	8617,	6019,	4221,	8327,
12,	9573,	9348,	7945,	13154,	4133,	1288,	3565,
13,	5460,	9330,	4491,	3657,	6750,	1002,	647,
14,	1927,	4622,	3899,	1895,	1662,	3322,	467,
+gp,	750,	4103,	4205,	2167,	1450,	611,	1044,
TOTALNUM,	189376,	294576,	265539,	304823,	227796,	329242,	455852,
TONSLAND,	706000,	882017,	774295,	800122,	731982,	827180,	876795,
SOPCOF %,	67,	57,	62,	68,	78,	88,	75,

Table 1	Catch numbers at age Numbers*10**3									
YEAR,	1953,	1954,	1955,	1956,	1957,	1958,	1959,	1960,	1961,	1962,
AGE										
3,	47413,	11473,	3902,	10614,	17321,	31219,	32308,	37882,	45478,	42416,
4,	107659,	155171,	37652,	24172,	33931,	133576,	77942,	97865,	132655,	170566,
5,	112040,	146395,	201834,	129803,	27182,	71051,	148285,	64222,	123458,	167241,
6,	55500,	100751,	161336,	250472,	70702,	40737,	53480,	67425,	51167,	89460,
7,	22742,	40635,	84031,	86784,	87033,	38380,	18498,	23117,	38740,	28297,
8,	16863,	10713,	30451,	51091,	39213,	35786,	17735,	8429,	17376,	21996,
9,	10559,	11791,	13713,	14987,	17747,	13338,	23118,	7240,	5791,	7956,
10,	10553,	8557,	9481,	7465,	6219,	10475,	9483,	11675,	6778,	2728,
11,	5637,	6751,	4140,	3952,	3232,	3289,	3748,	4504,	5560,	2603,
12,	1752,	2370,	2406,	1655,	1220,	1070,	997,	1843,	1682,	1647,
13,	468,	896,	867,	1292,	347,	252,	254,	354,	910,	392,
14,	173,	268,	355,	448,	299,	40,	161,	102,	280,	280,
+gp,	156,	123,	128,	166,	173,	141,	98,	226,	108,	103,
TOTALNUM,	391515,	495894,	550296,	582901,	304619,	379354,	386107,	324884,	429983,	535685,
TONSLAND,	695546,	826021,	1147841,	1343068,	792557,	769313,	744607,	622042,	783221,	909266,
SOPCOF %,	84,	78,	82,	84,	83,	88,	86,	88,	91,	92,

Table 3.12b

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: JIM1)

At 31-Aug-93 20:34

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
3,	13196,	5298,	15725,	55937,	34467,	3709,	2307,	7164,	7754,	35536,
4,	106984,	45912,	25999,	55644,	160048,	174585,	24545,	10792,	13739,	45431,
5,	205549,	97950,	78299,	34676,	69235,	267961,	238511,	25813,	11831,	26832,
6,	95498,	58575,	68511,	42539,	22061,	107051,	181239,	137829,	9527,	12089,
7,	35518,	19642,	25444,	37169,	26295,	26701,	79363,	96420,	59290,	7918,
8,	16221,	9162,	8438,	18500,	25139,	16399,	26989,	31920,	52003,	34885,
9,	11894,	6196,	3569,	5077,	11323,	11597,	13463,	8933,	12093,	22315,
10,	3884,	3553,	1467,	1495,	2329,	3657,	5092,	3249,	2434,	4572,
11,	1021,	783,	1161,	380,	687,	657,	1913,	1232,	762,	1215,
12,	1025,	172,	131,	403,	316,	122,	414,	260,	418,	353,
13,	498,	387,	67,	77,	225,	124,	121,	106,	149,	315,
14,	129,	264,	91,	9,	40,	70,	23,	39,	42,	121,
+gp,	157,	131,	179,	70,	14,	46,	46,	35,	25,	40,
TOTALNUM,	491574,	248025,	229081,	251976,	352179,	612679,	574026,	323792,	170067,	191622,
TONSLAND,	776337,	437695,	444930,	483711,	572605,	1074084,	1197226,	933246,	689048,	565254,
SOPCOF %,	78,	82,	90,	94,	88,	96,	87,	97,	112,	108,

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	294262,	91855,	45282,	85337,	39594,	78822,	8600,	3911,	3407,	8948,
4,	131493,	437377,	59798,	114341,	168609,	45400,	77484,	17086,	9466,	20933,
5,	61000,	203772,	226646,	79993,	136335,	88495,	43677,	81986,	20803,	19345,
6,	20569,	47006,	118567,	118236,	52925,	56823,	31943,	40061,	63433,	28084,
7,	7248,	12630,	29522,	47872,	61821,	25407,	16815,	17664,	21788,	42496,
8,	8328,	4370,	9353,	13962,	23338,	31821,	8274,	7442,	9933,	8395,
9,	19130,	2523,	2617,	4051,	5659,	9408,	10974,	3508,	4267,	2878,
10,	4499,	5607,	1555,	936,	1521,	1227,	1785,	3196,	1311,	708,
11,	677,	2127,	1928,	558,	610,	913,	427,	678,	882,	271,
12,	195,	322,	575,	442,	271,	446,	103,	79,	109,	260,
13,	81,	151,	231,	139,	122,	748,	59,	24,	37,	27,
14,	59,	83,	15,	26,	92,	48,	38,	26,	3,	5,
+gp,	55,	62,	37,	53,	54,	51,	45,	8,	1,	5,
TOTALNUM,	547596,	807885,	496126,	465946,	490951,	339609,	200224,	175669,	135440,	132355,
TONSLAND,	792685,	1102433,	829377,	867463,	905301,	698715,	440538,	380434,	399038,	363730,
SOPCOF %,	114,	103,	90,	102,	99,	100,	107,	97,	110,	108,

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
3,	3108,	7027,	19282,	16942,	5570,	3988,	3874,	1541,	4737,	23305,
4,	19594,	14165,	38322,	55859,	100391,	21234,	19833,	5171,	8239,	37370,
5,	20473,	18839,	27216,	75486,	97318,	144215,	28126,	10615,	15089,	28105,
6,	17656,	20350,	20342,	27772,	62371,	59397,	83802,	15467,	18133,	22769,
7,	17004,	15415,	13588,	13337,	12901,	21302,	23501,	31161,	19864,	18887,
8,	18329,	8359,	4385,	4587,	3942,	3415,	4943,	6665,	26659,	13232,
9,	2545,	6054,	1904,	1082,	1021,	1200,	917,	830,	4075,	18751,
10,	646,	764,	1062,	559,	435,	320,	321,	163,	405,	2228,
11,	229,	221,	163,	455,	140,	67,	46,	41,	32,	190,
12,	74,	153,	59,	124,	233,	60,	8,	14,	8,	62,
13,	58,	56,	51,	29,	17,	51,	1,	9,	1,	3,
14,	20,	12,	45,	32,	21,	7,	9,	5,	1,	8,
+gp,	5,	12,	38,	1,	8,	15,	7,	2,	5,	0,
TOTALNUM,	99741,	91427,	126457,	196265,	284368,	255271,	165388,	71684,	97248,	164910,
TONSLAND,	289992,	277651,	307920,	430113,	523071,	434939,	332481,	212000,	319158,	508057,
SOPCOF %,	98,	95,	99,	94,	97,	96,	103,	100,	97,	98,

Table 3.13a

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY3)

At 1-Sep-93 09:39

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age						
YEAR,	1946,	1947,	1948,	1949,	1950,	1951,	1952,
AGE							
3,	.0060,	.0019,	.0003,	.0023,	.0020,	.0252,	.0224,
4,	.0199,	.0246,	.0124,	.0209,	.0320,	.1603,	.1656,
5,	.0528,	.1095,	.0744,	.1497,	.1165,	.2638,	.3690,
6,	.0987,	.2013,	.1989,	.3644,	.2921,	.2792,	.5538,
7,	.1814,	.4268,	.5192,	.5105,	.4070,	.4213,	.5352,
8,	.2012,	.2607,	.3667,	.3849,	.3473,	.4007,	.4316,
9,	.3138,	.4297,	.5515,	.4044,	.4711,	.5058,	.5720,
10,	.3027,	.4443,	.3950,	.4015,	.5495,	.5101,	.7665,
11,	.3248,	.9143,	.5630,	.7328,	1.0438,	.5304,	1.0193,
12,	.3226,	.5693,	.6202,	.5180,	1.0030,	.6557,	1.2790,
13,	.3612,	.6037,	.5979,	.6598,	.5540,	.7159,	.8405,
14,	.3270,	.5974,	.5500,	.5478,	.7313,	.5886,	.9051,
+gp,	.3270,	.5974,	.5500,	.5478,	.7313,	.5886,	.9051,
FBAR 5-10,	.1918,	.3120,	.3510,	.3692,	.3639,	.3968,	.5380,

Table 8	Fishing mortality (F) at age									
YEAR,	1953,	1954,	1955,	1956,	1957,	1958,	1959,	1960,	1961,	1962,
AGE										
3,	.0331,	.0197,	.0158,	.0267,	.0238,	.0712,	.0529,	.0538,	.0556,	.0658,
4,	.1320,	.1447,	.0831,	.1282,	.1119,	.2577,	.2551,	.2246,	.2695,	.3040,
5,	.2283,	.2670,	.2841,	.4536,	.2080,	.3606,	.5085,	.3459,	.4910,	.6469,
6,	.3109,	.3309,	.5309,	.6892,	.4810,	.5504,	.5094,	.4590,	.5144,	.8233,
7,	.3262,	.3947,	.5101,	.6167,	.5466,	.5269,	.5227,	.4319,	.5255,	.6057,
8,	.3498,	.2509,	.5850,	.6816,	.6360,	.4546,	.4967,	.4814,	.6849,	.6528,
9,	.4133,	.4427,	.5905,	.6499,	.5354,	.4609,	.6053,	.3868,	.7317,	.7987,
10,	.5246,	.7064,	.7918,	.7661,	.6235,	.7143,	.7103,	.7197,	.7765,	.9690,
11,	.7069,	.7744,	.9332,	.9536,	.9388,	.8189,	.6082,	.9167,	.9493,	.7999,
12,	.6073,	.7502,	.7113,	1.3990,	.9198,	.9930,	.6339,	.6988,	1.1541,	.8511,
13,	.5375,	.7378,	.6918,	1.1392,	1.5206,	.4791,	.6787,	.4842,	.9413,	.9624,
14,	.5626,	.6887,	.7510,	.9927,	.9175,	.6998,	.6532,	.6470,	.9205,	.8856,
+gp,	.5626,	.6887,	.7510,	.9927,	.9175,	.6998,	.6532,	.6470,	.9205,	.8856,
FBAR 5-10,	.3589,	.3988,	.5487,	.6429,	.5051,	.5113,	.5588,	.4708,	.6207,	.7494,

Table 3.13b

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY3)

At 1-Sep-93 09:39

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age									
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
3,	.0310,	.0172,	.0223,	.0394,	.0296,	.0242,	.0228,	.0406,	.0212,	.0390,
4,	.2350,	.1437,	.1101,	.1028,	.1515,	.2057,	.2209,	.1416,	.1022,	.1661,
5,	.7399,	.3514,	.3883,	.2103,	.1797,	.4073,	.4798,	.3821,	.2277,	.2965,
6,	1.0064,	.4803,	.4458,	.3781,	.2007,	.4649,	.5367,	.5703,	.2355,	.3844,
7,	.9669,	.5728,	.3962,	.4655,	.4261,	.3984,	.7676,	.6192,	.5174,	.3140,
8,	.8744,	.7204,	.5204,	.5652,	.6729,	.5186,	.9268,	.8375,	.8320,	.6674,
9,	.9372,	1.0555,	.6973,	.6965,	.8392,	.7784,	1.1442,	.9598,	.9326,	1.1402,
10,	1.3060,	.8360,	.7804,	.7255,	.8304,	.7309,	.9990,	.9964,	.7684,	1.2436,
11,	1.3766,	1.0867,	.7376,	.4685,	.9118,	.5904,	1.1652,	.7073,	.6722,	1.2207,
12,	.8899,	.9400,	.5132,	.6208,	.9341,	.3900,	.9659,	.4561,	.5555,	.7818,
13,	.6846,	1.0840,	1.3556,	.6567,	.8836,	1.3487,	.8623,	.7110,	.5185,	1.1510,
14,	1.0509,	1.0118,	.8253,	.6393,	.8893,	.7754,	1.0392,	.7738,	.6959,	1.1206,
+gp,	1.0509,	1.0118,	.8253,	.6393,	.8893,	.7754,	1.0392,	.7738,	.6959,	1.1206,
FBAR 5-10,	.9718,	.6694,	.5381,	.5069,	.5248,	.5497,	.8090,	.7276,	.5856,	.6743,

Table 8	Fishing mortality (F) at age									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	.1949,	.2126,	.0829,	.1647,	.1330,	.1449,	.0484,	.0309,	.0239,	.0641,
4,	.1981,	.4952,	.2087,	.3098,	.5658,	.2223,	.2073,	.1282,	.0973,	.1998,
5,	.3516,	.5356,	.5202,	.4766,	.7528,	.6690,	.3460,	.3533,	.2275,	.2946,
6,	.3903,	.5050,	.7003,	.5706,	.6801,	.8478,	.5444,	.6219,	.5117,	.5468,
7,	.4205,	.4432,	.7012,	.6935,	.6759,	.8466,	.6584,	.6709,	.8509,	.7911,
8,	.6424,	.4861,	.7020,	.8841,	.9060,	.9345,	.7544,	.7005,	1.0690,	.9982,
9,	1.0097,	.4055,	.6122,	.7731,	1.2155,	1.2946,	1.0531,	.8753,	1.2399,	1.1294,
10,	.7421,	.9799,	.4724,	.4603,	.7656,	.9892,	.9519,	1.0906,	1.0185,	.6884,
11,	.5912,	1.0088,	1.2006,	.3074,	.6261,	1.8535,	1.2657,	1.3391,	1.0967,	.5918,
12,	.6319,	.6318,	.8564,	1.0504,	.2401,	1.5012,	1.3534,	.8561,	.8050,	1.2661,
13,	.4038,	1.7923,	1.4780,	.5108,	.9852,	2.4656,	.8288,	1.6979,	1.4899,	.4687,
14,	.6821,	.9745,	.9341,	.6259,	.7742,	1.6428,	1.1035,	1.1861,	1.1436,	.8375,
+gp,	.6821,	.9745,	.9341,	.6259,	.7742,	1.6428,	1.1035,	1.1861,	1.1436,	.8375,
FBAR 5-10,	.5928,	.5592,	.6180,	.6430,	.8326,	.9303,	.7180,	.7188,	.8196,	.7414,

Table 8	Fishing mortality (F) at age										
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	FBAR 90-92
AGE											
3,	.0203,	.0197,	.0436,	.0199,	.0216,	.0183,	.0272,	.0106,	.0145,	.0409,	.0220,
4,	.1950,	.1213,	.1422,	.1716,	.1569,	.1073,	.1188,	.0460,	.0721,	.1520,	.0901,
5,	.3069,	.2915,	.3603,	.4584,	.5082,	.3538,	.2024,	.0861,	.1838,	.3732,	.2144,
6,	.4811,	.5728,	.5911,	.7779,	.8839,	.6807,	.3585,	.1633,	.2077,	.4651,	.2787,
7,	.7726,	1.0755,	.9958,	1.0368,	1.1020,	.8977,	.6373,	.2180,	.3261,	.3478,	.2973,
8,	1.0086,	1.2030,	1.1119,	1.2167,	1.0703,	1.0495,	.5312,	.3693,	.2937,	.3765,	.3465,
9,	1.0063,	1.2130,	1.0449,	.9543,	1.0384,	1.2467,	.9384,	.1552,	.4058,	.3471,	.3027,
10,	.8534,	1.0114,	.7061,	1.0815,	1.5328,	1.1991,	1.6599,	.4122,	.1054,	.4068,	.3082,
11,	.4964,	.8280,	.6086,	.7699,	.9068,	1.1492,	.5222,	1.0919,	.1305,	.0658,	.4294,
12,	.3137,	.7435,	.5451,	1.5075,	1.2918,	1.4820,	.3774,	.2943,	.6384,	.4002,	.4443,
13,	1.1842,	.4163,	.5964,	.5712,	.8883,	1.2230,	.0718,	.9943,	.0303,	.5263,	.5170,
14,	.7785,	.8513,	.7069,	.9809,	1.1437,	1.2719,	.7272,	.6058,	.2628,	.3576,	.4087,
+gp,	.7785,	.8513,	.7069,	.9809,	1.1437,	1.2719,	.7272,	.6058,	.2628,	.3576,	.4087,
FBAR 5-10,	.7381,	.8945,	.8017,	.9209,	1.0226,	.9046,	.7213,	.2340,	.2538,	.3861,	

Table 3.14a

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY3)

At 1-Sep-93 09:39

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)						Numbers*10**-3	
YEAR,	1946,	1947,	1948,	1949,	1950,	1951,	1952,	
AGE								
3,	736154,	423698,	444698,	471039,	711497,	1095084,	1201991,	
4,	582517,	599086,	346252,	363962,	384757,	581365,	874241,	
5,	406074,	467526,	478553,	279984,	291826,	305101,	405473,	
6,	195140,	315359,	343065,	363707,	197368,	212646,	191874,	
7,	92209,	144751,	211127,	230222,	206845,	120663,	131693,	
8,	93191,	62968,	77341,	102844,	113132,	112726,	64827,	
9,	245549,	62391,	39723,	43884,	57304,	65446,	61824,	
10,	95716,	146889,	33240,	18736,	23979,	29289,	32310,	
11,	40225,	57900,	77122,	18333,	10267,	11333,	14399,	
12,	38369,	23801,	19000,	35960,	7213,	2960,	5459,	
13,	19907,	22752,	11028,	8367,	17539,	2166,	1258,	
14,	7636,	11358,	10185,	4966,	3541,	8252,	867,	
+gp,	2951,	9967,	10867,	5618,	3047,	1501,	1906,	
TOTAL,	2555639,	2348444,	2102201,	1947620,	2028316,	2548533,	2988122,	

Table 10	Stock number at age (start of year)					Numbers*10**-3				
YEAR,	1953,	1954,	1955,	1956,	1957,	1958,	1959,	1960,	1961,	1962,
AGE										
3,	1607390,	650388,	275562,	444498,	812821,	501835,	692475,	799768,	928663,	736364,
4,	962301,	1273119,	522112,	222080,	354320,	649809,	382620,	537717,	620517,	719175,
5,	606550,	690452,	901937,	393400,	159952,	259391,	411154,	242738,	351693,	388006,
6,	229543,	395223,	432830,	555817,	204638,	106362,	148082,	202451,	140626,	176233,
7,	90292,	137715,	232418,	208389,	228428,	103570,	50222,	72848,	104744,	68837,
8,	63132,	53347,	75984,	114254,	92089,	108270,	50068,	24381,	38726,	50704,
9,	34471,	36430,	33983,	34657,	47314,	39914,	56264,	24945,	12334,	15984,
10,	28569,	18668,	19157,	15415,	14814,	22679,	20610,	25147,	13872,	4858,
11,	12292,	13842,	7542,	7106,	5866,	6501,	9090,	8294,	10024,	5225,
12,	4254,	4963,	5224,	2428,	2242,	1878,	2347,	4051,	2715,	3176,
13,	1244,	1898,	1919,	2100,	491,	732,	570,	1019,	1649,	701,
14,	444,	595,	743,	787,	550,	88,	371,	237,	514,	527,
+gp,	396,	270,	264,	286,	313,	306,	223,	518,	195,	191,
TOTAL,	3640879,	3276910,	2509675,	2001216,	1923838,	1801336,	1824095,	1944112,	2226274,	2169980,

Table 3.14b

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY3)

At 1-Sep-93 09:39

Terminal Fs derived using XSA (With F shrinkage)

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3				
	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
3,	477739,	342420,	786474,	1598375,	1305600,	171237,	112897,	198893,	409201,	1026905,
4,	564504,	379199,	275556,	629682,	1258025,	1037748,	136841,	90344,	156357,	328009,
5,	434476,	365374,	268919,	202082,	465191,	885166,	691665,	89827,	64203,	115583,
6,	166346,	169731,	210514,	149324,	134074,	318220,	482252,	350474,	50187,	41860,
7,	63340,	49783,	85963,	110363,	83766,	89809,	163673,	230842,	162231,	32470,
8,	30755,	19721,	22986,	47358,	56726,	44789,	49369,	62193,	101753,	79176,
9,	21610,	10503,	7856,	11184,	22034,	23696,	21832,	16000,	22037,	36254,
10,	5887,	6931,	2992,	3202,	4563,	7794,	8908,	5692,	5016,	7100,
11,	1509,	1306,	2459,	1123,	1269,	1628,	3072,	2685,	1721,	1905,
12,	1922,	312,	361,	963,	575,	418,	739,	784,	1084,	719,
13,	1110,	646,	100,	177,	424,	185,	231,	230,	407,	509,
14,	219,	458,	179,	21,	75,	143,	39,	80,	93,	198,
+gp,	262,	223,	347,	162,	26,	93,	77,	71,	54,	64,
TOTAL,	1769681,	1346606,	1664706,	2754016,	3332347,	2580927,	1671595,	1048116,	974345,	1670753,

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3				
	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	1836871,	530114,	629343,	621030,	351255,	645813,	201133,	142094,	159757,	159188,
4,	808605,	1237644,	350907,	474290,	431240,	251757,	457426,	156892,	112798,	127715,
5,	227444,	543050,	617542,	233191,	284856,	200506,	165042,	304399,	112992,	83786,
6,	70353,	131020,	260231,	300523,	118540,	109859,	84087,	95604,	175036,	73687,
7,	23333,	38988,	64737,	105775,	139063,	49164,	38529,	39941,	42025,	85911,
8,	19419,	12545,	20493,	26290,	43285,	57917,	17263,	16330,	16718,	14693,
9,	33258,	8364,	6317,	8315,	8891,	14322,	18626,	6647,	6636,	4700,
10,	9491,	9920,	4565,	2804,	3142,	2159,	3213,	5320,	2268,	1572,
11,	1676,	3700,	3048,	2330,	1449,	1196,	657,	1015,	1464,	671,
12,	460,	760,	1105,	751,	1403,	634,	153,	152,	218,	400,
13,	269,	200,	331,	384,	215,	903,	116,	32,	53,	80,
14,	132,	147,	27,	62,	189,	66,	63,	41,	5,	10,
+gp,	121,	108,	66,	124,	109,	68,	73,	12,	2,	10,
TOTAL,	3031433,	2516561,	1958712,	1775869,	1383637,	1334365,	986381,	768480,	629972,	552422,

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3					GMST	
	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,		1993,
AGE												
3,	170871,	397981,	499425,	952097,	287899,	243344,	159426,	161595,	362878,	641959,	0,	4825
4,	122236,	137085,	319481,	391447,	764181,	230672,	195624,	127022,	130908,	292813,	504078,	3904
5,	85623,	82349,	99419,	226894,	269947,	534821,	169645,	142218,	99318,	99724,	205869,	2756
6,	51094,	51578,	50375,	56771,	117462,	132957,	307383,	113444,	106833,	67661,	56245,	1602
7,	34918,	25856,	23815,	22837,	21351,	39735,	55111,	175837,	78885,	71060,	34811,	781
8,	31886,	13203,	7221,	7203,	6630,	5808,	13257,	23857,	115767,	46612,	41118,	359
9,	4433,	9521,	3246,	1945,	1747,	1861,	1665,	6381,	13501,	70660,	26200,	161
10,	1244,	1327,	2318,	935,	613,	506,	438,	533,	4474,	7367,	40818,	67
11,	647,	434,	395,	937,	260,	108,	125,	68,	289,	3296,	4013,	27
12,	304,	322,	155,	176,	355,	86,	28,	61,	19,	208,	2525,	11
13,	92,	182,	125,	74,	32,	80,	16,	16,	37,	8,	114,	4
14,	41,	23,	98,	57,	34,	11,	19,	12,	5,	29,	4,	1
+gp,	10,	23,	82,	2,	13,	23,	15,	5,	24,	0,	17,	
TOTAL,	503399,	719884,	1006155,	1661374,	1470523,	1190010,	902752,	751048,	912938,	1301398,	915813,	

Table 3.15

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY3)

At 1-Sep-93 09:39

Table 16 Summary (without SOP correction)

	Terminal Fs derived using XSA (With F shrinkage)					
	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 5-10,
1946,	736154,	6344803,	3877670,	706000,	.1821,	.1918,
1947,	423698,	6037168,	3197531,	882017,	.2758,	.3120,
1948,	444698,	5138151,	2226498,	774295,	.3478,	.3510,
1949,	471039,	4469102,	1716012,	800122,	.4663,	.3692,
1950,	711497,	4034313,	1557322,	731982,	.4700,	.3639,
1951,	1095084,	4142457,	1460375,	827180,	.5664,	.3968,
1952,	1201991,	4372973,	1183710,	876795,	.7407,	.5380,
1953,	1607390,	4715105,	916914,	695546,	.7586,	.3589,
1954,	650388,	5007131,	837167,	826021,	.9867,	.3988,
1955,	275562,	4797250,	879027,	1147841,	1.3058,	.5487,
1956,	444498,	4148963,	1003080,	1343068,	1.3389,	.6429,
1957,	812821,	3335435,	935880,	792557,	.8469,	.5051,
1958,	501835,	3010565,	1025240,	769313,	.7504,	.5113,
1959,	692475,	2857611,	866337,	744607,	.8595,	.5588,
1960,	799768,	2767492,	606598,	622042,	1.0255,	.4708,
1961,	928663,	2978912,	517801,	783221,	1.5126,	.6207,
1962,	736364,	2926926,	476070,	909266,	1.9099,	.7494,
1963,	477739,	2536796,	378886,	776337,	2.0490,	.9718,
1964,	342420,	1982838,	244120,	437695,	1.7930,	.6694,
1965,	786474,	2210013,	215144,	444930,	2.0681,	.5381,
1966,	1598375,	3055525,	342008,	483711,	1.4143,	.5069,
1967,	1305600,	3894181,	462404,	572605,	1.2383,	.5248,
1968,	171237,	4020740,	442022,	1074084,	2.4299,	.5497,
1969,	112897,	3456624,	476357,	1197226,	2.5133,	.8090,
1970,	198893,	2452136,	473260,	933246,	1.9720,	.7276,
1971,	409201,	1887192,	687703,	689048,	1.0020,	.5856,
1972,	1026905,	2071038,	685997,	565254,	.8240,	.6743,
1973,	1836871,	2998012,	397075,	792685,	1.9963,	.5928,
1974,	530114,	3101943,	235592,	1102433,	4.6794,	.5592,
1975,	629343,	2768188,	216130,	829377,	3.8374,	.6180,
1976,	621030,	2544248,	233690,	867463,	3.7120,	.6430,
1977,	351255,	2177485,	318067,	905301,	2.8463,	.8326,
1978,	645813,	1818478,	408374,	698715,	1.7110,	.9303,
1979,	201133,	1406462,	231955,	440538,	1.8992,	.7180,
1980,	142094,	1254471,	170933,	380434,	2.2256,	.7188,
1981,	159757,	1101737,	153636,	399038,	2.5973,	.8196,
1982,	159188,	952595,	378137,	363730,	.9619,	.7414,
1983,	170871,	772221,	330314,	289992,	.8779,	.7381,
1984,	397981,	926098,	275070,	277651,	1.0094,	.8945,
1985,	499425,	1021646,	204078,	307920,	1.5088,	.8017,
1986,	952097,	1325149,	174701,	430113,	2.4620,	.9209,
1987,	287899,	1160301,	152345,	523071,	3.4335,	1.0226,
1988,	243344,	864781,	159970,	434939,	2.7189,	.9046,
1989,	159426,	967838,	177818,	332481,	1.8698,	.7213,
1990,	161595,	1131635,	374710,	212000,	.5658,	.2340,
1991,	362878,	1662634,	787183,	319158,	.4054,	.2538,
1992,	641959,	1952041,	1047089,	508057,	.4852,	.3861,
Arith.						
Mean	598250,	2777860,	725915,	677045,	1.5628,	.6063,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

Table 3.16

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RAY2)

At 1-Sep-93 09:25

Table 17 Summary (with SOP correction)

	Terminal Fs derived using XSA (With F shrinkage)						
	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	SOPCOFAC,	FBAR 5-10,
1981,	159722,	1217296,	169747,	399037,	2.3508,	1.1050,	.8197,
1982,	159136,	1025520,	407099,	363730,	.8935,	1.0767,	.7416,
1983,	170560,	759330,	324846,	289992,	.8927,	.9837,	.7384,
1984,	397601,	882670,	262257,	277651,	1.0587,	.9538,	.8951,
1985,	496241,	1012752,	202575,	307920,	1.5200,	.9936,	.8031,
1986,	942197,	1238050,	163710,	430113,	2.6273,	.9390,	.9249,
1987,	277452,	1112291,	146639,	523071,	3.5671,	.9670,	1.0311,
1988,	280667,	824764,	151713,	434939,	2.8668,	.9588,	.9254,
1989,	150662,	896302,	162123,	333163,	2.0550,	.9321,	.7685,
1990,	155854,	1081303,	361112,	187000,	.5178,	.9984,	.2221,
1991,	358823,	1561369,	747704,	269158,	.3600,	.9682,	.2163,
1992,	634234,	1913740,	1041820,	378057,	.3629,	.9809,	.2732,
Arith.							
Mean	348596,	1127115,	345112,	349486,	1.5894		.6966,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),			

Table 3.17a

09:28 Tuesday, October 12, 1993 2

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	702000.00	0.2000	0.0000	0.0000	0.0000	0.350	0.0292	1.020
4	504078.00	0.2000	0.0300	0.0000	0.0000	1.180	0.1194	1.770
5	205869.00	0.2000	0.0700	0.0000	0.0000	1.830	0.2842	2.460
6	56245.0000	0.2000	0.2100	0.0000	0.0000	2.870	0.3694	3.330
7	34811.0000	0.2000	0.5600	0.0000	0.0000	4.140	0.3941	4.320
8	41118.0000	0.2000	0.8900	0.0000	0.0000	5.560	0.4593	5.400
9	26200.0000	0.2000	0.9500	0.0000	0.0000	6.730	0.4012	6.350
10	40818.0000	0.2000	0.9900	0.0000	0.0000	8.450	0.4085	8.300
11	4013.0000	0.2000	1.0000	0.0000	0.0000	10.660	0.5691	11.630
12	2525.0000	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.970
13	114.0000	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	4.0000	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	17.0000	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	547000.00	0.2000	0.0000	0.0000	0.0000	0.390	0.0292	1.010
4	.	0.2000	0.0200	0.0000	0.0000	1.080	0.1194	1.700
5	.	0.2000	0.0500	0.0000	0.0000	1.730	0.2842	2.400
6	.	0.2000	0.2500	0.0000	0.0000	2.710	0.3694	3.240
7	.	0.2000	0.6500	0.0000	0.0000	3.890	0.3941	4.250
8	.	0.2000	0.8800	0.0000	0.0000	5.230	0.4593	5.340
9	.	0.2000	0.9500	0.0000	0.0000	6.730	0.4012	6.880
10	.	0.2000	1.0000	0.0000	0.0000	8.730	0.4085	8.930
11	.	0.2000	1.0000	0.0000	0.0000	10.190	0.5691	11.630
12	.	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.670
13	.	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	.	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	.	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	672000.00	0.2000	0.0000	0.0000	0.0000	0.420	0.0292	1.000
4	.	0.2000	0.0200	0.0000	0.0000	0.980	0.1194	1.630
5	.	0.2000	0.0500	0.0000	0.0000	1.630	0.2842	2.330
6	.	0.2000	0.2500	0.0000	0.0000	2.550	0.3694	3.140
7	.	0.2000	0.6500	0.0000	0.0000	3.650	0.3941	4.170
8	.	0.2000	0.8800	0.0000	0.0000	4.890	0.4593	5.270
9	.	0.2000	0.9500	0.0000	0.0000	6.730	0.4012	7.420
10	.	0.2000	1.0000	0.0000	0.0000	9.000	0.4085	9.550
11	.	0.2000	1.0000	0.0000	0.0000	9.720	0.5691	11.640
12	.	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.370
13	.	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	.	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	.	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : HS1
Date and time: 12OCT93:09:45

High growth

Table 3.17b

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	702000.00	0.2000	0.0000	0.0000	0.0000	0.350	0.0292	1.020
4	504078.00	0.2000	0.0300	0.0000	0.0000	1.180	0.1194	1.770
5	205869.00	0.2000	0.0700	0.0000	0.0000	1.830	0.2842	2.460
6	56245.000	0.2000	0.2100	0.0000	0.0000	2.870	0.3694	3.330
7	34811.000	0.2000	0.5600	0.0000	0.0000	4.140	0.3941	4.320
8	41118.000	0.2000	0.8900	0.0000	0.0000	5.560	0.4593	5.400
9	26200.000	0.2000	0.9500	0.0000	0.0000	6.730	0.4012	6.350
10	40818.000	0.2000	0.9900	0.0000	0.0000	8.450	0.4085	8.300
11	4013.000	0.2000	1.0000	0.0000	0.0000	10.660	0.5691	11.630
12	2525.000	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.970
13	114.000	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	4.000	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	17.000	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	547000.00	0.2000	0.0000	0.0000	0.0000	0.360	0.0292	0.970
4	.	0.2000	0.0200	0.0000	0.0000	1.000	0.1194	1.590
5	.	0.2000	0.0500	0.0000	0.0000	1.630	0.2842	2.240
6	.	0.2000	0.2500	0.0000	0.0000	2.580	0.3694	3.060
7	.	0.2000	0.6500	0.0000	0.0000	3.790	0.3941	4.100
8	.	0.2000	0.8800	0.0000	0.0000	5.200	0.4593	5.270
9	.	0.2000	0.9500	0.0000	0.0000	6.530	0.4012	6.520
10	.	0.2000	1.0000	0.0000	0.0000	8.250	0.4085	8.470
11	.	0.2000	1.0000	0.0000	0.0000	10.020	0.5691	11.100
12	.	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.670
13	.	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	.	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	.	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	672000.00	0.2000	0.0000	0.0000	0.0000	0.370	0.0292	0.930
4	.	0.2000	0.0200	0.0000	0.0000	0.820	0.1194	1.400
5	.	0.2000	0.0500	0.0000	0.0000	1.420	0.2842	2.020
6	.	0.2000	0.2500	0.0000	0.0000	2.300	0.3694	2.790
7	.	0.2000	0.6500	0.0000	0.0000	3.440	0.3941	3.880
8	.	0.2000	0.8800	0.0000	0.0000	4.830	0.4593	5.130
9	.	0.2000	0.9500	0.0000	0.0000	6.320	0.4012	6.690
10	.	0.2000	1.0000	0.0000	0.0000	8.050	0.4085	8.640
11	.	0.2000	1.0000	0.0000	0.0000	9.380	0.5691	10.580
12	.	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.370
13	.	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	.	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	.	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : HS2
Date and time: 12OCT93:09:52

Medium growth

Table 3.17c

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	702000.00	0.2000	0.0000	0.0000	0.0000	0.350	0.0292	1.020
4	504078.00	0.2000	0.0300	0.0000	0.0000	1.180	0.1194	1.770
5	205869.00	0.2000	0.0700	0.0000	0.0000	1.830	0.2842	2.460
6	56245.000	0.2000	0.2100	0.0000	0.0000	2.870	0.3694	3.330
7	34811.000	0.2000	0.5600	0.0000	0.0000	4.140	0.3941	4.320
8	41118.000	0.2000	0.8900	0.0000	0.0000	5.560	0.4593	5.400
9	26200.000	0.2000	0.9500	0.0000	0.0000	6.730	0.4012	6.350
10	40818.000	0.2000	0.9900	0.0000	0.0000	8.450	0.4085	8.300
11	4013.000	0.2000	1.0000	0.0000	0.0000	10.660	0.5691	11.630
12	2525.000	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	12.970
13	114.000	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	3.000	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	17.000	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	547000.00	0.2000	0.0000	0.0000	0.0000	0.310	0.0292	0.890
4	.	0.2000	0.0200	0.0000	0.0000	0.850	0.1194	1.420
5	.	0.2000	0.0500	0.0000	0.0000	1.410	0.2842	2.010
6	.	0.2000	0.2500	0.0000	0.0000	2.300	0.3694	2.800
7	.	0.2000	0.6500	0.0000	0.0000	3.500	0.3941	3.940
8	.	0.2000	0.8800	0.0000	0.0000	5.120	0.4593	5.260
9	.	0.2000	0.9500	0.0000	0.0000	6.450	0.4012	6.260
10	.	0.2000	1.0000	0.0000	0.0000	8.080	0.4085	8.000
11	.	0.2000	1.0000	0.0000	0.0000	9.960	0.5691	10.440
12	.	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	11.910
13	.	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	.	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	.	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	672000.00	0.2000	0.0000	0.0000	0.0000	0.280	0.0292	0.770
4	.	0.2000	0.0300	0.0000	0.0000	0.510	0.1194	1.060
5	.	0.2000	0.0500	0.0000	0.0000	0.990	0.2842	1.550
6	.	0.2000	0.2500	0.0000	0.0000	1.720	0.3694	2.270
7	.	0.2000	0.6500	0.0000	0.0000	2.860	0.3941	3.570
8	.	0.2000	0.8800	0.0000	0.0000	4.680	0.4593	5.120
9	.	0.2000	0.9500	0.0000	0.0000	6.170	0.4012	6.170
10	.	0.2000	1.0000	0.0000	0.0000	7.700	0.4085	7.700
11	.	0.2000	1.0000	0.0000	0.0000	9.250	0.5691	9.250
12	.	0.2000	1.0000	0.0000	0.0000	10.850	0.5889	10.850
13	.	0.2000	1.0000	0.0000	0.0000	12.500	0.6853	12.500
14	.	0.2000	1.0000	0.0000	0.0000	13.900	0.5417	13.900
15+	.	0.2000	1.0000	0.0000	0.0000	15.000	0.5417	15.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : HS3
Date and time: 12OCT93:10:09

Low growth

Table 3.18a

09:28 Tuesday, October 12, 1993 1

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0975	0.4238	2344558	943172	630000	0.0000	0.0000	2499583	791125	0	3293628	1159842
.	0.0500	0.0193	.	791125	40036	3254970	1136776
.	0.1000	0.0386	.	791125	79390	3216996	1114203
.	0.1500	0.0579	.	791125	118077	3179692	1092111
.	0.2000	0.0772	.	791125	156108	3143043	1070491
.	0.2500	0.0965	.	791125	193499	3107037	1049332
.	0.3000	0.1158	.	791125	230260	3071661	1028622
.	0.3500	0.1351	.	791125	266406	3036903	1008353
.	0.4000	0.1544	.	791125	301947	3002749	988514
.	0.4500	0.1738	.	791125	336897	2969187	969095
.	0.5000	0.1931	.	791125	371266	2936207	950088
.	0.5500	0.2124	.	791125	405066	2903796	931482
.	0.6000	0.2317	.	791125	438309	2871942	913269
.	0.6500	0.2510	.	791125	471006	2840636	895441
.	0.7000	0.2703	.	791125	503166	2809865	877988
.	0.7500	0.2896	.	791125	534801	2779620	860902
.	0.8000	0.3089	.	791125	565921	2749890	844176
.	0.8500	0.3282	.	791125	596536	2720665	827800
.	0.9000	0.3475	.	791125	626655	2691934	811768
.	0.9500	0.3668	.	791125	656289	2663689	796071
.	1.0000	0.3861	.	791125	685447	2635919	780703
.	1.0500	0.4054	.	791125	714137	2608616	765655
.	1.1000	0.4247	.	791125	742370	2581770	750922
.	1.1500	0.4440	.	791125	770153	2555372	736495
.	1.2000	0.4633	.	791125	797496	2529414	722369
.	1.2500	0.4826	.	791125	824406	2503886	708536
.	1.3000	0.5020	.	791125	850893	2478782	694990
.	1.3500	0.5213	.	791125	876964	2454092	681725
.	1.4000	0.5406	.	791125	902627	2429808	668735
.	1.4500	0.5599	.	791125	927890	2405923	656014
.	1.5000	0.5792	.	791125	952760	2382429	643555
.	1.5500	0.5985	.	791125	977245	2359319	631353
.	1.6000	0.6178	.	791125	1001352	2336584	619403
.	1.6500	0.6371	.	791125	1025088	2314219	607698
.	1.7000	0.6564	.	791125	1048461	2292215	596234
.	1.7500	0.6757	.	791125	1071476	2270567	585006
.	1.8000	0.6950	.	791125	1094141	2249266	574008
.	1.8500	0.7143	.	791125	1116463	2228308	563234
.	1.9000	0.7336	.	791125	1138446	2207684	552681
.	1.9500	0.7529	.	791125	1160099	2187389	542344
.	2.0000	0.7722	.	791125	1181427	2167417	532218
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS1
 Date and time : 12OCT93:09:45
 Computation of ref. F: Simple mean, age 5 - 10
 Basis for 1993 : TAC constraints

Over-fishing and high growth

Table 3.18b

Cod in the North-East Arctic (Fishing Areas I and II)
 Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0975	0.4238	2344558	943172	630000	0.0000	0.0000	2368453	767809	0	2969982	1094425
.	0.0500	0.0193	.	767809	37923	2933994	1072454
.	0.1000	0.0386	.	767809	75198	2898653	1050957
.	0.1500	0.0579	.	767809	111838	2863946	1029923
.	0.2000	0.0772	.	767809	147855	2829858	1009340
.	0.2500	0.0965	.	767809	183261	2796378	989199
.	0.3000	0.1158	.	767809	218071	2763493	969490
.	0.3500	0.1351	.	767809	252294	2731191	950203
.	0.4000	0.1544	.	767809	285943	2699461	931329
.	0.4500	0.1738	.	767809	319029	2668290	912858
.	0.5000	0.1931	.	767809	351564	2637667	894780
.	0.5500	0.2124	.	767809	383558	2607582	877088
.	0.6000	0.2317	.	767809	415023	2578023	859773
.	0.6500	0.2510	.	767809	445967	2548980	842825
.	0.7000	0.2703	.	767809	476403	2520443	826237
.	0.7500	0.2896	.	767809	506339	2492401	810001
.	0.8000	0.3089	.	767809	535786	2464844	794109
.	0.8500	0.3282	.	767809	564753	2437764	778553
.	0.9000	0.3475	.	767809	593249	2411149	763325
.	0.9500	0.3668	.	767809	621285	2384992	748419
.	1.0000	0.3861	.	767809	648867	2359283	733827
.	1.0500	0.4054	.	767809	676006	2334012	719542
.	1.1000	0.4247	.	767809	702710	2309172	705557
.	1.1500	0.4440	.	767809	728988	2284755	691866
.	1.2000	0.4633	.	767809	754847	2260750	678462
.	1.2500	0.4826	.	767809	780296	2237151	665339
.	1.3000	0.5020	.	767809	805342	2213950	652490
.	1.3500	0.5213	.	767809	829994	2191138	639910
.	1.4000	0.5406	.	767809	854258	2168709	627592
.	1.4500	0.5599	.	767809	878142	2146654	615531
.	1.5000	0.5792	.	767809	901654	2124966	603721
.	1.5500	0.5985	.	767809	924800	2103639	592156
.	1.6000	0.6178	.	767809	947588	2082665	580832
.	1.6500	0.6371	.	767809	970023	2062038	569742
.	1.7000	0.6564	.	767809	992114	2041750	558883
.	1.7500	0.6757	.	767809	1013866	2021795	548247
.	1.8000	0.6950	.	767809	1035285	2002167	537832
.	1.8500	0.7143	.	767809	1056378	1982859	527631
.	1.9000	0.7336	.	767809	1077151	1963866	517641
.	1.9500	0.7529	.	767809	1097610	1945181	507856
.	2.0000	0.7722	.	767809	1117761	1926798	498273
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS2
 Date and time : 12OCT93:09:52
 Computation of ref. F: Simple mean, age 5 - 10
 Basis for 1993 : TAC constraints

Over-fishing and medium growth

Table 3.18c

Cod in the North-East Arctic (Fishing Areas I and II)
 Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0976	0.4238	2344544	943158	630000	0.0000	0.0000	2127768	741247	0	2330860	990291
.	0.0500	0.0193	.	741247	35059	2300011	969942
.	0.1000	0.0386	.	741247	69513	2269741	950040
.	0.1500	0.0579	.	741247	103374	2240038	930574
.	0.2000	0.0772	.	741247	136655	2210891	911533
.	0.2500	0.0965	.	741247	169367	2182288	892909
.	0.3000	0.1158	.	741247	201522	2154218	874692
.	0.3500	0.1351	.	741247	233130	2126669	856872
.	0.4000	0.1544	.	741247	264204	2099630	839440
.	0.4500	0.1738	.	741247	294753	2073091	822388
.	0.5000	0.1931	.	741247	324787	2047041	805706
.	0.5500	0.2124	.	741247	354319	2021470	789386
.	0.6000	0.2317	.	741247	383356	1996369	773420
.	0.6500	0.2510	.	741247	411910	1971727	757800
.	0.7000	0.2703	.	741247	439989	1947535	742518
.	0.7500	0.2896	.	741247	467604	1923783	727566
.	0.8000	0.3089	.	741247	494762	1900463	712936
.	0.8500	0.3282	.	741247	521474	1877565	698622
.	0.9000	0.3475	.	741247	547748	1855081	684617
.	0.9500	0.3668	.	741247	573593	1833003	670912
.	1.0000	0.3861	.	741247	599017	1811322	657502
.	1.0500	0.4054	.	741247	624028	1790030	644379
.	1.1000	0.4247	.	741247	648634	1769118	631538
.	1.1500	0.4440	.	741247	672843	1748580	618972
.	1.2000	0.4633	.	741247	696663	1728408	606674
.	1.2500	0.4826	.	741247	720102	1708594	594639
.	1.3000	0.5020	.	741247	743166	1689130	582861
.	1.3500	0.5213	.	741247	765864	1670011	571333
.	1.4000	0.5406	.	741247	788201	1651228	560051
.	1.4500	0.5599	.	741247	810186	1632776	549009
.	1.5000	0.5792	.	741247	831824	1614646	538201
.	1.5500	0.5985	.	741247	853122	1596834	527622
.	1.6000	0.6178	.	741247	874087	1579332	517268
.	1.6500	0.6371	.	741247	894726	1562135	507132
.	1.7000	0.6564	.	741247	915043	1545236	497211
.	1.7500	0.6757	.	741247	935047	1528629	487499
.	1.8000	0.6950	.	741247	954741	1512309	477992
.	1.8500	0.7143	.	741247	974133	1496269	468685
.	1.9000	0.7336	.	741247	993227	1480505	459573
.	1.9500	0.7529	.	741247	1012030	1465010	450654
.	2.0000	0.7722	.	741247	1030547	1449780	441921
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS3
 Date and time : 12OCT93:10:09
 Computation of ref. F: Simple mean, age 5 - 10
 Basis for 1993 : TAC constraints

Over-fishing and low growth

Table 3.18d

Cod in the North-East Arctic (Fishing Areas I and II)
 Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.8371	0.3232	2344558	943172	500000	0.0000	0.0000	2632681	875320	0	3432401	1263369
.	0.0500	0.0193	.	875320	42832	3390987	1238053
.	0.1000	0.0386	.	875320	84924	3350315	1213282
.	0.1500	0.0579	.	875320	126291	3310370	1189042
.	0.2000	0.0772	.	875320	166948	3271137	1165322
.	0.2500	0.0965	.	875320	206908	3232602	1142110
.	0.3000	0.1158	.	875320	246186	3194751	1119394
.	0.3500	0.1351	.	875320	284796	3157569	1097164
.	0.4000	0.1544	.	875320	322752	3121043	1075408
.	0.4500	0.1738	.	875320	360065	3085160	1054116
.	0.5000	0.1931	.	875320	396750	3049908	1033277
.	0.5500	0.2124	.	875320	432818	3015272	1012881
.	0.6000	0.2317	.	875320	468281	2981241	992918
.	0.6500	0.2510	.	875320	503153	2947803	973379
.	0.7000	0.2703	.	875320	537445	2914946	954253
.	0.7500	0.2896	.	875320	571167	2882658	935532
.	0.8000	0.3089	.	875320	604332	2850927	917207
.	0.8500	0.3282	.	875320	636950	2819744	899268
.	0.9000	0.3475	.	875320	669032	2789096	881708
.	0.9500	0.3668	.	875320	700588	2758973	864517
.	1.0000	0.3861	.	875320	731630	2729366	847688
.	1.0500	0.4054	.	875320	762166	2700262	831212
.	1.1000	0.4247	.	875320	792207	2671654	815082
.	1.1500	0.4440	.	875320	821763	2643530	799290
.	1.2000	0.4633	.	875320	850842	2615882	783828
.	1.2500	0.4826	.	875320	879454	2588700	768690
.	1.3000	0.5020	.	875320	907609	2561975	753867
.	1.3500	0.5213	.	875320	935314	2535697	739354
.	1.4000	0.5406	.	875320	962578	2509859	725143
.	1.4500	0.5599	.	875320	989411	2484452	711227
.	1.5000	0.5792	.	875320	1015820	2459467	697601
.	1.5500	0.5985	.	875320	1041813	2434896	684257
.	1.6000	0.6178	.	875320	1067398	2410731	671190
.	1.6500	0.6371	.	875320	1092583	2386965	658393
.	1.7000	0.6564	.	875320	1117376	2363589	645861
.	1.7500	0.6757	.	875320	1141784	2340596	633587
.	1.8000	0.6950	.	875320	1165815	2317979	621567
.	1.8500	0.7143	.	875320	1189474	2295730	609794
.	1.9000	0.7336	.	875320	1212770	2273843	598264
.	1.9500	0.7529	.	875320	1235709	2252310	586970
.	2.0000	0.7722	.	875320	1258299	2231126	575908
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS1
 Date and time : 12OCT93:09:45
 Computation of ref. F: Simple mean, age 5 - 10
 Basis for 1993 : TAC constraints

No over-fishing and high growth

Table 3.18e

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.8371	0.3232	2344558	943172	500000	0.0000	0.0000	2496810	849749	0	3100798	1193066
.	0.0500	0.0193	.	849749	40592	3062187	1168939
.	0.1000	0.0386	.	849749	80480	3024280	1145336
.	0.1500	0.0579	.	849749	119678	2987061	1122242
.	0.2000	0.0772	.	849749	158200	2950516	1099648
.	0.2500	0.0965	.	849749	196059	2914631	1077541
.	0.3000	0.1158	.	849749	233270	2879393	1055911
.	0.3500	0.1351	.	849749	269845	2844788	1034746
.	0.4000	0.1544	.	849749	305797	2810804	1014036
.	0.4500	0.1738	.	849749	341139	2777427	993771
.	0.5000	0.1931	.	849749	375882	2744646	973940
.	0.5500	0.2124	.	849749	410039	2712448	954535
.	0.6000	0.2317	.	849749	443622	2680822	935544
.	0.6500	0.2510	.	849749	476642	2649755	916959
.	0.7000	0.2703	.	849749	509110	2619237	898771
.	0.7500	0.2896	.	849749	541037	2589256	880971
.	0.8000	0.3089	.	849749	572434	2559801	863550
.	0.8500	0.3282	.	849749	603311	2530862	846499
.	0.9000	0.3475	.	849749	633679	2502429	829810
.	0.9500	0.3668	.	849749	663547	2474491	813476
.	1.0000	0.3861	.	849749	692926	2447039	797487
.	1.0500	0.4054	.	849749	721825	2420062	781837
.	1.1000	0.4247	.	849749	750253	2393552	766518
.	1.1500	0.4440	.	849749	778220	2367498	751522
.	1.2000	0.4633	.	849749	805734	2341892	736842
.	1.2500	0.4826	.	849749	832805	2316725	722471
.	1.3000	0.5020	.	849749	859440	2291989	708403
.	1.3500	0.5213	.	849749	885649	2267674	694630
.	1.4000	0.5406	.	849749	911440	2243772	681146
.	1.4500	0.5599	.	849749	936820	2220276	667945
.	1.5000	0.5792	.	849749	961798	2197177	655021
.	1.5500	0.5985	.	849749	986381	2174468	642366
.	1.6000	0.6178	.	849749	1010577	2152140	629976
.	1.6500	0.6371	.	849749	1034393	2130187	617844
.	1.7000	0.6564	.	849749	1057837	2108601	605965
.	1.7500	0.6757	.	849749	1080915	2087374	594333
.	1.8000	0.6950	.	849749	1103635	2066501	582942
.	1.8500	0.7143	.	849749	1126003	2045974	571788
.	1.9000	0.7336	.	849749	1148025	2025786	560866
.	1.9500	0.7529	.	849749	1169710	2005931	550169
.	2.0000	0.7722	.	849749	1191061	1986402	539694
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS2
 Date and time : 12OCT93:09:52
 Computation of ref. F: Simple mean, age 5 - 10
 Basis for 1993 : TAC constraints

No over-fishing and medium growth

Table 3.18f

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.8371	0.3232	2344544	943158	500000	0.0000	0.0000	2248650	821061	0	2448720	1083102
.	0.0500	0.0193	.	821061	37569	2415447	1060701
.	0.1000	0.0386	.	821061	74480	2382806	1038793
.	0.1500	0.0579	.	821061	110748	2350784	1017368
.	0.2000	0.0772	.	821061	146384	2319369	996413
.	0.2500	0.0965	.	821061	181402	2288548	975919
.	0.3000	0.1158	.	821061	215814	2258307	955874
.	0.3500	0.1351	.	821061	249634	2228635	936268
.	0.4000	0.1544	.	821061	282872	2199520	917092
.	0.4500	0.1738	.	821061	315540	2170949	898335
.	0.5000	0.1931	.	821061	347651	2142912	879987
.	0.5500	0.2124	.	821061	379215	2115398	862039
.	0.6000	0.2317	.	821061	410243	2088394	844483
.	0.6500	0.2510	.	821061	440746	2061891	827308
.	0.7000	0.2703	.	821061	470735	2035878	810507
.	0.7500	0.2896	.	821061	500220	2010346	794071
.	0.8000	0.3089	.	821061	529210	1985283	777991
.	0.8500	0.3282	.	821061	557716	1960680	762259
.	0.9000	0.3475	.	821061	585748	1936528	746867
.	0.9500	0.3668	.	821061	613314	1912817	731809
.	1.0000	0.3861	.	821061	640424	1889538	717075
.	1.0500	0.4054	.	821061	667087	1866682	702659
.	1.1000	0.4247	.	821061	693312	1844241	688553
.	1.1500	0.4440	.	821061	719107	1822206	674751
.	1.2000	0.4633	.	821061	744481	1800568	661245
.	1.2500	0.4826	.	821061	769442	1779320	648030
.	1.3000	0.5020	.	821061	793998	1758453	635097
.	1.3500	0.5213	.	821061	818157	1737960	622441
.	1.4000	0.5406	.	821061	841927	1717833	610057
.	1.4500	0.5599	.	821061	865315	1698064	597936
.	1.5000	0.5792	.	821061	888328	1678647	586074
.	1.5500	0.5985	.	821061	910975	1659574	574466
.	1.6000	0.6178	.	821061	933261	1640839	563104
.	1.6500	0.6371	.	821061	955194	1622433	551984
.	1.7000	0.6564	.	821061	976781	1604352	541099
.	1.7500	0.6757	.	821061	998028	1586588	530446
.	1.8000	0.6950	.	821061	1018941	1569134	520019
.	1.8500	0.7143	.	821061	1039528	1551985	509812
.	1.9000	0.7336	.	821061	1059794	1535135	499821
.	1.9500	0.7529	.	821061	1079746	1518577	490041
.	2.0000	0.7722	.	821061	1099389	1502305	480468
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS3
 Date and time : 12OCT93:10:09
 Computation of ref. F: Simple mean, age 5 - 10
 Basis for 1993 : TAC constraints

No over-fishing and low growth

Table 3.19a

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Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	0.8288	0.3200	188634	583616	1696601	2499583	153678	791125	153678	791125
1995	0.8288	0.3200	224103	678477	1891288	2732995	194378	834701	194378	834701
1996	0.8288	0.3200	243984	760728	1946815	3031425	257091	1041429	257091	1041429
1997	0.8288	0.3200	257552	827907	1974420	3259770	301313	1266650	301313	1266650
1998	0.8288	0.3200	262536	878859	1984835	3440508	325910	1451663	325910	1451663
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM1
Date and time : 12OCT93:11:30
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	1.0000	0.3861	222875	685447	1696601	2499583	153678	791125	153678	791125
1995	1.0000	0.3861	256228	761726	1860618	2635919	183897	780703	183897	780703
1996	1.0000	0.3861	272458	824787	1892973	2842557	232926	924554	232926	924554
1997	1.0000	0.3861	283362	875766	1904900	2989628	263732	1078025	263732	1078025
1998	1.0000	0.3861	285827	911044	1904885	3098411	278863	1195281	278863	1195281
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM1
Date and time : 12OCT93:11:30
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	1.1914	0.4600	259475	792824	1696601	2499583	153678	791125	153678	791125
1995	1.1914	0.4600	287880	838893	1827891	2533847	172941	724777	172941	724777
1996	1.1914	0.4600	298840	876112	1837929	2654317	209004	810810	209004	810810
1997	1.1914	0.4600	306488	908392	1836326	2732872	228233	903896	228233	903896
1998	1.1914	0.4600	306291	927593	1828163	2786041	236057	969113	236057	969113
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM1
Date and time : 12OCT93:11:30
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

Over-fishing and high growth

Table 3.19b

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	0.8288	0.3200	188634	552529	1696601	2368453	153678	767809	153678	767809
1995	0.8288	0.3200	224103	610794	1891288	2449188	194378	785108	194378	785108
1996	0.8288	0.3200	243984	689543	1946815	2736082	257091	985936	257091	985936
1997	0.8288	0.3200	257552	753794	1974420	2961241	301313	1205015	301313	1205015
1998	0.8288	0.3200	262536	799167	1984835	3128437	325910	1374956	325910	1374956
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM2
 Date and time : 12OCT93:11:52
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	1.0000	0.3861	222875	648867	1696601	2368453	153678	767809	153678	767809
1995	1.0000	0.3861	256228	684854	1860618	2359282	183897	733827	183897	733827
1996	1.0000	0.3861	272458	745859	1892973	2558934	232926	874227	232926	874227
1997	1.0000	0.3861	283362	794784	1904900	2705571	263732	1024023	263732	1024023
1998	1.0000	0.3861	285827	825702	1904885	2805608	278863	1130701	278863	1130701
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM2
 Date and time : 12OCT93:11:52
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	1.1914	0.4600	259475	750429	1696601	2368453	153678	767809	153678	767809
1995	1.1914	0.4600	287880	753178	1827891	2264850	172941	680748	172941	680748
1996	1.1914	0.4600	298840	790265	1837929	2382689	209004	765614	209004	765614
1997	1.1914	0.4600	306488	821497	1836326	2463119	228233	857103	228233	857103
1998	1.1914	0.4600	306291	837687	1828163	2511408	236057	915330	236057	915330
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM2
 Date and time : 12OCT93:11:52
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Over-fishing and medium growth

Table 3.19c

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Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	0.8288	0.3200	188634	510206	1696601	2127780	153678	741257	153678	741257
1995	0.8288	0.3200	224103	509684	1891288	1887230	194378	702430	194378	702430
1996	0.8288	0.3200	243984	589903	1946815	2128303	257091	873418	257091	873418
1997	0.8288	0.3200	257552	654625	1974420	2353612	301313	1085332	301313	1085332
1998	0.8288	0.3200	262536	696451	1984835	2523380	325910	1254622	325910	1254622
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM3
Date and time : 12OCT93:12:42
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	1.0000	0.3861	222875	599021	1696601	2127780	153678	741257	153678	741257
1995	1.0000	0.3861	256228	570154	1860618	1811328	183897	655289	183897	655289
1996	1.0000	0.3861	272458	634826	1892973	1975918	232926	771436	232926	771436
1997	1.0000	0.3861	283362	685091	1904900	2126487	263732	917225	263732	917225
1998	1.0000	0.3861	285827	713468	1904885	2230726	278863	1024480	278863	1024480
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM3
Date and time : 12OCT93:12:42
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0975	0.4238	194576	630000	1617812	2344558	169407	943172	169407	943172
1994	1.1914	0.4600	259475	692599	1696601	2127780	153678	741257	153678	741257
1995	1.1914	0.4600	287880	625416	1827891	1731858	172941	606570	172941	606570
1996	1.1914	0.4600	298840	668828	1837929	1825137	209004	672586	209004	672586
1997	1.1914	0.4600	306488	702274	1836326	1912731	228233	762816	228233	762816
1998	1.1914	0.4600	306291	717009	1828163	1966464	236057	822464	236057	822464
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM3
Date and time : 12OCT93:12:42
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

Over-fishing and low growth

Table 3.19d

Cod in the North-East Arctic (Fishing Areas I and II)
 Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	0.8288	0.3200	196884	623186	1733835	2632681	167321	875320	167321	875320
1995	0.8288	0.3200	229970	710230	1914359	2832900	206632	906828	206632	906828
1996	0.8288	0.3200	247762	784823	1960435	3105028	267164	1103112	267164	1103112
1997	0.8288	0.3200	259764	844567	1982179	3311580	308232	1314710	308232	1314710
1998	0.8288	0.3200	263790	890314	1989203	3476494	330117	1486728	330117	1486728
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM1
 Date and time : 12OCT93:11:30
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	1.0000	0.3861	232545	731630	1733835	2632681	167321	875320	167321	875320
1995	1.0000	0.3861	262692	796279	1882422	2729366	195350	847688	195350	847688
1996	1.0000	0.3861	276342	849154	1905025	2906757	241756	977986	241756	977986
1997	1.0000	0.3861	285476	891415	1911286	3031586	269400	1116801	269400	1116801
1998	1.0000	0.3861	286938	921029	1908218	3125475	282068	1221613	282068	1221613
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM1
 Date and time : 12OCT93:11:30
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	1.1914	0.4600	270633	845874	1733835	2632681	167321	875320	167321	875320
1995	1.1914	0.4600	294847	875619	1848370	2620604	183561	786464	183561	786464
1996	1.1914	0.4600	302716	900002	1848453	2709489	216631	856365	216631	856365
1997	1.1914	0.4600	308435	922533	1841471	2766093	232776	934466	232776	934466
1998	1.1914	0.4600	307230	935901	1830633	2805783	238427	988289	238427	988289
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM1
 Date and time : 12OCT93:11:30
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

No over-fishing and high growth

Table 3.19e

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	0.8288	0.3200	196884	590282	1733835	2496810	167321	849750	167321	849750
1995	0.8288	0.3200	229970	640348	1914359	2543070	206632	853684	206632	853684
1996	0.8288	0.3200	247762	712330	1960435	2806692	267164	1045380	267164	1045380
1997	0.8288	0.3200	259764	769619	1982179	3011159	308232	1251330	308232	1251330
1998	0.8288	0.3200	263790	809923	1989203	3162603	330117	1408236	330117	1408236
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM2
 Date and time : 12OCT93:11:52
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	1.0000	0.3861	232545	692926	1733835	2496810	167321	849750	167321	849750
1995	1.0000	0.3861	262692	716983	1882422	2447039	195350	797487	195350	797487
1996	1.0000	0.3861	276342	768878	1905025	2620480	241756	925695	241756	925695
1997	1.0000	0.3861	285476	809635	1911286	2745977	269400	1061373	269400	1061373
1998	1.0000	0.3861	286938	835064	1908218	2831282	282068	1155671	282068	1155671
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM2
 Date and time : 12OCT93:11:52
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	1.1914	0.4600	270633	801033	1733835	2496810	167321	849750	167321	849750
1995	1.1914	0.4600	294847	787293	1848370	2346265	183561	739345	183561	739345
1996	1.1914	0.4600	302716	812807	1848453	2435539	216631	809469	216631	809469
1997	1.1914	0.4600	308435	834904	1841471	2495095	232776	886535	232776	886535
1998	1.1914	0.4600	307230	845464	1830633	2530121	238427	933498	238427	933498
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM2
 Date and time : 12OCT93:11:52
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

No over-fishing and medium growth

Table 3.19f

Cod in the North-East Arctic (Fishing Areas I and II)
 Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	0.8288	0.3200	196884	545692	1733835	2248663	167321	821072	167321	821072
1995	0.8288	0.3200	229970	535991	1914359	1971063	206632	766664	206632	766664
1996	0.8288	0.3200	247762	611128	1960435	2194139	267164	929950	267164	929950
1997	0.8288	0.3200	259764	669527	1982179	2401878	308232	1130307	308232	1130307
1998	0.8288	0.3200	263790	706470	1989203	2556782	330117	1287162	330117	1287162
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM3
 Date and time : 12OCT93:12:42
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	1.0000	0.3861	232545	640429	1733835	2248663	167321	821072	167321	821072
1995	1.0000	0.3861	262692	598730	1882422	1889544	195350	714863	195350	714863
1996	1.0000	0.3861	276342	656243	1905025	2033172	241756	820309	241756	820309
1997	1.0000	0.3861	285476	699071	1911286	2165499	269400	953450	269400	953450
1998	1.0000	0.3861	286938	722181	1908218	2255812	282068	1048881	282068	1048881
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM3
 Date and time : 12OCT93:12:42
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.8371	0.3232	153002	500000	1617812	2344558	169407	943172	169407	943172
1994	1.1914	0.4600	270633	740152	1733835	2248663	167321	821072	167321	821072
1995	1.1914	0.4600	294847	655731	1848370	1804268	183561	661347	183561	661347
1996	1.1914	0.4600	302716	689775	1848453	1874174	216631	714160	216631	714160
1997	1.1914	0.4600	308435	714892	1841471	1943552	232776	791322	232776	791322
1998	1.1914	0.4600	307230	724241	1830633	1984738	238427	840207	238427	840207
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HM3
 Date and time : 12OCT93:12:42
 Computation of ref. F: Simple mean, age 5 - 10
 Prediction basis : F factors

No over-fishing and low growth

Table 3.20a

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Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 1.0975 Reference F: 0.4238						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0320	20078	20480	702000	245700	0	0	0	0
4	0.1310	56237	99539	504078	594812	15122	17844	15122	17844
5	0.3119	50258	123635	205869	376740	14411	26372	14411	26372
6	0.4054	17106	56963	56245	161423	11811	33899	11811	33899
7	0.4325	11159	48205	34811	144118	19494	80706	19494	80706
8	0.5041	14880	80350	41118	228616	36595	203468	36595	203468
9	0.4403	8520	54101	26200	176326	24890	167510	24890	167510
10	0.4483	13467	111773	40818	344912	40410	341463	40410	341463
11	0.6246	1707	19853	4013	42779	4013	42779	4013	42779
12	0.6463	1101	14281	2525	27396	2525	27396	2525	27396
13	0.7521	55	691	114	1425	114	1425	114	1425
14	0.5945	2	23	4	56	4	56	4	56
15+	0.5945	7	105	17	255	17	255	17	255
Total		194576	630000	1617812	2344558	169407	943172	169407	943172
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	14274	13846	547000	196920	0	0	0	0
4	0.1194	56892	90458	556621	556621	11132	11132	11132	11132
5	0.2842	81553	182679	362014	590083	18101	29504	18101	29504
6	0.3694	34751	106339	123386	318336	30846	79584	30846	79584
7	0.3941	9123	37402	30701	116355	19955	75631	19955	75631
8	0.4593	6220	32778	18493	96163	16274	84624	16274	84624
9	0.4012	6132	39978	20335	132787	19318	126148	19318	126148
10	0.4085	4226	35795	13810	113936	13810	113936	13810	113936
11	0.5691	8474	94066	21344	213868	21344	213868	21344	213868
12	0.5889	717	9079	1759	19089	1759	19089	1759	19089
13	0.6853	493	6157	1083	13540	1083	13540	1083	13540
14	0.5417	17	234	44	612	44	612	44	612
15+	0.5417	4	54	9	142	9	142	9	142
Total		222875	648867	1696601	2368453	153678	767809	153678	767809
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	17536	16309	672000	248640	0	0	0	0
4	0.1194	44457	62240	434958	356665	8699	7133	8699	7133
5	0.2842	91109	184040	404433	574294	20222	28715	20222	28715
6	0.3694	62827	175287	223070	513060	55767	128265	55767	128265
7	0.3941	20747	80497	69820	240180	45383	156117	45383	156117
8	0.4593	5700	29243	16949	81862	14915	72038	14915	72038
9	0.4012	2884	19295	9565	60450	9087	57427	9087	57427
10	0.4085	3411	29471	11147	89731	11147	89731	11147	89731
11	0.5691	2984	31569	7515	70492	7515	70492	7515	70492
12	0.5889	4029	49839	9891	107323	9891	107323	9891	107323
13	0.6853	363	4543	799	9992	799	9992	799	9992
14	0.5417	171	2376	447	6212	447	6212	447	6212
15+	0.5417	10	146	25	382	25	382	25	382
Total		256228	684854	1860618	2359282	183897	733827	183897	733827
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

(cont.)

Table 3.20b

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Cod in the North-East Arctic (Fishing Areas I and II)
Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

(cont.)

Year: 1996 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	15657	14561	600000	222000	0	0	0	0
4	0.1194	54616	76463	534354	438170	10687	8763	10687	8763
5	0.2842	71195	143814	316034	448768	15802	22438	15802	22438
6	0.3694	70188	195826	249207	573177	62302	143294	62302	143294
7	0.3941	37508	145530	126227	434222	82048	282244	82048	282244
8	0.4593	12964	66504	38545	186171	33919	163830	33919	163830
9	0.4012	2643	17683	8766	55401	8328	52631	8328	52631
10	0.4085	1604	13862	5243	42206	5243	42206	5243	42206
11	0.5691	2408	25480	6066	56896	6066	56896	6066	56896
12	0.5889	1419	17548	3483	37788	3483	37788	3483	37788
13	0.6853	2044	25544	4494	56177	4494	56177	4494	56177
14	0.5417	126	1753	330	4584	330	4584	330	4584
15+	0.5417	86	1291	225	3375	225	3375	225	3375
Total		272458	745859	1892973	2558934	232926	874227	232926	874227
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1997 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	15657	14561	600000	222000	0	0	0	0
4	0.1194	48764	68270	477102	391223	9542	7824	9542	7824
5	0.2842	87464	176678	388253	551320	19413	27566	19413	27566
6	0.3694	54847	153023	194737	447895	48684	111974	48684	111974
7	0.3941	41903	162582	141018	485101	91661	315315	91661	315315
8	0.4593	23437	120233	69685	336578	61323	296189	61323	296189
9	0.4012	6011	40215	19936	125994	18939	119695	18939	119695
10	0.4085	1470	12704	4805	38681	4805	38681	4805	38681
11	0.5691	1133	11985	2853	26762	2853	26762	2853	26762
12	0.5889	1145	14163	2811	30499	2811	30499	2811	30499
13	0.6853	720	8994	1582	19780	1582	19780	1582	19780
14	0.5417	709	9858	1854	25774	1854	25774	1854	25774
15+	0.5417	101	1516	264	3964	264	3964	264	3964
Total		283362	794784	1904900	2705571	263732	1024023	263732	1024023
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1998 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	15657	14561	600000	222000	0	0	0	0
4	0.1194	48764	68270	477102	391223	9542	7824	9542	7824
5	0.2842	78093	157748	346655	492250	17333	24612	17333	24612
6	0.3694	67381	187992	239238	550247	59809	137562	59809	137562
7	0.3941	32744	127046	110195	379070	71627	246395	71627	246395
8	0.4593	26184	134321	77850	376016	68508	330894	68508	330894
9	0.4012	10868	72706	36042	227785	34240	216396	34240	216396
10	0.4085	3344	28893	10928	87969	10928	87969	10928	87969
11	0.5691	1038	10984	2615	24527	2615	24527	2615	24527
12	0.5889	539	6662	1322	14346	1322	14346	1322	14346
13	0.6853	581	7259	1277	15965	1277	15965	1277	15965
14	0.5417	250	3471	653	9075	653	9075	653	9075
15+	0.5417	386	5789	1009	15136	1009	15136	1009	15136
Total		285827	825702	1904885	2805608	278863	1130701	278863	1130701
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

(cont.)

Table 3.20c

Cod in the North-East Arctic (Fishing Areas I and II)
Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 0.8371 Reference F: 0.3232						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0244	15370	15677	702000	245700	0	0	0	0
4	0.0999	43528	77045	504078	594812	15122	17844	15122	17844
5	0.2379	39661	97567	205869	376740	14411	26372	14411	26372
6	0.3092	13629	45384	56245	161423	11811	33899	11811	33899
7	0.3299	8915	38511	34811	144118	19494	80706	19494	80706
8	0.3845	11972	64646	41118	228616	36595	203468	36595	203468
9	0.3358	6812	43255	26200	176326	24890	167510	24890	167510
10	0.3420	10776	89437	40818	344912	40410	341463	40410	341463
11	0.4764	1389	16158	4013	42779	4013	42779	4013	42779
12	0.4930	898	11647	2525	27396	2525	27396	2525	27396
13	0.5737	46	569	114	1425	114	1425	114	1425
14	0.4535	1	19	4	56	4	56	4	56
15+	0.4535	6	85	17	255	17	255	17	255
Total		153002	500000	1617812	2344558	169407	943172	169407	943172
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	14274	13846	547000	196920	0	0	0	0
4	0.1194	57326	91149	560871	560871	11217	11217	11217	11217
5	0.2842	84129	188449	373449	608722	18672	30436	18672	30436
6	0.3694	37421	114509	132865	342793	33216	85698	33216	85698
7	0.3941	10044	41180	33801	128106	21971	83269	21971	83269
8	0.4593	6892	36321	20492	106558	18033	93771	18033	93771
9	0.4012	6911	45058	22919	149661	21773	142178	21773	142178
10	0.4085	4692	39738	15332	126486	15332	126486	15332	126486
11	0.5691	9426	104626	23740	237877	23740	237877	23740	237877
12	0.5889	831	10530	2040	22138	2040	22138	2040	22138
13	0.6853	574	7177	1263	15784	1263	15784	1263	15784
14	0.5417	20	280	53	731	53	731	53	731
15+	0.5417	4	63	11	164	11	164	11	164
Total		232545	692926	1733835	2496810	167321	849750	167321	849750
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 1.0000 Reference F: 0.3861						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	17536	16309	672000	248640	0	0	0	0
4	0.1194	44457	62240	434958	356665	8699	7133	8699	7133
5	0.2842	91805	185445	407520	578678	20376	28934	20376	28934
6	0.3694	64811	180823	230116	529266	57529	132316	57529	132316
7	0.3941	22340	86681	75184	258633	48870	168111	48870	168111
8	0.4593	6276	32196	18660	90129	16421	79313	16421	79313
9	0.4012	3196	21380	10599	66984	10069	63635	10069	63635
10	0.4085	3844	33216	12563	101133	12563	101133	12563	101133
11	0.5691	3312	35046	8343	78257	8343	78257	8343	78257
12	0.5889	4481	55434	11002	119371	11002	119371	11002	119371
13	0.6853	422	5269	927	11588	927	11588	927	11588
14	0.5417	199	2770	521	7242	521	7242	521	7242
15+	0.5417	12	174	30	454	30	454	30	454
Total		262692	716983	1882422	2447039	195350	797487	195350	797487
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

(cont.)

No over-fishing, medium growth and *Status quo* F

Table 3.20d

Cod in the North-East Arctic (Fishing Areas I and II)

Cod in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

(cont.)

Year: 1996 F-factor: 1.0000 Reference F: 0.3861

Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
						Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	15657	14561	600000	222000	0	0	0	0
4	0.1194	54616	76463	534354	438170	10687	8763	10687	8763
5	0.2842	71195	143814	316034	448768	15802	22438	15802	22438
6	0.3694	70724	197320	251110	577552	62777	144388	62777	144388
7	0.3941	38692	150127	130214	447937	84639	291159	84639	291159
8	0.4593	13960	71614	41506	200474	36525	176417	36525	176417
9	0.4012	2910	19469	9651	60996	9169	57946	9169	57946
10	0.4085	1778	15361	5810	46768	5810	46768	5810	46768
11	0.5691	2714	28718	6836	64126	6836	64126	6836	64126
12	0.5889	1575	19481	3866	41950	3866	41950	3866	41950
13	0.6853	2273	28412	4999	62483	4999	62483	4999	62483
14	0.5417	146	2034	382	5317	382	5317	382	5317
15+	0.5417	100	1506	263	3938	263	3938	263	3938
Total		276342	768878	1905025	2620480	241756	925695	241756	925695
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1997 F-factor: 1.0000 Reference F: 0.3861

Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
						Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	15657	14561	600000	222000	0	0	0	0
4	0.1194	48764	68270	477102	391223	9542	7824	9542	7824
5	0.2842	87464	176678	388253	551320	19413	27566	19413	27566
6	0.3694	54847	153023	194737	447895	48684	111974	48684	111974
7	0.3941	42222	163823	142094	488804	92361	317723	92361	317723
8	0.4593	24178	124031	71886	347209	63260	305544	63260	305544
9	0.4012	6473	43305	21467	135674	20394	128890	20394	128890
10	0.4085	1619	13987	5290	42588	5290	42588	5290	42588
11	0.5691	1255	13280	3161	29654	3161	29654	3161	29654
12	0.5889	1290	15963	3168	34375	3168	34375	3168	34375
13	0.6853	799	9985	1757	21958	1757	21958	1757	21958
14	0.5417	789	10965	2062	28667	2062	28667	2062	28667
15+	0.5417	118	1763	307	4609	307	4609	307	4609
Total		285476	809635	1911286	2745977	269400	1061373	269400	1061373
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1998 F-factor: 1.0000 Reference F: 0.3861

Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
						Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0292	15657	14561	600000	222000	0	0	0	0
4	0.1194	48764	68270	477102	391223	9542	7824	9542	7824
5	0.2842	78093	157748	346655	492250	17333	24612	17333	24612
6	0.3694	67381	187992	239238	550247	59809	137562	59809	137562
7	0.3941	32744	127046	110195	379070	71627	246395	71627	246395
8	0.4593	26383	135347	78444	378886	69031	333420	69031	333420
9	0.4012	11211	75002	37180	234980	35321	223231	35321	223231
10	0.4085	3601	31112	11767	94728	11767	94728	11767	94728
11	0.5691	1143	12093	2879	27004	2879	27004	2879	27004
12	0.5889	597	7382	1465	15896	1465	15896	1465	15896
13	0.6853	655	8182	1439	17993	1439	17993	1439	17993
14	0.5417	277	3853	725	10074	725	10074	725	10074
15+	0.5417	432	6475	1129	16930	1129	16930	1129	16930
Total		286938	835064	1908218	2831282	282068	1155671	282068	1155671
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

(cont.)

Table 4.1 North-East Arctic HADDOCK. Total nominal catch (t) by fishing areas.
(Data provided by Working Group Members).

Year	Sub-area I	Division IIa	Division IIb	Total
1960	125,657	27,925	1,854	155,434
1961	165,165	25,642	2,427	193,234
1962	160,972	25,189	1,727	187,888
1963	124,774	21,031	939	146,744
1964	79,056	18,735	1,109	98,900
1965	98,505	18,640	939	118,079
1966	124,115	34,892	1,614	160,621
1967	108,066	27,980	440	136,486
1968	140,970	40,031	725	181,726
1969	88,960	40,208	1,341	130,509
1970	59,493	26,611	497	86,601
1971	56,300	21,567	435	78,302
1972	221,183	41,979	2,155	265,317
1973	283,728	23,348	2,989	320,065
1974	159,037	47,033	5,068	221,138
1975	121,686	44,330	9,726	175,742
1976	94,065	37,566	5,649	137,279
1977	72,159	28,452	9,547	110,158
1978	63,965	30,478	979	95,422
1979	63,841	39,167	615	103,623
1980	54,205	33,616	68	87,889
1981	36,834	39,864	455	77,153
1982	17,948	29,005	2	46,955
1983	7,550	13,872	185	21,607
1984	4,000	13,247	71	17,318
1985	30,385	10,774	111	41,270
1986	69,865	26,006	714	96,585
1987	109,429	38,182	3,048	150,659
1988	43,990	47,086	668	91,744
1989	31,265	23,502	355	55,122
1990	15,138	10,375	304	25,817
1991	18,772	14,417	416	33,605
1992 ¹	29,958	22,434	963	53,355

¹Provisional figures.

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

Year	Sub-area I		Division IIa		Division IIb
	Trawl	Others	Trawl	Others	Trawl
1967	73.8	34.3	20.5	7.5	0.4
1968	98.1	42.9	31.4	8.6	0.7
1969	41.3	47.7	33.1	7.1	1.3
1970	36.7	22.8	20.2	6.4	0.5
1971	27.3	29.0	15.0	6.6	0.4
1972	193.4	27.8	34.4	7.6	2.2
1973	241.2	42.5	13.9	9.4	13.0
1974	133.1	25.9	39.9	7.1	15.1
1975	103.5	18.2	34.6	9.7	9.7
1976	77.7	16.4	28.1	9.5	5.6
1977	57.6	14.6	19.9	8.6	9.5
1978	53.9	10.1	15.7	14.8	1.0
1979	47.8	16.0	20.3	18.9	0.6
1980	30.5	23.7	14.8	18.9	0.1
1981	19.0	17.9	21.8	18.7	0.5
1982	9.0	8.9	18.5	10.5	-
1983	3.7	3.8	7.6	6.3	0.2
1984	1.6	2.4	6.4	6.9	0.1
1985	24.4	6.0	4.5	6.3	0.1
1986	51.7	18.1	12.8	13.2	0.7
1987	77.8	31.6	22.1	16.1	3.0
1988	27.5	16.5	33.6	13.5	0.7
1989	21.5	9.8	11.7	11.8	0.4
1990	5.9	9.2	4.8	5.6	0.3
1991	9.8	9.0	7.8	6.6	0.4
1992 ¹	20.6	9.4	9.8	12.6	1.0

¹Provisional

Table 4.3 North-East Arctic HADDOCK. Nominal catch (t) 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	United Kingdom	USSR/Russia ²	Others	Total
1960	172	-	-	5,597	46,263	-	45,469	57,025	125	155,651
1961	285	220	-	6,304	60,862	-	39,650	85,345	558	193,234
1962	83	409	-	2,895	54,567	-	37,486	91,910	58	187,438
1963	17	363	-	2,554	59,955	-	19,809	63,526	-	146,224
1964	-	208	-	1,482	38,695	-	14,653	43,870	250	99,158
1965	-	226	-	1,568	60,447	-	14,345	41,750	242	118,578
1966	-	1,072	11	2,098	82,090	-	27,723	48,710	74	161,778
1967	-	1,208	3	1,705	51,954	-	24,158	57,346	23	136,397
1968	-	-	-	1,867	64,076	-	40,129	75,654	-	181,726
1969	2	-	309	1,490	67,549	-	37,234	24,211	25	130,820
1970	541	-	656	2,119	37,716	-	20,423	26,802	-	87,257
1971	81	-	16	896	45,715	43	16,373	15,778	3	78,905
1972	137	-	829	1,433	46,700	1,433	17,166	196,224	2,231	266,157
1973	1,212	3,214	22	9,534	86,767	34	32,408	186,534	2,501	322,626
1974	925	3,601	454	23,409	66,164	3,045	37,663	78,548	7,348	221,157
1975	299	5,191	437	15,930	55,966	1,080	28,677	65,015	3,163	175,758
1976	536	4,459	348	16,660	49,492	986	16,940	42,485	5,358	137,265
1977	213	1,510	144	4,798	40,118	-	10,878	52,210	287	110,158
1978	466	1,411	369	1,521	39,955	1	5,766	45,895	38	95,422
1979	343	1,198	10	1,948	66,849	2	6,454	26,365	454	103,623
1980	497	226	15	1,365	61,886	-	2,948	20,706	246	87,889
1981	381	414	22	2,398	58,856	<u>Spain</u>	1,682	13,400	-	77,153
1982	496	53	-	1,258	41,421	-	827	2,900	-	46,955
1983	428	-	1	729	19,371	139	259	680	-	21,607
1984	297	15	4	400	15,186	37	276	1,103	-	17,318
1985	424	21	20	395	17,490	77	153	22,690	-	41,270
1986	893	33	75	1,079	48,314	22	431	45,738	-	96,585
1987	464	26	83	3,106	69,333	99	563	76,980	-	150,654
1988	1,113	116	78	1,324	57,273	72	435	31,293	41	91,745
1989	1,218	125	26	171	31,825	1	853	20,903	-	55,122
1990	875	-	5	128	17,634	-	569	6,605	-	25,810
1991	1,117	60	<u>Greenland</u>	219	19,285	-	514	12,388	22	33,605
1992 ¹	1,097	546	1,719	383	29,276	38	585	19,699	12	53,355

¹Provisional figures.

²From 1990 onwards Russia.

Table 4.4 North-East Arctic HADDOCK. Weight at age (kg) in Norwegian and Russian landings.

Norway													
Age	Age												
	2	3	4	5	6	7	8	9	10	11	12	13	14+
1984	1.17	1.58	1.99	2.42	2.64	2.89	3.16	3.41	3.51	4.04	4.04	3.84	4.36
1985	0.81	1.32	1.91	2.35	2.66	2.85	3.14	3.38	3.72	3.81	3.22	3.72	4.19
1986	0.62	1.17	1.51	2.24	2.54	2.62	3.04	3.17	3.51	3.72	3.98	4.06	4.14
1987	0.43	1.02	1.32	1.72	2.60	2.99	3.24	3.14	3.51	3.93	4.00	3.48	5.28
1988	0.61	0.77	0.87	1.10	1.48	2.05	2.52	2.83	3.14	3.32	3.71	3.66	4.78
1989	0.77	1.01	1.15	1.38	1.44	1.71	1.66	1.99	3.21	3.23	5.03	4.73	5.61
1990	0.79	0.95	1.24	1.39	1.58	1.72	2.10	2.24	2.44	2.95	3.19	3.59	4.59
1991	0.57	0.97	1.29	1.46	1.73	1.78	1.93	2.29	2.34	-	4.41	-	3.33
1992 ¹	0.55	0.90	1.34	1.60	1.83	1.95	2.04	2.12	2.66	3.17	2.65	2.23	3.27

Russia													
Age	Age												
	2	3	4	5	6	7	8	9	10	11	12	13	14+
1984	0.66	1.35	1.90	2.48	3.13	3.12	3.57	3.86	3.98	4.77	-	-	5.37
1985	0.25	0.81	1.46	2.51	2.84	3.23	3.29	3.90	4.03	6.75 (5.20)	4.78	-	-
1986	0.27	0.54	0.98	1.50	2.25	2.63	3.03	3.65	3.80	-	-	-	6.45
1987	-	0.47	0.69	1.09	1.93	2.75	2.72	3.34	2.83	2.40	-	-	4.52
1988	0.18	0.44	0.74	0.98	1.35	1.52	-	4.04	-	3.80	3.70	-	-
1989	0.42	0.41	0.64	0.98	1.28	1.72	2.48	-	-	-	-	-	-
1990	0.45	0.68	1.19	1.41	1.64	1.99	2.59	-	-	-	-	-	4.85
1991	0.25	0.64	1.32	1.70	1.95	2.33	2.61	3.43	-	-	-	-	-
1992 ¹	0.244	0.767	1.33	1.91	2.17	2.56	2.78	3.13	3.77	-	-	-	-
1993 ²	0.12	0.40	0.86	1.36	1.99	2.39	2.70	3.10	3.38	-	-	-	-

¹Provisional.

²Data from January-June.

Table 4.5 North-East Arctic HADDOCK. Input data to the assessment. Weight at age (kg) in the stock.

Age	Age											
	3	4	5	6	7	8	9	10	11	12	13	14+
1982	0.66	1.03	1.79	2.38	2.86	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1983	0.66	1.03	1.79	2.38	2.86	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1984	0.66	1.03	1.79	2.38	2.86	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1985	0.44	0.82	1.78	2.40	2.69	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1986	0.28	0.82	1.53	2.26	2.26	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1987	0.24	0.48	0.93	2.22	2.26	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1988	0.27	0.39	0.61	1.10	1.56	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1989	0.28	0.44	0.70	1.02	1.43	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1990	0.28	0.72	0.95	1.27	1.51	1.90	3.70	4.41	5.40	6.70	7.40	8.00
1991	0.39	0.75	1.48	1.62	1.69	2.08	2.36	4.41	5.40	6.70	7.40	8.00
1992	0.37	0.90	1.53	2.24	2.44	3.05	3.39	3.40	5.40	6.70	7.40	8.00
1993	0.33	0.79	1.33	2.03	2.32	2.70 ¹	3.10 ¹	3.38 ¹	5.40	6.70	7.40	8.00

¹Mean weight at age in the catch.

Table 4.6 North-East Arctic HADDOCK. Input data to the assessment. Weight at age (kg) in the catch.

Age	Age											
	3	4	5	6	7	8	9	10	11	12	13	14+
1982	0.66	1.03	1.79	2.38	2.86	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1983	1.52	1.86	2.10	2.38	2.86	3.33	3.70	4.41	5.40	6.70	7.40	8.00
1984	1.57	1.99	2.42	2.68	2.93	3.37	3.70	4.41	5.40	6.70	7.40	8.00
1985	0.92	1.66	2.39	2.89	2.71	3.22	3.70	4.41	5.40	6.70	7.40	8.00
1986	0.86	1.25	1.88	2.41	2.66	3.04	3.70	4.41	5.40	6.70	7.40	8.00
1987	0.64	0.86	1.33	2.45	2.98	2.98	3.70	4.41	5.40	6.70	7.40	8.00
1988	0.58	0.84	1.05	1.43	1.97	2.52	3.70	4.41	5.40	6.70	7.40	8.00
1989	0.80	0.89	1.17	1.37	1.71	2.01	3.70	4.41	5.40	6.70	7.40	8.00
1990	0.89	1.22	1.40	1.60	1.77	2.16	3.70	4.41	5.40	6.70	7.40	8.00
1991	0.77	1.31	1.61	1.86	2.11	2.34	2.93	2.34	5.40	6.70	7.40	8.00
1992 ¹	0.85	1.34	1.72	1.97	2.20	2.34	2.53	3.12	5.40	6.70	7.40	8.00
1993 ²	0.49 ³	1.00 ³	1.45 ³	2.00	2.40	2.70	3.10	3.38	5.40	6.70	7.40	8.00

¹Provisional.

²Calculated from January-June data.

³Corrected to account for growth during the year.

Table 4.7 North-East Arctic HADDOCK. Maturity at age in percent from Russian data.

Year	Maturity at age in percent							
	Age							
	3	4	5	6	7	8	9	10
1981	1	12	64	73	96	100	100	-
1982	9	55	73	93	96	100	93	-
1983	17	70	100	99	99	100	-	-
1984	7	14	35	47	74	82	89	-
1985	2	8	80	93	96	91	96	-
1986	+	22	53	86	86	100	83	100
1987	-	1	21	53	100	100	-	100
1988	-	3	33	51	-	-	-	-
1989	-	4	30	63	82	100	-	-
1990	-	2	30	54	77	87	80	100
1991	-	7	30	50	80	92	100	100
1992	2	13	50	62	77	80	94	100
1993	2	24	50	79	80	89	87	87

Table 4.8

Haddock in the North-East Arctic (Fishing Areas I and II)

Russian bottom trawl, total area, Nov - Dec, age 3 - 7, calendar (code: FLT21) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1983	1	0.50	0.40	0.01	-11.00	-11.00
1984	1	1.50	0.20	0.10	0.01	-11.00
1985	1	90.00	0.40	0.10	0.10	-11.00
1986	1	36.30	16.40	0.10	0.01	0.01
1987	1	8.30	22.50	5.70	0.01	0.01
1988	1	1.70	4.00	7.60	0.80	0.01
1989	1	0.40	1.40	4.10	8.10	1.10
1990	1	7.30	4.20	7.30	7.40	5.70
1991	1	6.20	0.90	0.30	0.60	1.80
1992	1	34.60	5.00	0.40	0.60	0.90

Haddock in the North-East Arctic (Fishing Areas I and II)

Russian acoustic survey, total area, Oct - Dec, age 3 - 7, calend (code: FLT23) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1985	1	636.0	3.0	1.0	0.1	-11.0
1986	1	917.0	910.0	2.0	0.1	0.1
1987	1	62.0	197.0	61.0	0.1	-11.0
1988	1	18.0	83.0	301.0	46.0	-11.0
1989	1	2.0	14.0	35.0	67.0	9.0
1990	1	28.0	17.0	23.0	43.0	44.0
1991	1	65.0	11.0	4.0	7.0	21.0
1992	1	218.0	35.0	3.0	4.0	7.0

Haddock in the North-East Arctic (Fishing Areas I and II)

Norway bott trawl survey, Barents sea, Jan-Mar, age 3-7, shifted (code: FLT24) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1982	1	3.50	1.90	1.90	4.20	1.90
1983	1	2.10	1.00	0.30	0.40	0.40
1984	1	8.20	0.60	0.30	0.40	0.40
1985	1	166.00	6.70	0.70	0.20	0.20
1986	1	355.00	75.30	0.20	0.30	0.05
1987	1	83.00	155.00	23.80	0.30	0.01
1988	1	19.20	37.90	40.90	4.40	0.01
1989	1	4.90	7.70	14.30	18.40	2.60
1990	1	17.60	4.70	3.60	4.60	8.50
1991	1	89.90	6.20	1.30	2.00	7.80
1992	1	130.30	14.20	0.60	0.80	0.40

Haddock in the North-East Arctic (Fishing Areas I and II)

Norway acoustic survey, Barents sea, Jan-Mar, age 3-7, shifted (code: FLT25) (Catch: Number)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1980	1	66.0	160.0	50.0	2.0	1.0
1981	1	10.0	12.0	29.0	14.0	1.0
1982	1	9.0	5.0	4.0	10.0	5.0
1983	1	15.0	7.0	2.0	2.0	2.0
1984	1	33.0	2.0	1.0	1.0	1.0
1985	1	751.0	2.0	1.0	1.0	0.5
1986	1	640.0	166.0	0.5	0.5	0.5
1987	1	70.0	150.0	23.0	0.5	0.1
1988	1	34.0	61.0	64.0	6.0	0.1
1989	1	11.0	15.0	27.0	36.0	5.0
1990	1	36.0	9.0	9.0	11.0	20.0
1991	1	101.0	9.0	2.0	2.0	5.0
1992	1	381.0	38.0	0.1	0.1	2.0

Table 4.9

NORTHEAST ARCTIC HADDOCK : recruits as 3 year-olds (inc. data for ages 0,1,2 & 3)
 10,36,2 (No. of surveys, No. of years, VPA Column No.)

1957,	246,	38,	9,	14,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1958,	110,	2,	4,	5,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1959,	244,	7,	14,	33,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1960,	277,	30,	40,	72,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1961,	323,	32,	50,	34,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1962,	101,	5,	3,	4,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1963,	242,	16,	9,	12,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1964,	293,	11,	12,	15,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1965,	20,	0.3,	0.3,	0.3,	-11,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1966,	17,	0.3,	0.3,	0.3,	1,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1967,	166,	3,	13,	8,	8,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1968,	97,	0.3,	0.3,	3,	0.3,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1969,	1028,	31,	69,	120,	29,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1970,	272,	10,	33,	31,	64,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1971,	54,	3,	3,	9,	26,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1972,	49,	2,	9,	3,	16,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1973,	57,	13,	8,	5,	26,	-11,	-11,	-11,	-11,	-11,	-11,	-11
1974,	115,	15,	35,	14,	51,	-11,	-11,	-11,	-11,	-11,	-11,	198
1975,	172,	163,	96,	59,	60,	-11,	-11,	-11,	-11,	-11,	755,	737
1976,	135,	6,	13,	4,	38,	-11,	-11,	-11,	267,	149,	181	
1977,	19,	1,	1,	0.3,	33,	-11,	-11,	-11,	111,	11,	-11	
1978,	6,	0.3,	0.3,	0.3,	12,	-11,	-11,	-11,	17,	-11,	14	
1979,	8,	0.3,	0.3,	0.3,	20,	-11,	-11,	-11,	-11,	25,	7	
1980,	5,	0.3,	0.3,	-11,	15,	-11,	-11,	3.1,	2,	4,	7	
1981,	8,	0.3,	0.3,	8,	3,	-11,	5.3,	16.9,	3,	10,	53	
1982,	257,	23,	59,	63,	38,	1780.0,	592.0,	436.0,	-11,	1002,	1187	
1983,	346,	40,	79,	239,	62,	3450.0,	1180.0,	385.0,	2148,	1972,	1720	
1984,	81,	9,	19,	18,	78,	911.0,	312.0,	187.0,	1034,	502,	175	
1985,	27,	5,	2,	3,	27,	416.0,	78.2,	30.3,	346,	29,	20	
1986,	12,	1,	1,	1,	39,	86.1,	15.0,	10.1,	37,	7,	19	
1987,	-11,	1,	1,	4,	10,	28.6,	6.0,	4.8,	8,	8,	12	
1988,	-11,	2,	3,	2,	13,	51.7,	49.2,	90.4,	20,	86,	217	
1989,	-11,	3,	25,	30,	14,	356.0,	405.0,	351.1,	202,	914,	600	
1990,	-11,	81,	67,	173,	61,	977.0,	1168.8,	526.6,	1662,	2145,	1852	
1991,	-11,	17,	44,	-11,	117,	821.9,	468,	-11,	717,	1244,	-11	
1992	-11,	20,	-11,	-11,	87,	431.9,	-11,	-11,	1212,	-11,	-11	

R-T-0 Russian Bottom Trawl Survey, age 0 +
 R-T-1 USSR Bottom Trawl Survey, age 1 +
 R-T-2 USSR Bottom Trawl Survey, age 2 +
 INT0GP International O-group Survey (scaled x 100)
 N-BST1 Norwegian Barents Sea Bottom Trawl Survey, age 1
 N-BST2 Norwegian Barents Sea Bottom Trawl Survey, age 2
 N-BST3 Norwegian Barents Sea Bottom Trawl Survey, age 3
 N-BSA1 Norwegian Barents Sea Acoustic Survey, age 1
 N-BSA2 Norwegian Barents Sea Acoustic Survey, age 2
 N-BSA3 Norwegian Barents Sea Acoustic Survey, age 3

Table 4.10

Analysis by RCT3 ver3.1 of data from file :
 j:\scratch\wg_108\had_arct\rcrt-dat.rci

NORTHEAST ARCTIC HADDOCK : recruits as 3 year-olds (inc. data for ages 0,1,2 & 3
 Data for 10 surveys over 36 years : 1957 - 1992

Regression type = P

Tapered time weighting applied

power = 3 over 20 years

Survey weighting not applied

Final estimates not shrunk towards mean

Estimates with S.E.'S greater than that of mean + included

Minimum S.E. for any survey taken as .00

Minimum of 3 points used for regression

Forecast/Hindcast variance correction used.

Year Class	Weighted Average Prediction	Log WAP	Int Std Error	Ext Std Error	Var Ratio	VPA	Log VPA
1962	144	4.97	.24	.09	.13	102	4.62
1963	182	5.21	.19	.07	.13	243	5.49
1964	198	5.29	.19	.02	.01	294	5.68
1965	82	4.41	.28	.03	.01	21	3.04
1966	38	3.66	.36	.03	.01	18	2.89
1967	121	4.80	.33	.28	.75	167	5.12
1968	43	3.77	.34	.27	.61	98	4.58
1969	616	6.42	.39	.21	.28	1028	6.94
1970	334	5.81	.34	.19	.31	273	5.61
1971	117	4.77	.32	.17	.27	55	4.01
1972	90	4.51	.35	.24	.48	50	3.91
1973	128	4.86	.35	.27	.58	57	4.06
1974	211	5.35	.37	.17	.19	115	4.75
1975	523	6.26	.41	.27	.42	173	5.15
1976	90	4.50	.41	.20	.23	135	4.91
1977	44	3.80	.44	.32	.53	20	3.00
1978	41	3.72	.37	.24	.43	6	1.95
1979	21	3.06	.42	.29	.47	9	2.20
1980	12	2.51	.49	.35	.53	6	1.79
1981	25	3.25	.35	.32	.85	9	2.20
1982	237	5.47	.45	.20	.21	257	5.55
1983	336	5.82	.38	.17	.20	346	5.85
1984	127	4.85	.20	.10	.25	81	4.41
1985	28	3.34	.24	.18	.54	28	3.33
1986	12	2.53	.23	.16	.51	12	2.56
1987	9	2.27	.21	.16	.58		
1988	29	3.39	.20	.22	1.30		
1989	99	4.60	.20	.24	1.47		
1990	256	5.55	.21	.16	.58		
1991	149	5.01	.23	.14	.38		
1992	90	4.50	.39	.32	.66		

Continued...

Table 4.10 (Continued)

R-T-2	.71	2.28	.77	.738	29	1.61	3.41	.889	.055
INTOGP	1.24	-.50	1.12	.471	21	2.40	2.48	1.352	.024
N-BST1	.96	-1.99	.38	.944	5	3.39	1.26	.782	.071
N-BST2	.72	.58	.36	.957	6	1.95	1.99	.544	.146
N-BST3	.86	.30	.40	.949	7	1.76	1.81	.562	.137
N-BSA1	.54	.93	.67	.816	9	2.20	2.12	.857	.059
N-BSA2	.64	.91	.47	.915	11	2.20	2.33	.576	.130
N-BSA3	.74	.37	.54	.893	12	2.56	2.28	.658	.100

VPA Mean = 3.66 1.475 .000

Yearclass = 1988

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-T-0	.93	2.04	.61	.848	30	1.10	3.07	.707	.076
R-T-1	.85	2.02	.37	.944	30	1.39	3.20	.429	.208
R-T-2	.71	2.24	.77	.747	29	1.10	3.02	.911	.046
INTOGP	1.26	-.60	1.12	.489	21	2.64	2.72	1.332	.022
N-BST1	.96	-1.98	.39	.944	5	3.96	1.82	.718	.074
N-BST2	.72	.58	.36	.956	6	3.92	3.41	.485	.162
N-BST3	.86	.30	.40	.949	7	4.52	4.19	.517	.143
N-BSA1	.54	.93	.67	.819	9	3.04	2.57	.841	.054
N-BSA2	.64	.91	.47	.917	11	4.47	3.79	.554	.125
N-BSA3	.74	.38	.55	.893	12	5.38	4.37	.651	.090

VPA Mean = 3.62 1.484 .000

Yearclass = 1989

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-T-0	.96	2.00	.58	.868	30	1.39	3.32	.678	.084
R-T-1	.85	2.01	.35	.951	30	3.26	4.78	.426	.212
R-T-2	.71	2.21	.76	.758	29	3.43	4.63	.931	.045
INTOGP	1.25	-.60	1.13	.490	21	2.71	2.79	1.367	.021
N-BST1	.96	-1.98	.39	.944	5	5.88	3.66	.570	.119
N-BST2	.72	.57	.36	.956	6	6.01	4.92	.501	.153
N-BST3	.86	.30	.40	.949	7	5.86	5.35	.560	.123
N-BSA1	.54	.93	.67	.821	9	5.31	3.78	.843	.054
N-BSA2	.64	.92	.46	.920	11	6.82	5.29	.595	.109
N-BSA3	.74	.39	.55	.892	12	6.40	5.11	.692	.081

VPA Mean = 3.60 1.498 .000

Yearclass = 1990

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-T-0	.98	1.95	.55	.886	30	4.41	6.29	.771	.074
R-T-1	.86	2.00	.34	.956	30	4.22	5.61	.446	.222
R-T-2	.71	2.17	.76	.771	29	5.16	5.83	1.058	.039
INTOGP	1.23	-.56	1.16	.483	21	4.13	4.52	1.450	.021
N-BST1	.96	-1.97	.39	.944	5	6.89	4.62	.572	.135
N-BST2	.72	.56	.36	.956	6	7.06	5.68	.550	.146
N-BST3	.86	.31	.40	.949	7	6.27	5.69	.590	.127
N-BSA1	.53	.93	.67	.824	9	7.42	4.89	.938	.050
N-BSA2	.64	.92	.46	.923	11	7.67	5.82	.633	.110
N-BSA3	.73	.40	.56	.892	12	7.52	5.92	.766	.075

VPA Mean = 3.58 1.515 .000

Yearclass = 1991

Survey/ Series	I-----Regression-----I					I-----Prediction-----I			
	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights

Continued...

Table 4.10 (Continued)

Series	cept		Error		Pts	Value	Value	Error	Weights
R-T-0	1.02	1.90	.51	.905	30	2.89	4.84	.651	.129
R-T-1	.86	1.99	.33	.961	30	3.81	5.27	.432	.294
R-T-2									
INTOGP	1.21	-.51	1.20	.474	21	4.77	5.27	1.688	.019
N-BST1	.95	-1.95	.40	.944	5	6.71	4.45	.589	.158
N-BST2	.73	.55	.37	.956	6	6.15	5.02	.531	.195
N-BST3									
N-BSA1	.53	.93	.68	.826	9	6.58	4.43	.930	.063
N-BSA2	.64	.93	.46	.926	11	7.13	5.46	.624	.141
N-BSA3									
VPA Mean =						3.57		1.534	.000

Yearclass = 1992

I-----Regression-----I I-----Prediction-----I									
Survey/ Series	Slope	Inter- cept	Std Error	Rsquare	No. Pts	Index Value	Predicted Value	Std Error	WAP Weights
R-T-0	1.05	1.85	.46	.925	30	3.04	5.04	.625	.396
R-T-1									
R-T-2									
INTOGP	1.19	-.46	1.24	.463	21	4.48	4.88	1.728	.052
N-BST1	.95	-1.94	.41	.944	5	6.07	3.84	.623	.399
N-BST2									
N-BST3									
N-BSA1	.53	.93	.69	.829	9	7.10	4.69	1.007	.153
N-BSA2									
N-BSA3									
VPA Mean =						3.58		1.550	.000

Table 4.11 North-east Arctic Haddock. Tuning Analysis.

Extended Survivors Analysis

Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HADDOCK FIN

CPUE data from file /users/ifad/ifapwork/wg_108/had_arct/FLEET.XXX

Data for 4 fleets over 43 years
Age range from 3 to 13

Fleet,	Alpha,	Beta
flt21: Russian botto	, .900	, 1.000
flt23: Russian acous	, .900	, 1.000
flt24: Norway bott t	, .900	, 1.000
flt25: Norway acoust	, .900	, 1.000

Time series weights :

Tapered time weighting applied
Power = 3 over 20 years

Catchability analysis :

Catchability dependent on stock size for ages < 4

Regression type = C
Minimum of 5 points used for regression
Survivor estimates shrunk to the population mean for ages < 4

Catchability independent of age for ages >= 8

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 2 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = .700

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning had not converged after 30 iterations

Total absolute residual between iterations
29 and 30 = .001

Final year F values

Age	3,	4,	5,	6,	7,	8,	9,	10,	11,	12,	13
Iteration 29,	.0838,	.2684,	.3370,	.6565,	.5207,	.3949,	.5936,	.6973,	.1611,	.5536,	.4907
Iteration 30,	.0838,	.2684,	.3370,	.6565,	.5206,	.3948,	.5932,	.6972,	.1611,	.5534,	.4905

Table 4.11 (Continued)

Regression weights
 , .482, .579, .670, .751, .820, .877, .921, .954, .976, .990, .997, 1.000, 1.000

Fishing mortalities

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3,	.037,	.100,	.130,	.184,	.062,	.136,	.089,	.054,	.032,	.091,	.033,	.063,	.084
4,	.310,	.210,	.272,	.462,	.350,	.219,	.462,	.496,	.171,	.218,	.140,	.168,	.268
5,	.694,	.560,	.471,	.469,	.372,	.404,	.305,	.953,	.601,	.370,	.152,	.349,	.337
6,	.826,	.915,	.705,	.356,	.293,	.637,	.542,	.291,	1.273,	.608,	.203,	.368,	.656
7,	.430,	.790,	.596,	.410,	.344,	.559,	.748,	.661,	.313,	.804,	.356,	.351,	.521
8,	.745,	.554,	.672,	.421,	.552,	.537,	.539,	.660,	.445,	.343,	.470,	.419,	.395
9,	.442,	.569,	.542,	.195,	.434,	.745,	.518,	.595,	.393,	.123,	1.542,	.419,	.593
10,	.610,	.239,	.621,	.569,	.435,	.807,	.690,	.407,	.892,	.929,	1.298,	.277,	.697
11,	.717,	.515,	.540,	.480,	1.002,	.646,	.525,	.577,	1.320,	.654,	.169,	.067,	.161
12,	.879,	.811,	1.599,	.225,	2.726,	.546,	1.501,	1.064,	1.333,	.732,	.331,	.747,	.553
13,	.685,	.542,	.803,	.381,	1.042,	.662,	.760,	.666,	.883,	.561,	.774,	.385,	.491

XSA population numbers

YEAR	3,	AGE 4,	5,	6,	7,	8,	9,	10,				
1980	1.89E+04	9.49E+04	4.81E+04	5.84E+03	7.90E+02	1.06E+03	7.11E+02	2.04E+03	2.81E+03	2.10E+02	7.80E+01	3.3
1981	5.64E+03	1.49E+04	5.70E+04	1.97E+04	2.09E+03	4.21E+02	4.12E+02	3.74E+02	9.06E+02	1.12E+03	7.13E+01	1.1
1982	8.01E+03	4.18E+03	9.91E+03	2.67E+04	6.46E+03	7.77E+02	1.98E+02	1.91E+02	2.41E+02	4.43E+02	4.08E+02	6.7
1983	4.62E+03	5.76E+03	2.61E+03	5.07E+03	1.08E+04	2.91E+03	3.25E+02	9.42E+01	8.40E+01	1.15E+02	7.33E+01	3.1
1984	8.41E+03	3.15E+03	2.97E+03	1.34E+03	2.90E+03	5.86E+03	1.57E+03	2.19E+02	4.37E+01	4.26E+01	7.51E+01	3.1
1985	2.57E+05	6.47E+03	1.82E+03	1.68E+03	8.16E+02	1.69E+03	2.76E+03	8.30E+02	1.16E+02	1.31E+01	2.28E+00	1.2
1986	3.33E+05	1.84E+05	4.25E+03	9.93E+02	7.26E+02	3.82E+02	8.06E+02	1.07E+03	3.03E+02	4.98E+01	6.23E+00	1.4
1987	8.21E+04	2.50E+05	9.46E+04	2.57E+03	4.73E+02	2.81E+02	1.82E+02	3.93E+02	4.41E+02	1.47E+02	9.09E+00	4.2
1988	2.81E+04	6.36E+04	1.24E+05	2.99E+04	1.57E+03	2.00E+02	1.19E+02	8.24E+01	2.14E+02	2.03E+02	4.15E+01	2.0
1989	1.33E+04	2.23E+04	4.39E+04	5.59E+04	6.85E+03	9.41E+02	1.05E+02	6.58E+01	2.76E+01	4.69E+01	4.37E+01	3.8
1990	1.77E+04	9.93E+03	1.47E+04	2.48E+04	2.49E+04	2.51E+03	5.47E+02	7.60E+01	2.13E+01	1.18E+01	1.85E+01	3.0
1991	7.22E+04	1.41E+04	7.07E+03	1.03E+04	1.66E+04	1.43E+04	1.28E+03	9.58E+01	1.70E+01	1.47E+01	6.92E+00	2.4
1992	1.64E+05	5.55E+04	9.73E+03	4.08E+03	5.85E+03	9.56E+03	7.69E+03	6.91E+02	5.94E+01	1.30E+01	5.70E+00	2.8

Population estimates for 1993

, 0.00E+00, 1.24E+05, 3.47E+04, 5.69E+03, 1.73E+03, 2.85E+03, 5.28E+03, 3.48E+03, 2.82E+02, 4.14E+01, 6.12E+00, 4.27

Taper weighted geometric mean of the VPA populations:

, 3.90E+04, 2.53E+04, 1.40E+04, 7.16E+03, 3.48E+03, 1.61E+03, 6.97E+02, 2.83E+02, 1.22E+02, 6.19E+01, 2.36E+01,

Standard error of the weighted Log(VPA populations):

, 1.4447, 1.4164, 1.3962, 1.3512, 1.3372, 1.4431, 1.4251, 1.2555, 1.4361, 1.4607, 1.5113,

Continued...

Table 4.11 (Continued)

Log catchability residuals.

Fleet : flt21: Russian botto

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3				.24	.50	.75	-.35	-.28	-.62	-1.09	1.12	-.40	.31
4				-.06	-.26	-.41	.19	.23	-.44	-.39	1.44	-.42	.02
5				-2.54	-.46	.07	-.88	.68	.36	.56	2.03	-.25	-.29
6				99.99	-1.92	.48	-1.39	-2.57	.29	1.34	1.68	.20	1.40
7				99.99	99.99	99.99	-1.17	-.82	-2.35	1.34	1.27	.52	1.03

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-8.8857	-9.2991	-9.4146	-9.1268					
S.E		.5888	1.1434	1.5459	1.4353					

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.88	8.97	.74	.81	10	-8.72
4	.98	8.91	.61	.87	10	-8.89
5	.71	9.33	.73	.83	10	-9.30
6	.59	9.15	.73	.83	9	-9.41
7	.58	8.76	.59	.89	7	-9.13

Fleet : flt23: Russian acous

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3						.14	.08	-.24	.03	-.58	.77	-.08	-.12
4						-.84	1.76	-.04	.15	-.54	.39	-.36	-.48
5						-.33	-.58	.35	1.34	.01	.48	-.35	-.97
6						-1.86	-1.42	-2.61	2.00	1.12	1.10	.32	.96
7						99.99	-1.68	99.99	99.99	.63	.50	.16	.27

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-6.4392	-6.6053	-7.0755	-6.3100					
S.E		.8008	.7289	1.6714	.9240					

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.63	8.30	.42	.91	8	-6.68
4	.76	7.42	.56	.87	8	-6.44
5	.73	7.43	.39	.94	8	-6.61
6	.52	7.97	.54	.90	8	-7.08
7	.63	7.24	.34	.96	5	-6.31

Continued...

Table 4.11 (Continued)

Fleet : flt24: Norway bott t

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3			-.25	-.10	.40	-.31	.06	.15	-.08	-.49	.30	.36	-.12
4			.09	-.69	-.70	.87	.17	.62	.27	-.23	.01	-.04	-.48
5			.16	-.35	-.58	.79	-1.40	.89	.82	.59	.10	.00	-1.10
6			.02	-1.00	.27	-.32	.52	-.67	.49	.67	-.29	-.09	-.19
7			1.13	-1.11	.14	.92	-.17	-1.44	-2.97	1.59	1.05	1.37	-.40

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-7.3418	-8.0806	-7.9186	-8.5089					
S.E		.4929	.8002	.5163	1.4482					

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	.88	7.36	.31	.96	11	-6.93
4	.89	7.62	.44	.93	11	-7.34
5	.77	8.38	.55	.89	11	-8.08
6	.92	7.99	.49	.90	11	-7.92
7	.66	8.40	.88	.73	11	-8.51

Fleet : flt25: Norway acoust

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	.64	.00	-.43	.69	.77	.58	.12	-.76	-.44	-.77	.08	-.25	.29
4	.81	-.02	.43	.63	-.12	-.97	.34	-.04	.12	-.19	.03	-.29	-.13
5	1.48	.64	.33	.97	.05	.57	-1.07	.28	.69	.65	.44	-.14	-3.47
6	.36	1.17	.34	.06	.64	.73	.47	-.71	.25	.78	.03	-.65	-2.44
7	1.09	.45	.75	-.85	-.30	.48	.78	-.48	-2.02	.89	.56	-.42	-.14

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q		-6.7149	-7.5040	-7.3641	-7.1600					
S.E		.4281	1.2886	.9725	.8903					

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
3	1.01	6.02	.57	.88	13	-6.07
4	.94	6.92	.41	.93	13	-6.71
5	.83	7.85	1.10	.66	13	-7.50
6	.90	7.52	.91	.71	13	-7.36
7	.98	7.18	.92	.70	13	-7.16

Table 4.12 Sum of products check.

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: PEWPE)

Table 1	Catch numbers at age			Numbers*10**-3
YEAR,	1950,	1951,	1952,	
AGE				
3,	3190,	65644,	6012,	
4,	37949,	9178,	151996,	
5,	35344,	18014,	13634,	
6,	18849,	13551,	9851,	
7,	27869,	6808,	4693,	
8,	9199,	6849,	3237,	
9,	1980,	3321,	2434,	
10,	1093,	1182,	606,	
11,	853,	734,	534,	
12,	868,	177,	185,	
13,	712,	81,	138,	
*gp,	258,	82,	1,	
TOTALNUM,	138164,	125621,	193321,	
TONSLAND,	131733,	120057,	127660,	
SOPCOF %,	45,	65,	51,	

Table 1	Catch numbers at age					Numbers*10**-3				
YEAR,	1953,	1954,	1955,	1956,	1957,	1958,	1959,	1960,	1961,	1962,
AGE										
3,	64527,	6563,	1154,	16436,	2074,	1727,	20317,	40117,	15430,	39604,
4,	13014,	154695,	10689,	5922,	24704,	5913,	7826,	71280,	56859,	30947,
5,	70780,	5884,	176678,	14714,	7942,	31437,	7244,	13717,	63354,	49028,
6,	5431,	27590,	4994,	127879,	12535,	5821,	14039,	7138,	8706,	33922,
7,	2866,	3233,	28278,	3182,	46619,	12748,	3153,	6267,	3578,	3209,
8,	1079,	1302,	1445,	8003,	1087,	17565,	2237,	1587,	4407,	1344,
9,	424,	711,	272,	450,	1970,	822,	5918,	2352,	787,	1778,
10,	315,	319,	100,	200,	356,	1072,	285,	2015,	527,	243,
11,	393,	126,	50,	80,	17,	226,	316,	497,	1287,	247,
12,	202,	69,	30,	60,	1,	79,	70,	70,	67,	482,
13,	121,	51,	15,	30,	33,	89,	4,	30,	60,	20,
*gp,	176,	34,	5,	15,	36,	18,	23,	12,	20,	8,
TOTALNUM,	159328,	200577,	223710,	176971,	97374,	77517,	61432,	145082,	155082,	160832,
TONSLAND,	123447,	156448,	202745,	213279,	122705,	112672,	88179,	155454,	193234,	187888,
SOPCOF %,	57,	60,	47,	55,	56,	62,	80,	84,	80,	74,

Continued...

Table 4.12 (Continued)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: PEWPE)

At 2-Sep-93 14:31

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
3,	28567,	22305,	5911,	26157,	15918,	657,	1520,	23004,	1979,	230229,
4,	72995,	49162,	46161,	22469,	41373,	67632,	1963,	2408,	24359,	22246,
5,	19035,	30592,	40032,	62724,	13505,	41267,	44526,	1870,	1258,	42849,
6,	13627,	5800,	12578,	28840,	25736,	7748,	18956,	21995,	918,	3196,
7,	9290,	3519,	1672,	5711,	8878,	15599,	3611,	7948,	9279,	1606,
8,	1243,	2709,	970,	578,	1617,	5292,	4925,	1974,	3056,	6736,
9,	561,	832,	893,	435,	218,	655,	1624,	1978,	826,	2630,
10,	409,	104,	122,	188,	176,	182,	315,	726,	1043,	896,
11,	79,	206,	204,	186,	155,	101,	43,	166,	369,	988,
12,	84,	234,	123,	25,	76,	115,	43,	26,	130,	538,
13,	169,	121,	14,	8,	27,	18,	14,	52,	27,	53,
+gp,	41,	67,	205,	7,	7,	19,	2,	19,	4,	42,
TOTALNUM,	146100,	115651,	108885,	147328,	107686,	139285,	77542,	62166,	43248,	312009,
TONSLAND,	146744,	98900,	118079,	160621,	136486,	181726,	130509,	86601,	78302,	265317,
SOPCOF %,	74,	62,	70,	66,	79,	79,	80,	75,	100,	86,

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	70204,	9684,	10037,	13989,	55967,	47311,	17540,	627,	486,	883,
4,	258773,	41701,	14089,	13449,	22043,	18812,	35290,	22878,	2561,	900,
5,	24018,	88111,	33871,	6808,	7368,	4076,	10645,	21794,	22124,	3372,
6,	6872,	5827,	49712,	20789,	2586,	1389,	1429,	2971,	10685,	12203,
7,	418,	4138,	2135,	40044,	7781,	1626,	812,	250,	1034,	2625,
8,	422,	382,	1236,	1247,	11043,	2596,	546,	504,	162,	344,
9,	1680,	617,	92,	1349,	311,	6215,	1466,	230,	162,	75,
10,	525,	2043,	131,	193,	388,	162,	2310,	842,	72,	80,
11,	146,	935,	500,	279,	96,	258,	181,	1299,	330,	91,
12,	340,	276,	147,	652,	101,	3,	87,	111,	564,	320,
13,	68,	458,	53,	331,	84,	74,	2,	35,	27,	204,
+gp,	13,	143,	92,	46,	98,	65,	53,	15,	42,	34,
TOTALNUM,	363479,	154315,	112095,	99176,	107866,	82587,	70361,	51556,	38249,	21131,
TONSLAND,	320065,	221138,	175742,	137279,	110158,	95422,	103623,	87889,	77153,	46955,
SOPCOF %,	83,	86,	81,	63,	77,	95,	112,	103,	98,	93,

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
3,	704,	456,	29548,	25596,	3928,	794,	1050,	518,	3968,	11943,
4,	1930,	841,	1153,	61470,	88297,	9031,	3951,	1174,	1967,	11819,
5,	884,	836,	546,	1013,	52611,	50868,	12305,	1871,	1886,	2519,
6,	1374,	307,	715,	376,	586,	19465,	23032,	4138,	2876,	1778,
7,	3282,	765,	316,	346,	207,	382,	3423,	6754,	4442,	2150,
8,	906,	2250,	634,	144,	123,	65,	247,	851,	4422,	2823,
9,	52,	499,	1312,	295,	74,	35,	11,	389,	398,	3113,
10,	37,	70,	416,	484,	119,	44,	36,	50,	21,	314,
11,	29,	25,	50,	112,	175,	142,	12,	3,	1,	8,
12,	21,	36,	5,	35,	87,	135,	22,	3,	7,	5,
13,	21,	44,	1,	3,	4,	22,	17,	9,	2,	2,
+gp,	91,	185,	57,	7,	19,	11,	15,	15,	7,	1,
TOTALNUM,	9331,	6314,	34753,	89881,	146230,	80994,	44121,	15775,	19997,	36475,
TONSLAND,	21607,	17661,	41270,	96585,	150659,	91744,	55122,	25816,	33605,	53355,
SOPCOF %,	91,	91,	97,	90,	98,	99,	96,	96,	96,	99,

Table 4.13

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HADDOCK FIN

At 31-Aug-93 20:44

Terminal Fs derived using XSA (With F shrinkage)

Table 8		Fishing mortality (F) at age		
YEAR,	1950,	1951,	1952,	
AGE				
3,	.0540,	.1391,	.1117,	
4,	.5944,	.2170,	.5481,	
5,	.8100,	.6363,	.5794,	
6,	.7984,	.8779,	.9018,	
7,	1.1370,	.7746,	.9030,	
8,	.9332,	1.0095,	1.1372,	
9,	.5318,	1.1402,	1.4150,	
10,	.5263,	.7172,	.6427,	
11,	.9286,	.8395,	.8644,	
12,	1.7946,	.4910,	.5190,	
13,	.9534,	.8483,	.9257,	
+gp,	.9534,	.8483,	.9257,	
FBAR 4- 7,	.8350,	.6265,	.7331,	

Table 8		Fishing mortality (F) at age									
YEAR,	1953,	1954,	1955,	1956,	1957,	1958,	1959,	1960,	1961,	1962,	
AGE											
3,	.0710,	.0604,	.0245,	.1125,	.0436,	.0278,	.0708,	.1990,	.1677,	.1981,	
4,	.3746,	.2425,	.1322,	.1687,	.2466,	.1685,	.1694,	.3774,	.4801,	.5926,	
5,	.5365,	.2889,	.4826,	.2714,	.3580,	.5704,	.3210,	.5029,	.6885,	1.0468,	
6,	.4812,	.4126,	.4266,	.7947,	.3922,	.4867,	.5437,	.6081,	.7064,	1.0438,	
7,	.7344,	.5966,	1.0197,	.5346,	.7776,	.9076,	.5358,	.5007,	.7183,	.6202,	
8,	.5310,	.9203,	.5896,	.9485,	.3494,	.7793,	.3810,	.5723,	.8167,	.6581,	
9,	.4138,	.8298,	.4866,	.3646,	.6455,	.4881,	.6647,	.9053,	.6307,	.9740,	
10,	.6785,	.6367,	.2511,	.8277,	.5535,	.9233,	.3099,	.4984,	.5159,	.4026,	
11,	1.2524,	.6430,	.1868,	.3271,	.1436,	.8517,	.7904,	1.4864,	.7014,	.4885,	
12,	1.0068,	.7675,	.3043,	.3583,	.0059,	2.0894,	.7099,	.3943,	.8285,	.6254,	
13,	.7843,	.7670,	.3661,	.5700,	.3417,	1.0382,	.5760,	.7791,	.7053,	.6354,	
+gp,	.7843,	.7670,	.3661,	.5700,	.3417,	1.0382,	.5760,	.7791,	.7053,	.6354,	
FBAR 4- 7,	.5317,	.3851,	.5153,	.4423,	.4436,	.5333,	.3925,	.4972,	.6483,	.8259,	

Continued...

Table 4.13 (Continued)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HADDOCK FIN

At 31-Aug-93 20:44

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age									
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
3,	.1209,	.0793,	.0668,	.1270,	.0619,	.0369,	.1015,	.1663,	.0229,	.2844,
4,	.6799,	.3147,	.2341,	.3866,	.3033,	.4022,	.1475,	.2316,	.2666,	.3825,
5,	.9354,	.6899,	.4587,	.5757,	.4253,	.5649,	.5077,	.2044,	.1819,	1.0681,
6,	.9877,	.8586,	.6910,	.7177,	.4945,	.4644,	.5551,	.5093,	.1462,	.9650,
7,	.9557,	.7582,	.6516,	.8034,	.5020,	.6415,	.4101,	.4781,	.4188,	.4100,
8,	.5218,	.8442,	.4812,	.4908,	.5559,	.6437,	.4259,	.4133,	.3395,	.6184,
9,	.6438,	.8212,	.7633,	.4133,	.3452,	.4586,	.4135,	.3018,	.3032,	.5533,
10,	.6221,	.2289,	.2588,	.3489,	.2915,	.5453,	.4182,	.3280,	.2573,	.6334,
11,	.2192,	.7566,	.9579,	.7987,	.5455,	.2708,	.2348,	.4068,	.2757,	.4148,
12,	.3033,	2.1785,	1.7424,	.2750,	.9422,	1.0710,	.1764,	.2175,	.6542,	.8332,
13,	.4655,	.9767,	.8496,	.4688,	.5404,	.6031,	.3358,	.3355,	.3684,	.6160,
+gp,	.4655,	.9767,	.8496,	.4688,	.5404,	.6031,	.3358,	.3355,	.3684,	.6160,
FBAR 4- 7,	.8897,	.6554,	.5088,	.6208,	.4313,	.5182,	.4051,	.3559,	.2534,	.7064,

Table 8	Fishing mortality (F) at age									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	.3356,	.2202,	.2562,	.3192,	.7675,	.3630,	.1546,	.0373,	.1000,	.1298,
4,	.6008,	.3415,	.5757,	.6501,	1.2865,	.6423,	.5088,	.3098,	.2101,	.2717,
5,	.9528,	.4194,	.5172,	.6151,	.9487,	.8958,	.9744,	.6937,	.5602,	.4715,
6,	.4686,	.6387,	.4448,	.7089,	.5014,	.4531,	.9693,	.8264,	.9150,	.7051,
7,	.3005,	.5792,	.5110,	.8009,	.6380,	.6930,	.5263,	.4302,	.7901,	.5963,
8,	.1775,	.4964,	.3372,	.6459,	.5336,	.4522,	.5276,	.7447,	.5541,	.6716,
9,	.3021,	.4261,	.2096,	.7648,	.3237,	.6629,	.5015,	.4425,	.5694,	.5424,
10,	.1987,	.7422,	.1482,	.9099,	.5167,	.2786,	.5567,	.6102,	.2393,	.6213,
11,	.1935,	.6503,	.3990,	.5372,	2.3194,	.7973,	.5770,	.7166,	.5150,	.5401,
12,	.2434,	.6792,	.1935,	1.5180,	.3776,	.4307,	.6977,	.8790,	.8107,	1.5992,
13,	.2241,	.6041,	.2588,	.8846,	.8226,	.5286,	.5770,	.6850,	.5421,	.8030,
+gp,	.2241,	.6041,	.2588,	.8846,	.8226,	.5286,	.5770,	.6850,	.5421,	.8030,
FBAR 4- 7,	.5807,	.4947,	.5122,	.6937,	.8436,	.6710,	.7447,	.5650,	.6189,	.5111,

Table 8	Fishing mortality (F) at age										
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	FBAR 90-92
AGE											
3,	.1843,	.0618,	.1360,	.0887,	.0543,	.0317,	.0913,	.0328,	.0627,	.0838,	.0598,
4,	.4622,	.3498,	.2193,	.4623,	.4959,	.1706,	.2179,	.1400,	.1680,	.2684,	.1921,
5,	.4693,	.3723,	.4037,	.3053,	.9530,	.6009,	.3704,	.1518,	.3493,	.3370,	.2793,
6,	.3564,	.2931,	.6372,	.5418,	.2907,	1.2732,	.6080,	.2035,	.3678,	.6565,	.4092,
7,	.4100,	.3441,	.5588,	.7481,	.6607,	.3129,	.8040,	.3563,	.3508,	.5206,	.4093,
8,	.4212,	.5524,	.5374,	.5390,	.6602,	.4448,	.3426,	.4698,	.4190,	.3948,	.4278,
9,	.1945,	.4344,	.7448,	.5182,	.5948,	.3931,	.1231,	1.5421,	.4193,	.5932,	.8515,
10,	.5691,	.4355,	.8074,	.6898,	.4073,	.8922,	.9288,	1.2985,	.2774,	.6972,	.7577,
11,	.4802,	1.0015,	.6465,	.5249,	.5775,	1.3196,	.6536,	.1695,	.0673,	.1611,	.1326,
12,	.2255,	2.7264,	.5461,	1.5006,	1.0642,	1.3332,	.7316,	.3309,	.7472,	.5534,	.5438,
13,	.3806,	1.0419,	.6625,	.7601,	.6662,	.8828,	.5614,	.7739,	.3847,	.4905,	.5497,
+gp,	.3806,	1.0419,	.6625,	.7601,	.6662,	.8828,	.5614,	.7739,	.3847,	.4905,	.5497,
FBAR 4- 7,	.4245,	.3398,	.4547,	.5144,	.6001,	.5894,	.5001,	.2129,	.3090,	.4456,	

Table 4.14 VPA

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HADDOCK FIN

At 31-Aug-93 20:44

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)			Numbers*10**-3
YEAR,	1950,	1951,	1952,	
AGE				
3,	67027,	558771,	62870,	
4,	93593,	51991,	398086,	
5,	70365,	42289,	34262,	
6,	37878,	25629,	18324,	
7,	45346,	13957,	8722,	
8,	16757,	11909,	5267,	
9,	5305,	5396,	3553,	
10,	2952,	2552,	1413,	
11,	1558,	1428,	1020,	
12,	1150,	504,	505,	
13,	1280,	157,	253,	
+gp,	456,	156,	2,	
TOTAL,	343668,	714738,	534275,	

Table 10	Stock number at age (start of year)					Numbers*10**-3				
YEAR,	1953,	1954,	1955,	1956,	1957,	1958,	1959,	1960,	1961,	1962,
AGE										
3,	1041093,	123750,	52782,	170749,	53766,	69697,	328561,	245647,	110479,	243507,
4,	46034,	793988,	95379,	42170,	124925,	42143,	55501,	250619,	164820,	76491,
5,	188393,	25914,	510089,	68418,	29167,	79927,	29154,	38359,	140693,	83495,
6,	15715,	90199,	15892,	257761,	42702,	16694,	36993,	17314,	18994,	57864,
7,	6089,	7952,	48884,	8493,	95327,	23619,	8401,	17585,	7717,	7673,
8,	2895,	2392,	3585,	14436,	4074,	35864,	7803,	4025,	8726,	3081,
9,	1383,	1394,	780,	1628,	4578,	2352,	13470,	4364,	1859,	3157,
10,	707,	749,	498,	393,	926,	1965,	1182,	5673,	1445,	810,
11,	608,	294,	324,	317,	140,	436,	639,	710,	2822,	706,
12,	352,	142,	126,	220,	187,	100,	152,	237,	131,	1146,
13,	246,	105,	54,	76,	126,	152,	10,	61,	131,	47,
+gp,	353,	69,	18,	38,	136,	30,	57,	24,	43,	19,
TOTAL,	1303867,	1046947,	728412,	564698,	356055,	272981,	481923,	584620,	457861,	477996,

Continued...

Table 4.14 (Continued)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HADDOCK FIN

At 31-Aug-93 20:44

Terminal Fs derived using XSA (With F shrinkage)

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3				
	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
3,	277341,	323227,	101132,	242404,	293288,	20051,	17401,	165939,	96674,	1027852,
4,	163532,	201219,	244454,	77451,	174796,	225721,	15822,	12872,	115045,	77359,
5,	34624,	67840,	120261,	158374,	43081,	105675,	123609,	11178,	8360,	72150,
6,	23997,	11124,	27862,	62239,	72910,	23052,	49179,	60913,	7459,	5706,
7,	16682,	7317,	3859,	11430,	24861,	36407,	11863,	23112,	29970,	5277,
8,	3379,	5252,	2807,	1647,	4191,	12321,	15693,	6445,	11731,	16141,
9,	1306,	1642,	1849,	1420,	825,	1968,	5300,	8392,	3490,	6840,
10,	976,	562,	591,	705,	769,	479,	1019,	2869,	5081,	2110,
11,	444,	429,	366,	374,	407,	470,	227,	549,	1692,	3216,
12,	355,	292,	165,	115,	138,	193,	294,	147,	299,	1052,
13,	502,	214,	27,	24,	71,	44,	54,	202,	97,	127,
+gp,	121,	117,	390,	20,	18,	46,	8,	73,	14,	100,
TOTAL,	523257,	619234,	503761,	556203,	615356,	426427,	240468,	292691,	279913,	1217929,

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3				
	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	272163,	54153,	49072,	56572,	115436,	171747,	135316,	18939,	5643,	8015,
4,	633214,	159305,	35574,	31095,	33659,	43870,	97806,	94916,	14939,	4180,
5,	43207,	284284,	92695,	16377,	13289,	7613,	18896,	48145,	57010,	9913,
6,	20300,	13643,	153026,	45245,	7248,	4214,	2545,	5839,	19698,	26657,
7,	1780,	10402,	5897,	80306,	18233,	3595,	2193,	790,	2092,	6459,
8,	2867,	1079,	4772,	2896,	29516,	7887,	1472,	1061,	421,	777,
9,	7120,	1965,	538,	2789,	1243,	14173,	4108,	711,	412,	198,
10,	3220,	4309,	1051,	357,	1063,	736,	5980,	2037,	374,	191,
11,	917,	2161,	1680,	742,	118,	519,	456,	2806,	906,	241,
12,	1739,	619,	923,	923,	355,	9,	191,	210,	1122,	443,
13,	374,	1116,	257,	623,	166,	199,	5,	78,	71,	408,
+gp,	71,	345,	443,	85,	190,	173,	132,	33,	110,	67,
TOTAL,	986973,	533381,	345929,	238010,	220516,	254735,	269101,	175565,	102798,	57551,

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3					GMST	
	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,		1993,
AGE												
3,	4624,	8408,	256809,	333149,	82076,	28116,	13293,	17744,	72166,	164236,	0,	886
4,	5763,	3148,	6471,	183522,	249599,	63644,	22301,	9934,	14059,	55494,	123664,	665
5,	2608,	2972,	1817,	4255,	94634,	124460,	43936,	14684,	7071,	9730,	34743,	385
6,	5065,	1336,	1677,	993,	2567,	29876,	55872,	24838,	10329,	4083,	5688,	178
7,	10783,	2904,	816,	726,	473,	1571,	6848,	24904,	16591,	5854,	1734,	78
8,	2913,	5859,	1685,	382,	281,	200,	941,	2509,	14278,	9564,	2848,	35
9,	325,	1565,	2761,	806,	182,	119,	105,	547,	1284,	7689,	5278,	17
10,	94,	219,	830,	1073,	393,	82,	66,	76,	96,	691,	3481,	8
11,	84,	44,	116,	303,	441,	214,	28,	21,	17,	59,	282,	4
12,	115,	43,	13,	50,	147,	203,	47,	12,	15,	13,	41,	2
13,	73,	75,	2,	6,	9,	41,	44,	18,	7,	6,	6,	
+gp,	315,	310,	128,	14,	43,	20,	38,	30,	24,	3,	4,	
TOTAL,	32764,	26883,	273126,	525280,	430846,	248548,	143518,	95317,	135937,	257423,	177769,	

Table 4.15 VPA

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HADDOCK FIN,

At 31-Aug-93 20:44

Table 16 Summary (without SOP correction)

	Terminal Fs derived using XSA (With F shrinkage)					
	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 4- 7,
1950,	67027,	604125,	312274,	131733,	.4219,	.8350,
1951,	558771,	683321,	171120,	120057,	.7016,	.6265,
1952,	62870,	629095,	127009,	127660,	1.0051,	.7331,
1953,	1041093,	1154731,	143042,	123447,	.8630,	.5317,
1954,	123750,	1203578,	205484,	156448,	.7614,	.3851,
1955,	52782,	1243929,	377916,	202745,	.5365,	.5153,
1956,	170749,	976237,	435772,	213279,	.4894,	.4423,
1957,	53766,	629257,	350576,	122705,	.3500,	.4436,
1958,	69697,	480948,	254378,	112672,	.4429,	.5333,
1959,	328561,	524311,	168188,	88179,	.5243,	.3925,
1960,	245647,	641069,	155170,	155454,	1.0018,	.4972,
1961,	110479,	621541,	168956,	193234,	1.1437,	.6483,
1962,	243507,	586119,	167911,	187888,	1.1190,	.8259,
1963,	277341,	548120,	124544,	146744,	1.1782,	.8897,
1964,	323227,	622251,	103221,	98900,	.9581,	.6554,
1965,	101132,	636340,	131962,	118079,	.8948,	.5088,
1966,	242404,	721045,	193333,	160621,	.8308,	.6208,
1967,	293288,	719553,	205198,	136486,	.6651,	.4313,
1968,	20051,	648821,	229967,	181726,	.7902,	.5182,
1969,	17401,	480030,	222565,	130509,	.5864,	.4051,
1970,	165939,	425054,	211034,	86601,	.4104,	.3559,
1971,	96674,	387093,	179784,	78302,	.4355,	.2534,
1972,	1027852,	1030399,	167608,	265317,	1.5830,	.7064,
1973,	272163,	1032619,	150330,	320065,	2.1291,	.5807,
1974,	54153,	827616,	225264,	221138,	.9817,	.4947,
1975,	49072,	659241,	290765,	175742,	.6044,	.5122,
1976,	56572,	473057,	304356,	137279,	.4510,	.6937,
1977,	115436,	317375,	173603,	110158,	.6345,	.8436,
1978,	171747,	280152,	106907,	95422,	.8926,	.6710,
1979,	135316,	287517,	72764,	103623,	1.4241,	.7447,
1980,	18939,	245146,	66540,	87889,	1.3208,	.5650,
1981,	5643,	192416,	125554,	77153,	.6145,	.6189,
1982,	8015,	121251,	104528,	46955,	.4492,	.5111,
1983,	4624,	72159,	67846,	21607,	.3185,	.4245,
1984,	8408,	55422,	40170,	17661,	.4397,	.3398,
1985,	256809,	149002,	32368,	41270,	1.2750,	.4547,
1986,	333149,	265285,	51019,	96585,	1.8931,	.5144,
1987,	82076,	241686,	31172,	150659,	4.8332,	.6001,
1988,	28116,	148102,	49464,	91744,	1.8548,	.5894,
1989,	13293,	115975,	58456,	55122,	.9430,	.5001,
1990,	17744,	102918,	56992,	25816,	.4530,	.2129,
1991,	72166,	127512,	65885,	33605,	.5101,	.3090,
1992,	164236,	207089,	82483,	53355,	.6469,	.4456,
Arith.						
Mean	175853,	514384,	161941,	123294,	.9387,	.5437,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

Table 4.16

**NORTH-EAST ARCTIC HADDOCK
INPUTS FOR THE PREDICTIONS**

Mean weight at age in the stock												
High												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.33	0.79	1.33	2.03	2.32	2.70	3.10	3.38	5.40	6.70	7.40	8.00
1994	0.42	0.86	1.53	2.19	2.49	3.02	3.40	3.90	5.40	6.70	7.40	8.00
1995+	0.51	0.93	1.72	2.36	2.67	3.33	3.70	4.41	5.40	6.70	7.40	8.00
Medium												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.33	0.79	1.33	2.03	2.32	2.70	3.10	3.38	5.40	6.70	7.40	8.00
1994	0.36	0.76	1.32	1.95	2.23	2.83	3.29	3.88	5.40	6.70	7.40	8.00
1995+	0.39	0.73	1.31	1.87	2.15	2.95	3.47	4.39	5.40	6.70	7.40	8.00
Low												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.33	0.79	1.33	2.03	2.32	2.70	3.10	3.38	5.40	6.70	7.40	8.00
1994	0.30	0.65	1.06	1.72	2.01	2.83	3.29	3.88	5.40	6.70	7.40	8.00
1995+	0.27	0.51	0.80	1.40	1.69	2.95	3.47	4.39	5.40	6.70	7.40	8.00

Mean weight at age in the catch												
High												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.49	1.00	1.45	2.00	2.40	2.70	3.10	3.38	5.40	6.70	7.40	8.00
1994	0.86	1.34	1.83	2.30	2.60	2.97	3.40	3.90	5.40	6.70	7.40	8.00
1995+	1.22	1.69	2.20	2.59	2.79	3.24	3.70	4.41	5.40	6.70	7.40	8.00
Medium												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.49	1.00	1.45	2.00	2.40	2.70	3.10	3.38	5.40	6.70	7.40	8.00
1994	0.72	1.16	1.58	2.05	2.40	2.72	3.30	3.73	5.40	6.69	7.40	8.00
1995+	0.94	1.32	1.71	2.10	2.39	2.73	3.51	4.07	5.40	6.67	7.40	8.00
Low												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.49	1.00	1.45	2.00	2.40	2.70	3.10	3.38	5.40	6.70	7.40	8.00
1994	0.61	0.97	1.35	1.86	2.25	2.56	3.30	3.73	5.40	6.66	7.40	8.00
1995+	0.73	0.95	1.24	1.71	2.11	2.42	3.51	4.07	5.40	6.63	7.40	8.00

Fishing Pattern												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993+	0.08	0.27	0.39	0.54	0.59	0.66	0.67	0.67	0.67	0.77	0.89	0.89

Maturity at age												
Age	3	4	5	6	7	8	9	10	11	12	13	14
1993	0.02	0.24	0.50	0.79	0.80	0.89	0.87	0.87	1.00	1.00	1.00	1.00
1994+	0.01	0.14	0.43	0.64	0.79	0.87	0.94	0.96	1.00	1.00	1.00	1.00

Recruitment at age 3	
Year-class	Millions
1989	164
1990	254
1991	149
1992	92
1993+	89

Continued...

Table 4.16 (Continued)

Haddock in the North-East Arctic (Fishing Areas I and II)
Haddock in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	254000.00	0.2000	0.0200	0.0000	0.0000	0.330	0.0810	0.490
4	123664.00	0.2000	0.2400	0.0000	0.0000	0.790	0.2679	1.000
5	34743.000	0.2000	0.5000	0.0000	0.0000	1.330	0.3862	1.450
6	5688.0000	0.2000	0.7900	0.0000	0.0000	2.030	0.5376	2.000
7	1734.0000	0.2000	0.8000	0.0000	0.0000	2.320	0.5908	2.400
8	2848.0000	0.2000	0.8900	0.0000	0.0000	2.700	0.6608	2.700
9	5278.0000	0.2000	0.8700	0.0000	0.0000	3.100	0.6684	3.100
10	3481.0000	0.2000	0.8700	0.0000	0.0000	3.380	0.6684	3.380
11	282.0000	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	41.0000	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.700
13	6.0000	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	4.0000	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	149000.00	0.2000	0.0133	0.0000	0.0000	0.420	0.0810	0.860
4	.	0.2000	0.1467	0.0000	0.0000	0.860	0.2679	1.340
5	.	0.2000	0.4333	0.0000	0.0000	1.530	0.3862	1.830
6	.	0.2000	0.6367	0.0000	0.0000	2.190	0.5376	2.300
7	.	0.2000	0.7900	0.0000	0.0000	2.490	0.5908	2.600
8	.	0.2000	0.8700	0.0000	0.0000	3.020	0.6608	2.970
9	.	0.2000	0.9367	0.0000	0.0000	3.400	0.6684	3.400
10	.	0.2000	0.9567	0.0000	0.0000	3.900	0.6684	3.900
11	.	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	.	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.700
13	.	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	.	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	92000.000	0.2000	0.0133	0.0000	0.0000	0.510	0.0810	1.220
4	.	0.2000	0.1467	0.0000	0.0000	0.930	0.2679	1.690
5	.	0.2000	0.4333	0.0000	0.0000	1.720	0.3862	2.200
6	.	0.2000	0.6367	0.0000	0.0000	2.360	0.5376	2.590
7	.	0.2000	0.7900	0.0000	0.0000	2.670	0.5908	2.790
8	.	0.2000	0.8700	0.0000	0.0000	3.330	0.6608	3.240
9	.	0.2000	0.9367	0.0000	0.0000	3.700	0.6684	3.700
10	.	0.2000	0.9567	0.0000	0.0000	4.410	0.6684	4.410
11	.	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	.	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.700
13	.	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	.	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : HIG2
Date and time: 01SEP93:20:14

High growth

Continued...

Table 4.16 (Continued)

Haddock in the North-East Arctic (Fishing Areas I and II)
Haddock in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	254000.00	0.2000	0.0200	0.0000	0.0000	0.330	0.0810	0.490
4	123664.00	0.2000	0.2400	0.0000	0.0000	0.790	0.2679	1.000
5	34743.0000	0.2000	0.5000	0.0000	0.0000	1.330	0.3862	1.450
6	5688.0000	0.2000	0.7900	0.0000	0.0000	2.030	0.5376	2.000
7	1734.0000	0.2000	0.8000	0.0000	0.0000	2.320	0.5908	2.400
8	2848.0000	0.2000	0.8900	0.0000	0.0000	2.700	0.6608	2.700
9	5278.0000	0.2000	0.8700	0.0000	0.0000	3.100	0.6684	3.100
10	3481.0000	0.2000	0.8700	0.0000	0.0000	3.380	0.6684	3.380
11	282.0000	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	41.0000	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.700
13	6.0000	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	4.0000	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	149000.00	0.2000	0.0133	0.0000	0.0000	0.360	0.0810	0.720
4	.	0.2000	0.1467	0.0000	0.0000	0.760	0.2679	1.160
5	.	0.2000	0.4333	0.0000	0.0000	1.320	0.3862	1.580
6	.	0.2000	0.6367	0.0000	0.0000	1.950	0.5376	2.050
7	.	0.2000	0.7900	0.0000	0.0000	2.230	0.5908	2.400
8	.	0.2000	0.8700	0.0000	0.0000	2.830	0.6608	2.720
9	.	0.2000	0.9367	0.0000	0.0000	3.290	0.6684	3.300
10	.	0.2000	0.9567	0.0000	0.0000	3.880	0.6684	3.730
11	.	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	.	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.690
13	.	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	.	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruit-ment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	92000.000	0.2000	0.0133	0.0000	0.0000	0.390	0.0810	0.940
4	.	0.2000	0.1467	0.0000	0.0000	0.730	0.2679	1.320
5	.	0.2000	0.4333	0.0000	0.0000	1.310	0.3862	1.710
6	.	0.2000	0.6367	0.0000	0.0000	1.870	0.5376	2.100
7	.	0.2000	0.7900	0.0000	0.0000	2.150	0.5908	2.390
8	.	0.2000	0.8700	0.0000	0.0000	2.950	0.6608	2.730
9	.	0.2000	0.9367	0.0000	0.0000	3.470	0.6684	3.510
10	.	0.2000	0.9567	0.0000	0.0000	4.390	0.6684	4.070
11	.	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	.	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.670
13	.	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	.	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : MEDIUM
Date and time: 01SEP93:20:12

Medium growth

Table 4.16 (Continued)

Haddock in the North-East Arctic (Fishing Areas I and II)
 Haddock in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	254000.00	0.2000	0.0200	0.0000	0.0000	0.330	0.0810	0.490
4	123664.00	0.2000	0.2400	0.0000	0.0000	0.790	0.2679	1.000
5	34743.0000	0.2000	0.5000	0.0000	0.0000	1.330	0.3862	1.450
6	5688.0000	0.2000	0.7900	0.0000	0.0000	2.030	0.5376	2.000
7	1734.0000	0.2000	0.8000	0.0000	0.0000	2.320	0.5908	2.400
8	2848.0000	0.2000	0.8900	0.0000	0.0000	2.700	0.6608	2.700
9	5278.0000	0.2000	0.8700	0.0000	0.0000	3.100	0.6684	3.100
10	3481.0000	0.2000	0.8700	0.0000	0.0000	3.380	0.6684	3.380
11	282.0000	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	41.0000	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.700
13	6.0000	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	4.0000	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	149000.00	0.2000	0.0133	0.0000	0.0000	0.300	0.0810	0.610
4	.	0.2000	0.1467	0.0000	0.0000	0.650	0.2679	0.970
5	.	0.2000	0.4333	0.0000	0.0000	1.060	0.3862	1.350
6	.	0.2000	0.6367	0.0000	0.0000	1.720	0.5376	1.860
7	.	0.2000	0.7900	0.0000	0.0000	2.010	0.5908	2.250
8	.	0.2000	0.8700	0.0000	0.0000	2.830	0.6608	2.560
9	.	0.2000	0.9367	0.0000	0.0000	3.290	0.6684	3.300
10	.	0.2000	0.9567	0.0000	0.0000	3.880	0.6684	3.730
11	.	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	.	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.660
13	.	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	.	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	92000.0000	0.2000	0.0133	0.0000	0.0000	0.270	0.0810	0.730
4	.	0.2000	0.1467	0.0000	0.0000	0.510	0.2679	0.950
5	.	0.2000	0.4333	0.0000	0.0000	0.800	0.3862	1.240
6	.	0.2000	0.6367	0.0000	0.0000	1.400	0.5376	1.710
7	.	0.2000	0.7900	0.0000	0.0000	1.690	0.5908	2.110
8	.	0.2000	0.8700	0.0000	0.0000	2.950	0.6608	2.420
9	.	0.2000	0.9367	0.0000	0.0000	3.470	0.6684	3.510
10	.	0.2000	0.9567	0.0000	0.0000	4.390	0.6684	4.070
11	.	0.2000	1.0000	0.0000	0.0000	5.400	0.6684	5.400
12	.	0.2000	1.0000	0.0000	0.0000	6.700	0.7746	6.630
13	.	0.2000	1.0000	0.0000	0.0000	7.400	0.8885	7.400
14+	.	0.2000	1.0000	0.0000	0.0000	8.000	.	8.000
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : LOW
 Date and time: 01SEP93:20:09

Low growth

Table 4.17

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Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0115	0.4508	280983	93724	73500	0.0000	0.0000	418095	131133	0	653882	293544
.	0.0500	0.0223	.	131133	7976	644823	288221
.	0.1000	0.0446	.	131133	15810	635931	283009
.	0.1500	0.0668	.	131133	23505	627204	277906
.	0.2000	0.0891	.	131133	31064	618636	272910
.	0.2500	0.1114	.	131133	38489	610226	268017
.	0.3000	0.1337	.	131133	45784	601969	263226
.	0.3500	0.1560	.	131133	52950	593862	258533
.	0.4000	0.1783	.	131133	59992	585903	253938
.	0.4500	0.2005	.	131133	66910	578088	249437
.	0.5000	0.2228	.	131133	73708	570413	245028
.	0.5500	0.2451	.	131133	80389	562878	240710
.	0.6000	0.2674	.	131133	86954	555477	236479
.	0.6500	0.2897	.	131133	93406	548209	232335
.	0.7000	0.3119	.	131133	99748	541070	228275
.	0.7500	0.3342	.	131133	105981	534059	224297
.	0.8000	0.3565	.	131133	112108	527172	220400
.	0.8500	0.3788	.	131133	118130	520407	216581
.	0.9000	0.4011	.	131133	124051	513762	212839
.	0.9500	0.4233	.	131133	129872	507233	209172
.	1.0000	0.4456	.	131133	135595	500820	205579
.	1.0500	0.4679	.	131133	141222	494518	202057
.	1.1000	0.4902	.	131133	146755	488327	198605
.	1.1500	0.5125	.	131133	152195	482243	195222
.	1.2000	0.5348	.	131133	157545	476265	191906
.	1.2500	0.5570	.	131133	162807	470390	188655
.	1.3000	0.5793	.	131133	167982	464617	185468
.	1.3500	0.6016	.	131133	173071	458943	182344
.	1.4000	0.6239	.	131133	178077	453367	179282
.	1.4500	0.6462	.	131133	183002	447886	176279
.	1.5000	0.6684	.	131133	187846	442499	173335
.	1.5500	0.6907	.	131133	192611	437203	170448
.	1.6000	0.7130	.	131133	197299	431998	167617
.	1.6500	0.7353	.	131133	201912	426880	164841
.	1.7000	0.7576	.	131133	206450	421849	162119
.	1.7500	0.7798	.	131133	210915	416903	159449
.	1.8000	0.8021	.	131133	215309	412040	156831
.	1.8500	0.8244	.	131133	219634	407258	154263
.	1.9000	0.8467	.	131133	223889	402556	151744
.	1.9500	0.8690	.	131133	228077	397933	149273
.	2.0000	0.8913	.	131133	232199	393386	146849
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HIG2
 Date and time : 01SEP93:20:14
 Computation of ref. F: Simple mean, age 4 - 7
 Basis for 1993 : TAC constraints

Continued...

High growth

Table 4.17 (Continued)

16:18 Wednesday, September 1, 1993 41

Haddock in the North-East Arctic (Fishing Areas I and II)
Haddock in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0115	0.4508	280983	93724	73500	0.0000	0.0000	368134	117387	0	513949	234865
.	0.0500	0.0223	.	117387	6999	506685	230503
.	0.1000	0.0446	.	117387	13871	499557	226234
.	0.1500	0.0668	.	117387	20620	492565	222057
.	0.2000	0.0891	.	117387	27248	485704	217969
.	0.2500	0.1114	.	117387	33757	478971	213969
.	0.3000	0.1337	.	117387	40150	472365	210054
.	0.3500	0.1560	.	117387	46430	465882	206222
.	0.4000	0.1783	.	117387	52598	459519	202471
.	0.4500	0.2005	.	117387	58658	453275	198799
.	0.5000	0.2228	.	117387	64611	447146	195205
.	0.5500	0.2451	.	117387	70460	441129	191687
.	0.6000	0.2674	.	117387	76207	435224	188242
.	0.6500	0.2897	.	117387	81853	429426	184869
.	0.7000	0.3119	.	117387	87402	423735	181567
.	0.7500	0.3342	.	117387	92854	418147	178333
.	0.8000	0.3565	.	117387	98213	412661	175166
.	0.8500	0.3788	.	117387	103479	407274	172065
.	0.9000	0.4011	.	117387	108655	401984	169028
.	0.9500	0.4233	.	117387	113743	396789	166054
.	1.0000	0.4456	.	117387	118744	391688	163140
.	1.0500	0.4679	.	117387	123660	386678	160286
.	1.1000	0.4902	.	117387	128494	381757	157491
.	1.1500	0.5125	.	117387	133245	376924	154752
.	1.2000	0.5348	.	117387	137917	372177	152069
.	1.2500	0.5570	.	117387	142511	367514	149441
.	1.3000	0.5793	.	117387	147028	362932	146866
.	1.3500	0.6016	.	117387	151469	358432	144342
.	1.4000	0.6239	.	117387	155837	354010	141869
.	1.4500	0.6462	.	117387	160133	349666	139446
.	1.5000	0.6684	.	117387	164358	345397	137072
.	1.5500	0.6907	.	117387	168514	341202	134744
.	1.6000	0.7130	.	117387	172602	337080	132463
.	1.6500	0.7353	.	117387	176623	333030	130228
.	1.7000	0.7576	.	117387	180578	329049	128036
.	1.7500	0.7798	.	117387	184470	325136	125888
.	1.8000	0.8021	.	117387	188298	321291	123783
.	1.8500	0.8244	.	117387	192065	317511	121718
.	1.9000	0.8467	.	117387	195772	313795	119694
.	1.9500	0.8690	.	117387	199419	310143	117710
.	2.0000	0.8913	.	117387	203008	306552	115764
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : MEDIUM
Date and time : 01SEP93:20:12
Computation of ref. F: Simple mean, age 4 - 7
Basis for 1993 : TAC constraints

Continued...

Medium growth

Table 4.17 (Continued)

16:18 Wednesday, September 1, 1993 39

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
1.0115	0.4508	280983	93724	73500	0.0000	0.0000	313021	102189	0	359108	171471
.	0.0500	0.0223	.	102189	6089	353777	168099
.	0.1000	0.0446	.	102189	12066	348552	164804
.	0.1500	0.0668	.	102189	17934	343433	161584
.	0.2000	0.0891	.	102189	23694	338415	158437
.	0.2500	0.1114	.	102189	29349	333497	155360
.	0.3000	0.1337	.	102189	34902	328676	152353
.	0.3500	0.1560	.	102189	40354	323951	149414
.	0.4000	0.1783	.	102189	45707	319319	146541
.	0.4500	0.2005	.	102189	50965	314778	143731
.	0.5000	0.2228	.	102189	56128	310325	140985
.	0.5500	0.2451	.	102189	61199	305960	138299
.	0.6000	0.2674	.	102189	66179	301679	135673
.	0.6500	0.2897	.	102189	71072	297481	133105
.	0.7000	0.3119	.	102189	75878	293365	130594
.	0.7500	0.3342	.	102189	80599	289327	128138
.	0.8000	0.3565	.	102189	85237	285368	125736
.	0.8500	0.3788	.	102189	89794	281484	123387
.	0.9000	0.4011	.	102189	94272	277674	121089
.	0.9500	0.4233	.	102189	98671	273936	118840
.	1.0000	0.4456	.	102189	102995	270270	116641
.	1.0500	0.4679	.	102189	107244	266673	114490
.	1.1000	0.4902	.	102189	111419	263143	112384
.	1.1500	0.5125	.	102189	115524	259680	110325
.	1.2000	0.5348	.	102189	119557	256282	108309
.	1.2500	0.5570	.	102189	123523	252947	106337
.	1.3000	0.5793	.	102189	127420	249675	104406
.	1.3500	0.6016	.	102189	131252	246462	102517
.	1.4000	0.6239	.	102189	135020	243310	100669
.	1.4500	0.6462	.	102189	138724	240215	98859
.	1.5000	0.6684	.	102189	142365	237178	97088
.	1.5500	0.6907	.	102189	145947	234196	95354
.	1.6000	0.7130	.	102189	149468	231268	93656
.	1.6500	0.7353	.	102189	152931	228394	91994
.	1.7000	0.7576	.	102189	156337	225571	90367
.	1.7500	0.7798	.	102189	159687	222800	88774
.	1.8000	0.8021	.	102189	162981	220079	87214
.	1.8500	0.8244	.	102189	166222	217407	85686
.	1.9000	0.8467	.	102189	169410	214782	84190
.	1.9500	0.8690	.	102189	172546	212205	82725
.	2.0000	0.8913	.	102189	175632	209673	81290
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : LOW
 Date and time : 01SEP93:20:09
 Computation of ref. F: Simple mean, age 4 - 7
 Basis for 1993 : TAC constraints

Low growth

Table 4.18

21:02 Wednesday, September 1, 1993 7

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0115	0.4507	63372	73499	431769	280983	68500	93756	68496	93724
1994	0.7850	0.3498	68890	110281	445520	418096	81465	129616	81465	129616
1995	0.7850	0.3498	74931	161467	394780	529226	113592	220347	113592	220347
1996	0.7850	0.3498	70660	163420	344844	518384	118984	260619	118984	260619
1997	0.7850	0.3498	62416	147904	307735	465290	107048	251321	107048	251321
1998	0.7850	0.3498	55624	133036	284803	420902	93456	228075	93456	228075
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HIGH1
 Date and time : 01SEP93:21:03
 Computation of ref. F: Simple mean, age 4 - 7
 Prediction basis : F factors

High growth

22:06 Thursday, September 2, 1993 18

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0115	0.4507	63372	73499	431769	280983	68500	93756	68496	93724
1994	1.0000	0.4456	85078	135595	445520	418096	81465	129616	81465	129616
1995	1.0000	0.4456	87383	186268	380303	500821	106473	204387	106473	204387
1996	1.0000	0.4456	78072	177088	321903	465488	104960	225718	104960	225718
1997	1.0000	0.4456	66487	152669	282438	401014	89593	204000	89593	204000
1998	1.0000	0.4456	58401	133421	260555	354442	75864	176143	75864	176143
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HIGH1
 Date and time : 02SEP93:22:32
 Computation of ref. F: Simple mean, age 4 - 7
 Prediction basis : F factors

High growth

22:06 Thursday, September 2, 1993 14

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0115	0.4507	63372	73499	431769	280983	68500	93756	68496	93724
1994	0.7850	0.3498	68890	96615	445520	360471	81465	114992	81465	114992
1995	0.7850	0.3498	74931	128922	394780	414297	113592	175182	113592	175182
1996	0.7850	0.3498	70660	132337	344844	409555	118984	208836	118984	208836
1997	0.7850	0.3498	62416	121347	307735	372244	107048	204848	107048	204848
1998	0.7850	0.3498	55624	109661	284803	341690	93456	190629	93456	190629
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : MEDIUM1
 Date and time : 02SEP93:22:27
 Computation of ref. F: Simple mean, age 4 - 7
 Prediction basis : F factors

Medium growth

Table 4.18 (Continued)

22:06 Thursday, September 2, 1993 10

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0115	0.4507	63372	73499	431769	280983	68500	93756	68496	93724
1994	1.0000	0.4456	85078	118745	445520	360471	81465	114992	81465	114992
1995	1.0000	0.4456	87383	148460	380303	391689	106473	162229	106473	162229
1996	1.0000	0.4456	78072	142928	321903	366915	104960	180368	104960	180368
1997	1.0000	0.4456	66487	124549	282438	319288	89593	165461	89593	165461
1998	1.0000	0.4456	58401	109022	260555	285030	75864	145787	75864	145787
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : MEDIUM1
 Date and time : 02SEP93:22:27
 Computation of ref. F: Simple mean, age 4 - 7
 Prediction basis : F factors

Medium growth

22:06 Thursday, September 2, 1993 22

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0115	0.4507	63372	73499	431769	280983	68500	93756	68496	93724
1994	1.0000	0.4456	85078	102995	445520	313022	81465	101089	81465	101089
1995	1.0000	0.4456	87383	114104	380303	270271	106473	116068	106473	116068
1996	1.0000	0.4456	78072	113599	321903	264182	104960	135117	104960	135117
1997	1.0000	0.4456	66487	101187	282438	238519	89593	130345	89593	130345
1998	1.0000	0.4456	58401	88879	260555	218099	75864	120285	75864	120285
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : LOW1
 Date and time : 02SEP93:22:34
 Computation of ref. F: Simple mean, age 4 - 7
 Prediction basis : F factors

Low growth

21:02 Wednesday, September 1, 1993 35

Haddock in the North-East Arctic (Fishing Areas I and II)

Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0115	0.4507	63372	73499	431769	280983	68500	93756	68496	93724
1994	0.7850	0.3498	68890	83855	445520	313022	81465	101089	81465	101089
1995	0.7850	0.3498	74931	99429	394780	286548	113592	125872	113592	125872
1996	0.7850	0.3498	70660	105862	344844	296939	118984	157671	118984	157671
1997	0.7850	0.3498	62416	99662	307735	282042	107048	163544	107048	163544
1998	0.7850	0.3498	55624	90921	284803	268164	93456	160980	93456	160980
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : LOW1
 Date and time : 01SEP93:21:22
 Computation of ref. F: Simple mean, age 4 - 7
 Prediction basis : F factors

Low growth

Table 4.19

Haddock in the North-East Arctic (Fishing Areas I and II)
 Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Medium growth

Year: 1993 F-factor: 1.0115 Reference F: 0.4507						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0819	18134	8886	254000	83820	5080	1676	5080	1676
4	0.2710	26725	26725	123664	97695	29679	23447	29679	23447
5	0.3906	10249	14861	34743	46208	17372	23104	17372	23104
6	0.5438	2182	4364	5688	11547	4494	9122	4494	9122
7	0.5976	714	1714	1734	4023	1387	3218	1387	3218
8	0.6684	1272	3435	2848	7690	2535	6844	2535	6844
9	0.6761	2377	7369	5278	16362	4592	14235	4592	14235
10	0.6761	1568	5299	3481	11766	3028	10236	3028	10236
11	0.6761	127	686	282	1523	282	1523	282	1523
12	0.7835	20	137	41	275	41	275	41	275
13	0.8987	3	24	6	44	6	44	6	44
14+	.	0	0	4	32	4	32	.	.
Total		63372	73499	431769	280983	68500	93756	68496	93724
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 1.0000 Reference F: 0.4456						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0810	10522	7576	149000	53640	1490	536	1490	536
4	0.2679	40994	47553	191599	137951	26824	19313	26824	19313
5	0.3862	22564	35651	77215	101923	33202	43827	33202	43827
6	0.5376	7319	15004	19247	37531	12318	24020	12318	24020
7	0.5908	1104	2649	2704	6029	2136	4763	2136	4763
8	0.6608	346	941	781	2210	679	1923	679	1923
9	0.6684	534	1762	1195	3932	1123	3696	1123	3696
10	0.6684	982	3662	2198	8527	2110	8186	2110	8186
11	0.6684	648	3497	1450	7827	1450	7827	1450	7827
12	0.7746	58	389	117	787	117	787	117	787
13	0.8885	8	61	15	113	15	113	15	113
14+	.	0	0	.	.	.	.	.	.
Total		85078	118745	445520	360471	81465	114992	81465	114992
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 1.0000 Reference F: 0.4456						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0810	6497	6107	92000	35880	920	359	920	359
4	0.2679	24070	31772	112499	82124	15750	11497	15750	11497
5	0.3862	35068	59966	120001	157202	51601	67597	51601	67597
6	0.5376	16338	34310	42965	80345	27498	51421	27498	51421
7	0.5908	3758	8982	9205	19791	7272	15635	7272	15635
8	0.6608	543	1483	1226	3617	1067	3147	1067	3147
9	0.6684	148	518	330	1146	310	1077	310	1077
10	0.6684	224	912	501	2202	481	2113	481	2113
11	0.6684	412	2225	922	4980	922	4980	922	4980
12	0.7746	301	2008	608	4075	608	4075	608	4075
13	0.8885	24	178	44	328	44	328	44	328
14+	.	0	0	.	.	.	.	.	.
Total		87383	148460	380303	391689	106473	162229	106473	162229
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

(cont.)

Table 4.19 (Continued)

Haddock in the North-East Arctic (Fishing Areas I and II)
 Haddock in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Medium growth

(cont.)

Year: 1996 F-factor: 1.0000 Reference F: 0.4456

Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
						Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0810	6285	5908	89000	34710	890	347	890	347
4	0.2679	14862	19618	69463	50708	9725	7099	9725	7099
5	0.3862	20590	35210	70460	92303	30298	39690	30298	39690
6	0.5376	25392	53323	66773	124866	42735	79914	42735	79914
7	0.5908	8390	20052	20548	44179	16233	34902	16233	34902
8	0.6608	1850	5049	4174	12314	3632	10713	3632	10713
9	0.6684	232	813	518	1799	487	1691	487	1691
10	0.6684	62	252	139	608	133	584	133	584
11	0.6684	94	508	210	1136	210	1136	210	1136
12	0.7746	192	1277	387	2593	387	2593	387	2593
13	0.8885	124	920	230	1698	230	1698	230	1698
14+	.	0	0	.	.	.	.	.	.
Total		78072	142928	321903	366915	104960	180368	104960	180368
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1997 F-factor: 1.0000 Reference F: 0.4456

Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
						Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0810	6285	5908	89000	34710	890	347	890	347
4	0.2679	14377	18978	67198	49054	9408	6868	9408	6868
5	0.3862	12714	21740	43506	56992	18707	24507	18707	24507
6	0.5376	14909	31309	39207	73316	25092	46923	25092	46923
7	0.5908	13039	31163	31935	68660	25229	54242	25229	54242
8	0.6608	4129	11271	9318	27489	8107	23916	8107	23916
9	0.6684	788	2767	1765	6124	1659	5757	1659	5757
10	0.6684	97	395	218	955	209	917	209	917
11	0.6684	26	140	58	314	58	314	58	314
12	0.7746	44	291	88	592	88	592	88	592
13	0.8885	79	585	146	1081	146	1081	146	1081
14+	.	0	0	.	.	.	.	.	.
Total		66487	124549	282438	319288	89593	165461	89593	165461
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1998 F-factor: 1.0000 Reference F: 0.4456

Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
						Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0810	6285	5908	89000	34710	890	347	890	347
4	0.2679	14377	18978	67198	49054	9408	6868	9408	6868
5	0.3862	12299	21031	42087	55134	18097	23708	18097	23708
6	0.5376	9206	19332	24208	45269	15493	28972	15493	28972
7	0.5908	7656	18298	18751	40315	14813	31849	14813	31849
8	0.6608	6417	17517	14482	42722	12599	37168	12599	37168
9	0.6684	1760	6178	3940	13672	3704	12852	3704	12852
10	0.6684	331	1347	741	3251	711	3121	711	3121
11	0.6684	41	220	91	493	91	493	91	493
12	0.7746	12	81	24	163	24	163	24	163
13	0.8885	18	133	33	247	33	247	33	247
14+	.	0	0	.	.	.	.	.	.
Total		58401	109022	260555	285030	75864	145787	75864	145787
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : MEDIUM1
 Date and time : 02SEP93:22:27
 Computation of rel. F: Simple mean, age 4 - 7
 Prediction basis : F factors

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

Country	1983	1984	1985	1986	1987
Denmark	-	-	-	-	1
Faroe Islands	539	503	490	426	712
France	418	431	657	308	576
German Dem.Rep.	-	6	11	-	-
Germany, Fed.Rep.	4,933	4,532	1,837	3,470	4,909
Greenland	-	-	-	-	-
Norway	149,556	152,818	103,899	63,090	85,710
Spain	33	-	-	-	-
UK (Engl.& Wales)	1,251	335	202	54	54
UK (Scotland)	-	-	+	21	3
USSR	206	161	51	27	426
Total	156,936	158,786	107,147	67,396	92,391

Country	1988	1989	1990	1991	1992 ¹
Denmark	-	-	-	5	-
Faroe Islands	441	388	1,207	963	519
France	411	460 ²	340 ²	77 ²	256 ²
German Dem.Rep.	17	-	14	-	-
Germany, Fed.Rep.	4,557	606	1,129	2,003	3,451
Greenland	-	-	-	-	734
Norway	108,244	119,625	92,397	104,240 ¹	118,447
Spain	-	-	-	-	6
UK (Engl.& Wales)	436	702	681	449	515
UK (Scotland)	6	23	28	42	12
USSR/Russia ³	130	506	52	518 ²	964
Total	114,242	122,310	95,848	108,297	124,904

¹Provisional figures.

²As reported to Norwegian authorities.

³In 1991-1992.

Table 5.2 North-East Arctic SAITHE. Landings ('000 tonnes) by gear category in Sub-area I, Division IIa and Division IIb combined.

Year	Purse Seine	Trawl	Gill Net	Others	Total
1977	75.2	69.5	19.3	12.7	176.7 ²
1978	62.9	57.7	21.1	13.9	155.6 ²
1979	74.7	52.0	21.6	15.8	164.1
1980	61.3	46.8	21.1	15.4	144.6
1981	64.3	72.4	24.0	14.8	175.5
1982	76.4	59.4	16.7	15.6	168.0
1983	54.1	68.2	19.6	15.1	156.9
1984	36.4	85.6	23.7	13.1	158.8
1985	31.1	49.9	14.6	11.5	107.1
1986	7.9	36.2	12.3	8.2	64.6 ²
1987	34.9	28.0	19.0	10.8	92.7 ²
1988	43.5	45.4	15.3	10.0	114.2
1989	48.6	44.8	16.8	12.4	122.7
1990	24.6	44.0	19.3	7.9	95.8
1991 ¹	38.9	42.1	17.9	9.3	108.3
1992 ¹	27.1	64.4	22.3	11.1	124.9

¹Preliminary.

²Unresolved discrepancy between Norwegian catch by gear figures and the total reported to ICES for these years.

Table 5.3 North-East Arctic SAITHE. Norwegian purse seiners taking part in the saithe fishery. (Number of vessels, catch in tonnes, catch per vessel).

Year	Vessel size (m)								
	-19.9			20.0-24.9			25.0-		
	Number	Catch	C/V	Number	Catch	C/V	Number	Catch	C/V
1977	208	21,398	103	66	25,324	384	19	5,655	298
1978	184	16,288	89	72	21,224	295	19	6,094	321
1979	250	21,224	85	72	27,057	376	25	9,122	365
1980	269	21,243	79	96	27,551	287	39	10,234	262
1981	312	25,984	83	89	29,108	327	23	7,354	320
1982	308	30,228	98	98	35,969	367	23	9,303	404
1983	222	19,925	90	80	28,348	354	12	5,524	460
1984	168	8,834	53	69	20,668	300	15	6,713	448
1985	90	4,150	46	57	18,328	322	16	8,391	524
1986	55	1,281	23	43	3,581	83	21	2,643	126
1987	106	9,084	86	46	16,766	364	15	8,185	546
1988	120	13,111	109	48	20,413	425	13	8,981	691
1989	195	14,993	77	61	23,000	377	13	10,466	805
1990	89	2,533	28	53	13,360	257	19	8,406	442
1991	122	8,726	72	56	20,378	364	19	9,797	516
1992	100	7,076	71	49	14,783	302	20	5,020	251

Table 5.4 North-East Arctic SAITHE. Catch, effort, and catch per unit effort for Norwegian trawlers fishing directly for Saithe.

Year	Catch ¹ (t)	Effort ¹ (h)	CPUE ¹ (kg/h)
1976	12,982	21,615	601
1977	15,583	29,308	532
1978	12,506	27,094	462
1979	16,609	24,258	685
1980	27,618	39,290	703
1981	43,682	49,191	888
1982	30,358	33,164	915
1983	38,846	37,856	1,026
1984	56,128	60,282	931
1985	29,260	39,894	733
1986	20,897	25,037	835
1987	8,631	11,860	728
1988	16,589	21,034	789
1989	28,753	40,813	705
1990	28,445	42,689	666
1991	26,362	35,680	739
1992 ²	34,078	36,165	942

¹ Including only days with more than 50% saithe on trips with more than 50% saithe in the catches.

² Preliminary.

Table 5.5 North-East Arctic SAITHE. Norwegian effort indices.

Year	Purse seine ¹	Trawl ²	Combined ³
1976	-	36.8	-
1977	206	52.7	351
1978	214	51.3	355
1979	199	42.7	316
1980	215	57.4	373
1981	203	71.0	398
1982	213	58.2	373
1983	161	57.7	320
1984	124	85.5	359
1985	98	63.7	273
1986	96	45.2	220
1987	94	30.1	177
1988	103	50.4	242
1989	131	59.8	295
1990	96	60.4	262
1991	107	51.5	249
1992	90	61.5	259

¹ No. of vessels 20-24.9 m.

² Hours trawling ('000).

³ Trawl indices scaled up to give the same average for 1977-1990 as the purse seine indices (i.e. x 2.75) before adding the two.

Effort indices for both categories raised to represent total Norwegian landings for the gear.

Table 5.6

Saithe in the North-East Arctic (Fishing Areas I and II)

NORTHEAST ARCTIC SAI THE : EFFORT AND CATCH DATA, Norw Purse Seine (code: FLT01)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1977	206	81152	8694	2144	133	9
1978	214	37652	8788	2126	456	88
1979	199	41942	6706	6575	1362	363
1980	215	23353	15280	3280	1683	681
1981	203	68716	57704	2219	154	36
1982	213	28360	43980	250	140	1
1983	161	12402	9775	12090	463	179
1984	124	21699	3842	2144	1363	21
1985	98	28815	2688	1096	340	95
1986	96	9869	593	181	108	51
1987	94	12364	32183	386	19	2
1988	103	3253	27063	13169	72	6
1989	131	5250	8521	18211	2880	24
1990	96	7207	3319	2582	1845	673
1991	107	43110	1907	453	162	95
1992	90	32948	2618	74	37	24

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Saithe in the North-East Arctic (Fishing Areas I and II)

NORTHEAST ARCTIC SAI THE : EFFORT AND CATCH DATA, Norw Trawl (code: FLT02)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1976	36.8	11184	583	1080	1137	869	612
1977	52.7	4557	9047	3260	202	660	322
1978	51.3	488	3104	3440	1400	319	591
1979	42.7	7374	6538	2340	762	845	419
1980	57.4	10270	10301	1726	2891	1392	406
1981	71.0	5680	12137	10877	1901	1053	1351
1982	58.2	1719	10344	10006	5519	420	306
1983	57.7	3341	10024	14949	2189	1720	535
1984	85.5	14876	25819	7038	7161	656	744
1985	63.7	10070	6177	3844	3877	2446	441
1986	45.2	4388	8150	4078	3172	2044	779
1987	30.1	470	7862	2452	1169	1405	189
1988	50.4	1539	2241	14077	3031	1438	609
1989	59.8	3923	9038	9226	8659	1154	178
1990	60.4	8909	7960	3932	3722	3967	479
1991	51.5	20741	7106	2683	2456	1516	1044
1992	61.5	11101	17108	5928	3578	2099	1195

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Saithe in the North-East Arctic (Fishing Areas I and II)

NORTHEAST ARCTIC SAI THE : EFFORT AND CATCH DATA, Norw Survey (code: FLT03)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5
1986	1	108.5	9.0	4.5
1987	1	54.0	118.5	4.4
1988	1	54.0	26.5	7.9
1989	1	68.6	37.0	21.6
1990	1	43.1	19.4	8.9
1991	1	219.4	10.8	8.1
1992	1	557.8	73.6	8.1

Continued

Table 5.6 Continued

Saithe in the North-East Arctic (Fishing Areas I and II)

NORTHEAST ARCTIC SAITHE : EFFORT AND CATCH DATA, Norw Purse Seine (code: FLT01)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1977	206	81152	8694	2144	133	9
1978	214	37652	8788	2126	456	88
1979	199	41942	6706	6575	1362	363
1980	215	23353	15280	3280	1683	681
1981	203	68716	57704	2219	154	36
1982	213	28360	43980	250	140	1
1983	161	12402	9775	12090	463	179
1984	124	21699	3842	2144	1363	21
1985	98	28815	2688	1096	340	95
1986	96	9869	593	181	108	51
1987	94	12364	32183	386	19	2
1988	103	3253	27063	13169	72	6
1989	131	5250	8521	18211	2880	24
1990	96	7207	3319	2582	1845	673
1991	107	43110	1907	453	162	95
1992	90	32948	2618	74	37	24

Saithe in the North-East Arctic (Fishing Areas I and II)

NORTHEAST ARCTIC SAITHE : EFFORT AND CATCH DATA, Norw Trawl (code: FLT02)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7	Catch, age 8
1976	36.8	11184	583	1080	1137	869	612
1977	52.7	4557	9047	3260	202	660	322
1978	51.3	488	3104	3440	1400	319	591
1979	42.7	7374	6538	2340	762	845	419
1980	57.4	10270	10301	1726	2891	1392	406
1981	71.0	5680	12137	10877	1901	1053	1351
1982	58.2	1719	10344	10006	5519	420	306
1983	57.7	3341	10024	14949	2189	1720	535
1984	85.5	14876	25819	7038	7161	656	744
1985	63.7	10070	6177	3844	3877	2446	441
1986	45.2	4388	8150	4078	3172	2044	779
1987	30.1	470	7862	2452	1169	1405	189
1988	50.4	1539	2241	14077	3031	1438	609
1989	59.8	3923	9038	9226	8659	1154	178
1990	60.4	8909	7960	3932	3722	3967	479
1991	51.5	20741	7106	2683	2456	1516	1044
1992	61.5	11101	17108	5928	3578	2099	1195

Saithe in the North-East Arctic (Fishing Areas I and II)

NORTHEAST ARCTIC SAITHE : EFFORT AND CATCH DATA, Norw Survey (code: FLT03)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5
1986	1	108.5	9.0	4.5
1987	1	54.0	118.5	4.4
1988	1	54.0	26.5	7.9
1989	1	68.6	37.0	21.6
1990	1	43.1	19.4	8.9
1991	1	219.4	10.8	8.1
1992	1	557.8	73.6	8.1

Table 5.7

VPA Version 3.1 (MSDOS)

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Extended Survivors Analysis

Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

CPUE data from file /users/ifad/ifapwork/wg_108/sai_arct/FLEET.028

Data for 3 fleets over 33 years

Age range from 1 to 10

Fleet,	Alpha,	Beta
FLT01: NORTHEAST ARC	, .000	, 1.000
FLT02: NORTHEAST ARC	, .000	, 1.000
FLT03: NORTHEAST ARC	, .750	, .850

Time series weights :

Tapered time weighting applied
Power = 3 over 20 years

Catchability analysis :

Catchability dependent on stock size for ages < 3

Regression type = C
Minimum of 5 points used for regression
Survivor estimates shrunk to the population mean for ages < 3

Catchability independent of age for ages >= 8

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 5 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = .500

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning converged after 18 iterations

Total absolute residual between iterations
17 and 18 = .000

Continued

Table 5.7 Continued

Log catchability residuals.

Fleet : FLT01: NORTHEAST ARC

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3		.84	.49	.12	.02	.21	.14	-.34	.85	1.24	-.88	-.33	-1.01	-.58	.02	.58	.00
4		-.30	-.36	-.13	-.11	1.91	.61	.20	-.39	.02	-1.59	.97	1.00	.40	-.02	-.64	-1.27
5		.01	-.16	.92	.69	-.44	-1.92	1.29	.46	.19	-1.19	-.65	1.42	1.93	.95	-.80	-2.34
6		-.64	.04	1.08	1.15	-.58	-1.50	.82	1.31	.54	-.54	-1.78	-.89	1.43	1.83	-.32	-1.54
7		-2.64	.69	1.80	2.16	-.76	-3.84	.93	-.17	1.02	.63	-2.46	-.86	-.31	2.45	.68	-.07
8	No data for this fleet at this age																

Mean catchability and Standard error.

Age	1	2	3	4	5	6	7	8	9	10
		Mean Q,	-6.6168,	-6.8004,	-7.5535,	-8.4710,	-9.6451,			
		S.E	.6620,	.9085,	1.3225,	1.2487,	1.6650,			

Regression statistics :

Age, Slope, Intercept, S.e., RSquare, No Pts, Fleet Mean Q

3,	.89,	7.18,	.62,	.46,	16,	-6.62,
4,	.64,	8.35,	.58,	.49,	16,	-6.80,
5,	.36,	9.36,	.35,	.71,	16,	-7.55,
6,	.38,	9.17,	.40,	.57,	16,	-8.47,
7,	.29,	9.07,	.42,	.50,	16,	-9.65,

Fleet : FLT02: NORTHEAST ARC

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	.91	-.25	-1.99	.35	.95	-.81	-.94	-.20	1.27	1.05	-.51	-2.03	-.61	.34	1.13	1.01	-.22
4	-2.16	.09	-.99	.36	-.20	.38	-.56	.23	.87	.27	.77	-.32	-1.79	.22	.29	.38	-.02
5	-.60	-.34	-.38	-.71	-.76	.06	.93	.40	-.12	-.26	.54	.21	.07	-.10	-.29	-.42	.22
6	-1.15	-2.09	-.63	-1.19	-.21	-.24	.24	.18	.12	.18	.37	.26	.34	.09	-.23	-.10	.11
7	-.43	-1.42	-1.03	-.25	-.24	-.77	-.94	-.22	-.79	.27	.64	.80	.90	-.09	.25	-.26	.23
8	-.68	-.91	-.69	.35	-.24	.61	-.99	.19	-.59	-.10	.53	-.43	.81	-.10	-.03	.18	.11

Mean catchability and Standard error.

Age	1	2	3	4	5	6	7	8	9	10
		Mean Q,	-7.0481,	-5.7805,	-5.4207,	-5.2452,	-5.2090,	-5.3984,		
		S.E	1.0469,	.7366,	.4291,	.4482,	.6290,	.5041,		

Regression statistics :

Age, Slope, Intercept, S.e., RSquare, No Pts, Fleet Mean Q

3,	2.13,	1.71,	2.24,	.06,	17,	-7.05,
4,	6.58,	-24.02,	4.01,	.02,	17,	-5.78,
5,	1.01,	5.36,	.46,	.59,	17,	-5.42,
6,	1.00,	5.23,	.47,	.50,	17,	-5.25,
7,	.99,	5.25,	.65,	.29,	17,	-5.21,
8,	1.30,	4.61,	.67,	.37,	17,	-5.40,

Continued

Table 5.7 Continued

Fleet : FLT03: NORTHEAST ARC

Age	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	,	,	,	,	,	,	,	,	,	,	-.49,	-.88,	-.14,	.33,	-.10,	.42,	.78
4	,	,	,	,	,	,	,	,	,	,	-.50,	.60,	-.60,	.55,	.09,	-.47,	.32
5	,	,	,	,	,	,	,	,	,	,	.04,	-.29,	-.97,	.56,	.20,	.14,	.30
6	, No data for this fleet at this age																
7	, No data for this fleet at this age																
8	, No data for this fleet at this age																

Mean catchability and Standard error.

Age	1	2	3	4	5	6	7	8	9	10
Mean Q			-6.8550,	-7.2861,	-7.6847,					
S.E			.5687,	.5168,	.5017,					

Regression statistics :

Age, Slope, Intercept, S.e., RSquare, No Pts, Fleet Mean Q

3,	.85,	7.62,	.52,	.66,	7,	-6.85,
4,	.75,	8.25,	.39,	.74,	7,	-7.29,
5,	1.37,	6.71,	.71,	.48,	7,	-7.68,

Table 5.8

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:01

Table 1	Catch numbers at age			Numbers*10**-3
YEAR,	1960,	1961,	1962,	
AGE				
1,	0,	1,	1,	
2,	7381,	4936,	1246,	
3,	10509,	17824,	37266,	
4,	13083,	9131,	11131,	
5,	13545,	12506,	4421,	
6,	5064,	3799,	8290,	
7,	4883,	1332,	2427,	
8,	2401,	968,	1024,	
9,	1315,	520,	938,	
10,	743,	405,	451,	
+gp,	1525,	1229,	1728,	
TOTALNUM,	60449,	52651,	68923,	
TONSLAND,	136006,	109821,	122841,	
SOPCOF %,	128,	144,	125,	

Table 1	Catch numbers at age										Numbers*10**-3
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	
AGE											
1,	43,	1,	18596,	1,	1,	281,	110,	1,	497,	1,	
2,	2815,	20308,	30430,	7450,	6952,	5297,	4090,	25952,	19842,	11608,	
3,	42050,	9001,	37115,	22392,	29664,	25196,	77333,	43540,	77019,	65178,	
4,	28925,	59601,	5001,	54537,	24836,	18384,	11949,	62846,	59280,	52389,	
5,	5888,	13154,	26300,	13124,	35956,	5101,	16939,	13987,	26961,	29146,	
6,	4650,	2718,	10142,	12899,	4125,	8282,	4747,	16189,	9556,	10186,	
7,	3861,	3472,	2861,	4652,	5616,	787,	4798,	5122,	9592,	5616,	
8,	1099,	2655,	2110,	1374,	2916,	1913,	1126,	7950,	2901,	3547,	
9,	1075,	1251,	2733,	933,	1413,	900,	1711,	2504,	4352,	1865,	
10,	697,	1221,	699,	965,	1397,	577,	675,	3697,	2195,	2140,	
+gp,	1777,	3559,	3593,	2900,	3493,	1166,	511,	2799,	5490,	3149,	
TOTALNUM,	92880,	116941,	139580,	121227,	116369,	67884,	123989,	184587,	217685,	184825,	
TONSLAND,	148036,	198110,	184548,	201860,	191191,	107181,	140379,	260404,	244732,	210508,	
SOPCOF %,	120,	117,	104,	110,	100,	113,	98,	96,	80,	82,	

Continued

Table 5.8 Continued

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:01

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
1,	194,	1,	1,	52,	121,	1711,	907,	486,	127,	137,
2,	13829,	21159,	81601,	54151,	31662,	45758,	28334,	18226,	10467,	17225,
3,	76296,	36782,	60832,	125030,	99049,	48969,	61963,	40796,	83954,	34733,
4,	25206,	44027,	11691,	30576,	34317,	27685,	23328,	36644,	21822,	65052,
5,	26911,	15671,	16366,	7947,	10140,	12476,	14122,	9211,	21528,	13060,
6,	16031,	20419,	4436,	8712,	2062,	4534,	4400,	6379,	3619,	8212,
7,	7114,	12148,	7808,	3435,	4332,	1468,	2901,	3200,	2550,	1054,
8,	3935,	4802,	6789,	3212,	1456,	1848,	963,	1338,	2008,	1251,
9,	2871,	3258,	2914,	2679,	1606,	938,	1356,	147,	369,	461,
10,	2610,	2505,	2350,	1724,	963,	976,	438,	730,	279,	263,
+gp,	3924,	3821,	4140,	2880,	1134,	2150,	1192,	1629,	629,	448,
TOTALNUM,	178921,	164593,	198928,	240398,	186842,	148513,	139904,	118786,	147352,	141896,
TONSLAND,	215659,	262301,	233453,	242486,	182808,	154465,	164234,	154379,	175516,	170903,
SOPCOF %,	82,	97,	102,	100,	101,	102,	114,	100,	100,	100,

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	484,	24,	0,	0,	65,	0,	412,	603,	202,	3,
2,	11638,	14624,	2216,	3311,	3867,	5017,	11157,	11543,	6135,	13530,
3,	17244,	41466,	48917,	22115,	17869,	8126,	12378,	21002,	73878,	50710,
4,	23768,	33233,	11974,	12895,	49829,	35847,	19915,	13463,	11619,	31889,
5,	32700,	12064,	7189,	6062,	4339,	32827,	32643,	8996,	5395,	7630,
6,	3226,	11204,	5279,	4525,	3118,	4560,	18751,	9152,	5066,	6202,
7,	3008,	1135,	3740,	2805,	3490,	2328,	1939,	7735,	2988,	3281,
8,	1177,	1772,	775,	1399,	755,	1219,	377,	1126,	2009,	2076,
9,	760,	560,	878,	351,	620,	966,	191,	154,	272,	954,
10,	247,	557,	134,	454,	257,	320,	179,	121,	81,	292,
+gp,	760,	897,	701,	285,	797,	102,	149,	253,	132,	77,
TOTALNUM,	95012,	117536,	81803,	54202,	85006,	91312,	98091,	74148,	107777,	116644,
TONSLAND,	155405,	158796,	107147,	70458,	91679,	114508,	122664,	95393,	108297,	124904,
SOPCOF %,	100,	100,	99,	99,	102,	99,	100,	100,	100,	100,

Table 5.9

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:01

Table 2	Catch weights at age (kg)									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
1,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.2500,	.1800,	.2900,	.3600,
2,	.3400,	.3400,	.3400,	.3400,	.3400,	.3400,	.3400,	.4500,	.4300,	.5100,
3,	.7100,	.7100,	.7100,	.7100,	.7100,	.7100,	.7100,	.7900,	.7300,	.7700,
4,	1.1100,	1.1100,	1.1100,	1.1100,	1.1100,	1.1100,	1.1100,	1.2700,	1.4000,	1.1200,
5,	1.6300,	1.6300,	1.6300,	1.6300,	1.6300,	1.6300,	1.6300,	2.0300,	2.0500,	2.0200,
6,	2.3300,	2.3300,	2.3300,	2.3300,	2.3300,	2.3300,	2.3300,	2.5500,	2.7600,	2.6100,
7,	3.1600,	3.1600,	3.1600,	3.1600,	3.1600,	3.1600,	3.1600,	3.2900,	3.3000,	3.2700,
8,	4.0300,	4.0300,	4.0300,	4.0300,	4.0300,	4.0300,	4.0300,	4.3400,	4.3800,	3.9100,
9,	4.8700,	4.8700,	4.8700,	4.8700,	4.8700,	4.8700,	4.8700,	5.1500,	5.9500,	4.6900,
10,	5.6300,	5.6300,	5.6300,	5.6300,	5.6300,	5.6300,	5.6300,	5.7500,	6.3900,	5.6300,
+gp,	7.3850,	7.2170,	7.1270,	7.3200,	7.3940,	7.5270,	7.8090,	6.9370,	6.8410,	7.5580,
SOPCOFAC,	.8166,	.9694,	1.0155,	1.0019,	1.0059,	1.0249,	1.1370,	.9985,	.9973,	.9958,

Table 2	Catch weights at age (kg)									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
1,	.1800,	.1800,	.1800,	.1800,	.1800,	.1800,	.2500,	.3400,	.2100,	.2900,
2,	.6000,	.5300,	.3800,	.3200,	.3400,	.3300,	.4500,	.5400,	.4000,	.4500,
3,	1.0500,	.7100,	.7500,	.5900,	.5300,	.6200,	.7400,	.7600,	.7200,	.7000,
4,	1.3300,	1.2600,	1.3300,	1.2200,	.8400,	.8700,	.9700,	1.0800,	1.1900,	1.1100,
5,	1.8600,	2.0200,	2.0700,	1.9700,	1.6600,	1.3100,	1.3900,	1.5600,	1.7800,	1.8100,
6,	2.8000,	2.7000,	2.6300,	2.3000,	2.3200,	2.4300,	1.8100,	2.1200,	2.2400,	2.1800,
7,	4.0000,	3.8800,	3.2800,	2.8700,	2.9700,	3.8700,	3.0200,	2.4000,	2.8600,	2.6600,
8,	4.1800,	4.4700,	3.9600,	3.7200,	4.0000,	5.3800,	3.7600,	3.6500,	3.3200,	3.1300,
9,	5.3300,	5.3600,	4.5400,	4.3000,	4.7200,	5.8300,	4.6400,	3.6000,	4.5300,	3.8300,
10,	5.6800,	6.0600,	5.5500,	4.6900,	5.4400,	5.3600,	4.7500,	6.3700,	5.7000,	5.8600,
+gp,	8.6650,	7.1900,	8.0120,	6.5970,	6.9040,	7.4480,	7.5000,	4.7950,	7.1250,	7.1890,
SOPCOFAC,	.9985,	.9997,	.9930,	.9929,	1.0152,	.9902,	.9969,	.9980,	.9998,	.9956,

Table 5.10

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:16

Terminal Fs derived using XSA (With F shrinkage)

Table 8		Fishing mortality (F) at age		
YEAR,	1960,	1961,	1962,	
AGE				
1,	.0000,	.0000,	.0000,	
2,	.0694,	.0259,	.0039,	
3,	.1413,	.2383,	.2772,	
4,	.1843,	.1756,	.2297,	
5,	.5008,	.2695,	.1205,	
6,	.2407,	.2519,	.2883,	
7,	.3848,	.0915,	.2530,	
8,	.4185,	.1206,	.0943,	
9,	.3586,	.1479,	.1646,	
10,	.3832,	.1770,	.1849,	
+gp,	.3832,	.1770,	.1849,	
FBAR 3- 6,	.2668,	.2338,	.2289,	

Table 8		Fishing mortality (F) at age									
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	
AGE											
1,	.0001,	.0000,	.0675,	.0000,	.0000,	.0007,	.0003,	.0000,	.0016,	.0000,	
2,	.0259,	.0628,	.1743,	.0347,	.0409,	.0160,	.0131,	.0786,	.1053,	.0473,	
3,	.1747,	.1080,	.1562,	.1877,	.1887,	.2043,	.3404,	.1881,	.3515,	.5900,	
4,	.3607,	.4013,	.0806,	.3617,	.3281,	.1710,	.1408,	.5150,	.4218,	.4306,	
5,	.1826,	.2761,	.3094,	.3133,	.4321,	.1025,	.2356,	.2435,	.4353,	.3785,	
6,	.1797,	.1198,	.3559,	.2449,	.1523,	.1649,	.1309,	.3712,	.2615,	.2899,	
7,	.2108,	.1979,	.1787,	.2737,	.1596,	.0391,	.1357,	.2037,	.3934,	.2414,	
8,	.1734,	.2195,	.1772,	.1219,	.2758,	.0747,	.0722,	.3483,	.1699,	.2455,	
9,	.1355,	.3056,	.3692,	.1106,	.1778,	.1275,	.0886,	.2273,	.3266,	.1571,	
10,	.1772,	.2249,	.2796,	.2139,	.2407,	.1021,	.1331,	.2803,	.3192,	.2639,	
+gp,	.1772,	.2249,	.2796,	.2139,	.2407,	.1021,	.1331,	.2803,	.3192,	.2639,	
FBAR 3- 6,	.2244,	.2263,	.2255,	.2769,	.2753,	.1607,	.2119,	.3294,	.3675,	.4223,	

Continued

Table 5.10 Continued

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:16

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
1,	.0009,	.0000,	.0000,	.0003,	.0004,	.0092,	.0023,	.0029,	.0008,	.0010,
2,	.1397,	.1204,	.2763,	.2185,	.2179,	.1966,	.2067,	.0582,	.0789,	.1461,
3,	.4919,	.6680,	.5967,	.9054,	.7890,	.6161,	.4453,	.5173,	.4111,	.4043,
4,	.4777,	.5939,	.4603,	.6952,	.6808,	.5278,	.6842,	.5196,	.5846,	.6563,
5,	.4120,	.6255,	.4592,	.6642,	.5221,	.5676,	.5676,	.6419,	.6712,	.8689,
6,	.3698,	.6395,	.3574,	.4764,	.3550,	.4690,	.3992,	.5473,	.5655,	.5900,
7,	.3382,	.5346,	.5418,	.5215,	.4630,	.4630,	.6305,	.5723,	.4396,	.3153,
8,	.2662,	.4031,	.6587,	.4483,	.4376,	.3664,	.6384,	.6831,	.8964,	.4017,
9,	.3218,	.3688,	.4588,	.5966,	.4238,	.5655,	.5053,	.1822,	.4006,	.5222,
10,	.3437,	.5184,	.4990,	.5458,	.4435,	.4972,	.5685,	.5661,	.6223,	.5603,
+gp,	.3437,	.5184,	.4990,	.5458,	.4435,	.4972,	.5685,	.5661,	.6223,	.5603,
FBAR 3- 6,	.4378,	.6317,	.4684,	.6853,	.5867,	.5451,	.5241,	.5565,	.5581,	.6299,

Table 8	Fishing mortality (F) at age										FBAR 90-92
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	
AGE											
1,	.0032,	.0001,	.0000,	.0000,	.0007,	.0000,	.0013,	.0013,	.0009,	.0001,	.0008,
2,	.1145,	.1245,	.0092,	.0184,	.0449,	.0666,	.1306,	.0446,	.0167,	.0723,	.0445,
3,	.2136,	.7511,	.7805,	.1195,	.1306,	.1255,	.2324,	.3868,	.4405,	.1864,	.3379,
4,	.5387,	.8219,	.5022,	.4792,	.4298,	.4182,	.5115,	.4271,	.3843,	.3451,	.3855,
5,	.8429,	.5842,	.4108,	.5165,	.2912,	.5657,	.8617,	.4595,	.3022,	.4714,	.4110,
6,	.5406,	.8068,	.5520,	.4951,	.5529,	.5691,	.7566,	.6315,	.5128,	.6840,	.6094,
7,	.4458,	.3684,	.7050,	.6502,	.9253,	1.1187,	.5079,	.8436,	.4324,	.7550,	.6770,
8,	.7045,	.5179,	.4644,	.6306,	.3583,	1.0485,	.5236,	.6337,	.5451,	.6145,	.5978,
9,	.4570,	.9024,	.5287,	.3959,	.6457,	1.1189,	.4380,	.4206,	.3024,	.5454,	.4228,
10,	.5957,	.7312,	.5591,	.5799,	.5698,	.8485,	.6284,	.5539,	.4093,	.6218,	.5284,
+gp,	.5957,	.7312,	.5591,	.5799,	.5698,	.8485,	.6284,	.5539,	.4093,	.6218,	.5284,
FBAR 3- 6,	.5339,	.7410,	.5613,	.4026,	.3511,	.4197,	.5905,	.4762,	.4100,	.4217,	

Table 5.11

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:16

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)			Numbers*10**-3
YEAR,	1960,	1961,	1962,	
AGE				
1,	260460,	434125,	148725,	
2,	121627,	213247,	355431,	
3,	88159,	92901,	170126,	
4,	85912,	62669,	59933,	
5,	37998,	58501,	43047,	
6,	26161,	18854,	36580,	
7,	16895,	16837,	11999,	
8,	7760,	9414,	12579,	
9,	4823,	4181,	6832,	
10,	2580,	2759,	2952,	
+gp,	5252,	8333,	11258,	
TOTAL,	657626,	921821,	859462,	

Table 10	Stock number at age (start of year)					Numbers*10**-3				
YEAR,	1963,	1964,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE										
1,	450534,	256815,	315044,	234167,	449099,	424479,	463661,	267892,	339985,	143129,
2,	121764,	368827,	210262,	241110,	191719,	367691,	347280,	379514,	219331,	277907,
3,	289875,	97145,	283595,	144613,	190663,	150675,	296247,	280628,	287237,	161619,
4,	105567,	199281,	71391,	198605,	98138,	129261,	100564,	172572,	190362,	165480,
5,	38998,	60259,	109228,	53925,	113257,	57876,	89195,	71523,	84425,	102217,
6,	31244,	26601,	37433,	65631,	32275,	60192,	42770,	57700,	45902,	44726,
7,	22448,	21373,	19320,	21471,	42063,	22692,	41788,	30721,	32592,	28935,
8,	7628,	14886,	14357,	13229,	13370,	29356,	17867,	29871,	20518,	18005,
9,	9373,	5251,	9785,	9845,	9588,	8308,	22304,	13609,	17263,	14174,
10,	4745,	6701,	3167,	5538,	7216,	6571,	5987,	16713,	8877,	10196,
+gp,	12041,	19427,	16177,	16557,	17942,	13234,	4515,	12574,	22047,	14913,
TOTAL,	1094216,	1076565,	1089759,	1004691,	1165329,	1270336,	1432177,	1333318,	1268540,	981300,

Continued

Table 5.11 Continued

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:16

Terminal Fs derived using XSA (With F shrinkage)

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10** ⁻³				
	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
1,	251965,	456245,	372354,	218337,	346156,	206672,	436236,	186855,	171238,	145304,
2,	117183,	206116,	373541,	304857,	178712,	283299,	167661,	356339,	152544,	140083,
3,	217028,	83428,	149608,	231994,	200598,	117668,	190542,	111631,	275254,	115421,
4,	73347,	108652,	35024,	67445,	76809,	74612,	52030,	99936,	54482,	149394,
5,	88080,	37244,	49119,	18096,	27553,	31834,	36037,	21490,	48664,	24861,
6,	57315,	47764,	16313,	25407,	7625,	13384,	14775,	16726,	9260,	20363,
7,	27402,	32420,	20630,	9342,	12918,	4377,	6855,	8115,	7923,	4307,
8,	18608,	15998,	15552,	9825,	4541,	6657,	2256,	2988,	3749,	4179,
9,	11532,	11675,	8753,	6590,	5138,	2400,	3778,	975,	1235,	1252,
10,	9917,	6844,	6610,	4529,	2971,	2753,	1116,	1866,	666,	678,
+gp,	14800,	10333,	11531,	7486,	3467,	6006,	3005,	4119,	1483,	1142,
TOTAL,	887177,	1016718,	1059034,	903909,	866488,	749663,	914289,	811041,	726497,	606984,

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10** ⁻³					GMST	
	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,		1993,
AGE												
1,	169131,	326702,	245130,	118783,	105242,	123015,	357886,	500528,	261937,	27996,	0,	2555
2,	118841,	138035,	267460,	200695,	97251,	86106,	100716,	292639,	409252,	214273,	22918,	2025
3,	99104,	86768,	99781,	216972,	161319,	76123,	65958,	72364,	229148,	329516,	163190,	1517
4,	63071,	65537,	33520,	37432,	157631,	115909,	54972,	42802,	40243,	120763,	223902,	871
5,	63452,	30132,	23586,	16609,	18979,	83970,	62462,	26987,	22861,	22435,	70019,	461
6,	8537,	22362,	13754,	12806,	8113,	11612,	39046,	21603,	13955,	13836,	11464,	239
7,	9242,	4071,	8171,	6484,	6390,	3821,	5381,	15002,	9406,	6842,	5716,	131
8,	2573,	4845,	2306,	3305,	2771,	2074,	1022,	2651,	5283,	4997,	2633,	74
9,	2290,	1041,	2363,	1187,	1440,	1585,	595,	496,	1152,	2508,	2213,	43
10,	608,	1187,	346,	1140,	654,	618,	424,	314,	266,	697,	1190,	26
+gp,	1850,	1885,	1789,	708,	2005,	194,	349,	650,	431,	182,	386,	
TOTAL,	538698,	682565,	698205,	616121,	561797,	505029,	688811,	976037,	993936,	744044,	503632,	

Table 5.12

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA28)

At 29-Aug-93 17:16

Table 16 Summary (without SOP correction)

	Terminal Fs derived using XSA (With F shrinkage)					
	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 3- 6,
1960,	260460,	552160,	225800,	136006,	.6023,	.2668,
1961,	434125,	649868,	237954,	109821,	.4615,	.2338,
1962,	148725,	728456,	312947,	122841,	.3925,	.2289,
1963,	450534,	881955,	341365,	148036,	.4337,	.2244,
1964,	256815,	981967,	403965,	198110,	.4904,	.2263,
1965,	315044,	1009255,	400367,	184548,	.4609,	.2255,
1966,	234167,	1038963,	487419,	201860,	.4141,	.2769,
1967,	449099,	1099115,	492743,	191191,	.3880,	.2753,
1968,	424479,	1085763,	509831,	107181,	.2102,	.1607,
1969,	463661,	1181143,	479803,	140379,	.2926,	.2119,
1970,	267892,	1308758,	605366,	260404,	.4302,	.3294,
1971,	339985,	1294576,	582154,	244732,	.4204,	.3675,
1972,	143129,	1101455,	506139,	210508,	.4159,	.4223,
1973,	251965,	998328,	516419,	215659,	.4176,	.4378,
1974,	456245,	872851,	448165,	262301,	.5853,	.6317,
1975,	372354,	773150,	327896,	233453,	.7120,	.4684,
1976,	218337,	668020,	240707,	242486,	1.0074,	.6853,
1977,	346156,	564170,	144275,	182808,	1.2671,	.5867,
1978,	206672,	510484,	144241,	154465,	1.0709,	.5451,
1979,	436236,	531166,	113324,	164234,	1.4492,	.5241,
1980,	186855,	579365,	126646,	154379,	1.2190,	.5565,
1981,	171238,	582093,	89868,	175516,	1.9530,	.5581,
1982,	145304,	532055,	101889,	170903,	1.6773,	.6299,
1983,	169131,	511026,	103313,	155405,	1.5042,	.5339,
1984,	326702,	461170,	124156,	158796,	1.2790,	.7410,
1985,	245130,	414878,	99402,	107147,	1.0779,	.5613,
1986,	118783,	367483,	75480,	70458,	.9335,	.4026,
1987,	105242,	374510,	73087,	91679,	1.2544,	.3511,
1988,	123015,	376763,	68167,	114508,	1.6798,	.4197,
1989,	357886,	421886,	98138,	122664,	1.2499,	.5905,
1990,	(500528,)	569913,	98386,	95393,	.9696,	.4762,
1991,	(261937,)	557785,	85508,	108297,	1.2665,	.4100,
1992,	(27996,)	588855,	78998,	124904,	1.5811,	.4217,
Arith.						
Mean	279267,	732406,	264967,	162457,	.8960,	.4237,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

Table 5.13

Saithe in the North-East Arctic (Fishing Areas I and II)
Saithe in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	255500.00	0.2000	0.0000	0.0000	0.0000	0.280	0.0008	0.280
2	209183.00	0.2000	0.0000	0.0000	0.0000	0.463	0.0430	0.463
3	158910.00	0.2000	0.0000	0.0000	0.0000	0.727	0.3269	0.727
4	147066.00	0.2000	0.0000	0.0000	0.0000	1.127	0.3729	1.127
5	70019.000	0.2000	0.0000	0.0000	0.0000	1.717	0.3976	1.717
6	11464.000	0.2000	1.0000	0.0000	0.0000	2.180	0.5895	2.180
7	5716.000	0.2000	1.0000	0.0000	0.0000	2.640	0.6549	2.640
8	2633.000	0.2000	1.0000	0.0000	0.0000	3.367	0.5783	3.367
9	2213.000	0.2000	1.0000	0.0000	0.0000	3.987	0.4090	3.987
10	1190.000	0.2000	1.0000	0.0000	0.0000	5.977	0.5111	5.977
11+	386.000	0.2000	1.0000	0.0000	0.0000	5.077	0.5111	5.077
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	255500.00	0.2000	0.0000	0.0000	0.0000	0.280	0.0008	0.280
2	.	0.2000	0.0000	0.0000	0.0000	0.463	0.0430	0.463
3	.	0.2000	0.0000	0.0000	0.0000	0.727	0.3269	0.727
4	.	0.2000	0.0000	0.0000	0.0000	1.127	0.3729	1.127
5	.	0.2000	0.0000	0.0000	0.0000	1.717	0.3976	1.717
6	.	0.2000	1.0000	0.0000	0.0000	2.180	0.5895	2.180
7	.	0.2000	1.0000	0.0000	0.0000	2.640	0.6549	2.640
8	.	0.2000	1.0000	0.0000	0.0000	3.367	0.5783	3.367
9	.	0.2000	1.0000	0.0000	0.0000	3.987	0.4090	3.987
10	.	0.2000	1.0000	0.0000	0.0000	5.977	0.5111	5.977
11+	.	0.2000	1.0000	0.0000	0.0000	5.077	0.5111	5.077
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
1	255500.00	0.2000	0.0000	0.0000	0.0000	0.280	0.0008	0.280
2	.	0.2000	0.0000	0.0000	0.0000	0.463	0.0430	0.463
3	.	0.2000	0.0000	0.0000	0.0000	0.727	0.3269	0.727
4	.	0.2000	0.0000	0.0000	0.0000	1.127	0.3729	1.127
5	.	0.2000	0.0000	0.0000	0.0000	1.717	0.3976	1.717
6	.	0.2000	1.0000	0.0000	0.0000	2.180	0.5895	2.180
7	.	0.2000	1.0000	0.0000	0.0000	2.640	0.6549	2.640
8	.	0.2000	1.0000	0.0000	0.0000	3.367	0.5783	3.367
9	.	0.2000	1.0000	0.0000	0.0000	3.987	0.4090	3.987
10	.	0.2000	1.0000	0.0000	0.0000	5.977	0.5111	5.977
11+	.	0.2000	1.0000	0.0000	0.0000	5.077	0.5111	5.077
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : PRE1
Date and time: 01SEP93:12:06

Table 5.14

Saithe in the North-East Arctic (Fishing Areas I and II)
 Saithe in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.9617	0.4056	636670	66841	138000	0.0000	0.0000	663206	123954	0	849841	271906
.	0.0500	0.0211	.	123954	9539	838197	265457
.	0.1000	0.0422	.	123954	18878	826798	259167
.	0.1500	0.0633	.	123954	28024	815639	253032
.	0.2000	0.0843	.	123954	36979	804714	247049
.	0.2500	0.1054	.	123954	45749	794017	241212
.	0.3000	0.1265	.	123954	54337	783545	235519
.	0.3500	0.1476	.	123954	62749	773290	229966
.	0.4000	0.1687	.	123954	70987	763250	224549
.	0.4500	0.1898	.	123954	79055	753418	219265
.	0.5000	0.2109	.	123954	86959	743790	214110
.	0.5500	0.2319	.	123954	94700	734362	209081
.	0.6000	0.2530	.	123954	102283	725129	204175
.	0.6500	0.2741	.	123954	109712	716087	199389
.	0.7000	0.2952	.	123954	116990	707231	194720
.	0.7500	0.3163	.	123954	124119	698558	190164
.	0.8000	0.3374	.	123954	131105	690063	185719
.	0.8500	0.3585	.	123954	137949	681741	181382
.	0.9000	0.3796	.	123954	144655	673591	177151
.	0.9500	0.4006	.	123954	151226	665607	173022
.	1.0000	0.4217	.	123954	157665	657785	168993
.	1.0500	0.4428	.	123954	163975	650123	165062
.	1.1000	0.4639	.	123954	170159	642617	161226
.	1.1500	0.4850	.	123954	176220	635263	157483
.	1.2000	0.5061	.	123954	182159	628058	153830
.	1.2500	0.5272	.	123954	187981	620999	150265
.	1.3000	0.5482	.	123954	193687	614082	146786
.	1.3500	0.5693	.	123954	199280	607305	143391
.	1.4000	0.5904	.	123954	204763	600664	140077
.	1.4500	0.6115	.	123954	210138	594156	136843
.	1.5000	0.6326	.	123954	215407	587779	133687
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : PRE1
 Date and time : 01SEP93:12:06
 Computation of ref. F: Simple mean, age 3 - 6
 Basis for 1993 : TAC constraints

Table 5.15

Saithe in the North-East Arctic (Fishing Areas I and II)
 Saithe in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 0.9617 Reference F: 0.4056						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	178	50	255500	71540	0	0	0	0
2	0.0414	7686	3561	209183	96921	0	0	0	0
3	0.3144	39056	28381	158910	115475	0	0	0	0
4	0.3586	40409	45527	147066	165694	0	0	0	0
5	0.3824	20294	34838	70019	120199	0	0	0	0
6	0.5669	4539	9894	11464	24992	11464	24992	11464	24992
7	0.6298	2446	6458	5716	15090	5716	15090	5716	15090
8	0.5562	1027	3459	2633	8864	2633	8864	2633	8864
9	0.3933	657	2617	2213	8822	2213	8822	2213	8822
10	0.4915	422	2524	1190	7112	1190	7112	1190	7112
11+	0.4915	137	695	386	1960	386	1960	386	1960
Total		116850	138003	864280	636670	23602	66841	23602	66841
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 0.3280 Reference F: 0.1383						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0003	61	17	255500	71540	0	0	0	0
2	0.0141	2654	1230	209025	96848	0	0	0	0
3	0.1072	15170	11024	164327	119411	0	0	0	0
4	0.1223	9934	11192	95008	107042	0	0	0	0
5	0.1304	9342	16038	84122	144409	0	0	0	0
6	0.1934	6252	13630	39111	85261	39111	85261	39111	85261
7	0.2148	936	2471	5324	14056	5324	14056	5324	14056
8	0.1897	392	1318	2493	8393	2493	8393	2493	8393
9	0.1342	141	562	1236	4928	1236	4928	1236	4928
10	0.1676	172	1025	1223	7307	1223	7307	1223	7307
11+	0.1676	111	562	789	4007	789	4007	789	4007
Total		45164	59069	858157	663202	50176	123952	50176	123952
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 0.3280 Reference F: 0.1383						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0003	61	17	255500	71540	0	0	0	0
2	0.0141	2655	1230	209131	96897	0	0	0	0
3	0.1072	15577	11320	168738	122617	0	0	0	0
4	0.1223	12637	14237	120860	136169	0	0	0	0
5	0.1304	7644	13122	68831	118159	0	0	0	0
6	0.1934	9664	21067	60452	131786	60452	131786	60452	131786
7	0.2148	4640	12250	26391	69673	26391	69673	26391	69673
8	0.1897	552	1860	3517	11839	3517	11839	3517	11839
9	0.1342	193	768	1688	6731	1688	6731	1688	6731
10	0.1676	124	742	885	5289	885	5289	885	5289
11+	0.1676	195	992	1393	7072	1393	7072	1393	7072
Total		53943	77606	917386	777772	94326	232390	94326	232390
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SOP1
 Date and time : 01SEP93:12:13
 Computation of ref. F: Simple mean, age 3 - 6
 Prediction basis : F factors

Continued

Table 5.15 Continued

Saithe in the North-East Arctic (Fishing Areas I and II)
 Saithe in the North-East Arctic (Fishing Areas I and II)
 Single option prediction: Detailed tables

Year: 1993 F-factor: 0.9617 Reference F: 0.4056						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	178	50	255500	71540	0	0	0	0
2	0.0414	7686	3561	209183	96921	0	0	0	0
3	0.3144	39056	28381	158910	115475	0	0	0	0
4	0.3586	40409	45527	147066	165694	0	0	0	0
5	0.3824	20294	34838	70019	120199	0	0	0	0
6	0.5669	4539	9894	11464	24992	11464	24992	11464	24992
7	0.6298	2446	6458	5716	15090	5716	15090	5716	15090
8	0.5562	1027	3459	2633	8864	2633	8864	2633	8864
9	0.3933	657	2617	2213	8822	2213	8822	2213	8822
10	0.4915	422	2524	1190	7112	1190	7112	1190	7112
11+	0.4915	137	695	386	1960	386	1960	386	1960
Total		116850	138003	864280	636670	23602	66841	23602	66841
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 0.4742 Reference F: 0.2000						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0004	88	25	255500	71540	0	0	0	0
2	0.0204	3825	1772	209025	96848	0	0	0	0
3	0.1550	21442	15581	164327	119411	0	0	0	0
4	0.1768	13998	15771	95008	107042	0	0	0	0
5	0.1885	13142	22561	84122	144409	0	0	0	0
6	0.2795	8685	18933	39111	85261	39111	85261	39111	85261
7	0.3106	1295	3419	5324	14056	5324	14056	5324	14056
8	0.2742	544	1833	2493	8393	2493	8393	2493	8393
9	0.1939	198	790	1236	4928	1236	4928	1236	4928
10	0.2424	239	1431	1223	7307	1223	7307	1223	7307
11+	0.2424	155	785	789	4007	789	4007	789	4007
Total		63612	82900	858157	663202	50176	123952	50176	123952
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 0.4742 Reference F: 0.2000						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0004	88	25	255500	71540	0	0	0	0
2	0.0204	3827	1773	209106	96886	0	0	0	0
3	0.1550	21880	15899	167681	121848	0	0	0	0
4	0.1768	16975	19126	115220	129814	0	0	0	0
5	0.1885	10183	17481	65178	111890	0	0	0	0
6	0.2795	12666	27612	57038	124343	57038	124343	57038	124343
7	0.3106	5889	15546	24212	63920	24212	63920	24212	63920
8	0.2742	698	2349	3195	10758	3195	10758	3195	10758
9	0.1939	249	992	1551	6185	1551	6185	1551	6185
10	0.2424	163	976	834	4982	834	4982	834	4982
11+	0.2424	253	1285	1293	6563	1293	6563	1293	6563
Total		72870	103063	900809	748729	88124	216752	88124	216752
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SOP1
 Date and time : 01SEP93:12:13
 Computation of ref. F: Simple mean, age 3 - 6
 Prediction basis : F factors

Continued

Table 5.15 Continued

Saithe in the North-East Arctic (Fishing Areas I and II)
Saithe in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 0.9617 Reference F: 0.4056						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	178	50	255500	71540	0	0	0	0
2	0.0414	7686	3561	209183	96921	0	0	0	0
3	0.3144	39056	28381	158910	115475	0	0	0	0
4	0.3586	40409	45527	147066	165694	0	0	0	0
5	0.3824	20294	34838	70019	120199	0	0	0	0
6	0.5669	4539	9894	11464	24992	11464	24992	11464	24992
7	0.6298	2446	6458	5716	15090	5716	15090	5716	15090
8	0.5562	1027	3459	2633	8864	2633	8864	2633	8864
9	0.3933	657	2617	2213	8822	2213	8822	2213	8822
10	0.4915	422	2524	1190	7112	1190	7112	1190	7112
11+	0.4915	137	695	386	1960	386	1960	386	1960
Total		116850	138003	864280	636670	23602	66841	23602	66841
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 0.6240 Reference F: 0.2632						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0005	116	32	255500	71540	0	0	0	0
2	0.0268	5018	2325	209025	96848	0	0	0	0
3	0.2040	27576	20039	164327	119411	0	0	0	0
4	0.2327	17946	20219	95008	107042	0	0	0	0
5	0.2481	16821	28877	84122	144409	0	0	0	0
6	0.3678	10977	23929	39111	85261	39111	85261	39111	85261
7	0.4087	1630	4303	5324	14056	5324	14056	5324	14056
8	0.3609	689	2318	2493	8393	2493	8393	2493	8393
9	0.2552	253	1010	1236	4928	1236	4928	1236	4928
10	0.3189	304	1818	1223	7307	1223	7307	1223	7307
11+	0.3189	196	997	789	4007	789	4007	789	4007
Total		81526	105867	858157	663202	50176	123952	50176	123952
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 0.6240 Reference F: 0.2632						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0005	116	32	255500	71540	0	0	0	0
2	0.0268	5019	2326	209081	96874	0	0	0	0
3	0.2040	27958	20316	166604	121066	0	0	0	0
4	0.2327	20723	23348	109713	123610	0	0	0	0
5	0.2481	12325	21158	61637	105811	0	0	0	0
6	0.3678	15083	32880	53740	117154	53740	117154	53740	117154
7	0.4087	6785	17913	22166	58517	22166	58517	22166	58517
8	0.3609	800	2694	2897	9753	2897	9753	2897	9753
9	0.2552	292	1163	1423	5672	1423	5672	1423	5672
10	0.3189	195	1166	784	4686	784	4686	784	4686
11+	0.3189	298	1512	1197	6079	1197	6079	1197	6079
Total		89595	124509	884743	720762	82207	201861	82207	201861
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SOP1
Date and time : 01SEP93:12:13
Computation of ref. F: Simple mean, age 3 - 6
Prediction basis : F factors

Continued

Table 5.15 Continued

Saithe in the North-East Arctic (Fishing Areas I and II)
Saithe in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 0.9617 Reference F: 0.4056						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	178	50	255500	71540	0	0	0	0
2	0.0414	7686	3561	209183	96921	0	0	0	0
3	0.3144	39056	28381	158910	115475	0	0	0	0
4	0.3586	40409	45527	147066	165694	0	0	0	0
5	0.3824	20294	34838	70019	120199	0	0	0	0
6	0.5669	4539	9894	11464	24992	11464	24992	11464	24992
7	0.6298	2446	6458	5716	15090	5716	15090	5716	15090
8	0.5562	1027	3459	2633	8864	2633	8864	2633	8864
9	0.3933	657	2617	2213	8822	2213	8822	2213	8822
10	0.4915	422	2524	1190	7112	1190	7112	1190	7112
11+	0.4915	137	695	386	1960	386	1960	386	1960
Total		116850	138003	864280	636670	23602	66841	23602	66841
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 0.8062 Reference F: 0.3400						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0006	149	42	255500	71540	0	0	0	0
2	0.0347	6459	2993	209025	96848	0	0	0	0
3	0.2635	34657	25184	164327	119411	0	0	0	0
4	0.3006	22470	25317	95008	107042	0	0	0	0
5	0.3205	21021	36086	84122	144409	0	0	0	0
6	0.4753	13515	29462	39111	85261	39111	85261	39111	85261
7	0.5280	1997	5272	5324	14056	5324	14056	5324	14056
8	0.4662	848	2857	2493	8393	2493	8393	2493	8393
9	0.3297	316	1261	1236	4928	1236	4928	1236	4928
10	0.4120	377	2252	1223	7307	1223	7307	1223	7307
11+	0.4120	243	1235	789	4007	789	4007	789	4007
Total		102053	131960	858157	663202	50176	123952	50176	123952
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 0.8062 Reference F: 0.3400						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0006	149	42	255500	71540	0	0	0	0
2	0.0347	6460	2993	209051	96860	0	0	0	0
3	0.2635	34863	25334	165304	120121	0	0	0	0
4	0.3006	24448	27545	103369	116463	0	0	0	0
5	0.3205	14391	24704	57589	98861	0	0	0	0
6	0.4753	17272	37654	49985	108967	49985	108967	49985	108967
7	0.5280	7467	19712	19908	52558	19908	52558	19908	52558
8	0.4662	875	2946	2571	8656	2571	8656	2571	8656
9	0.3297	328	1307	1280	5105	1280	5105	1280	5105
10	0.4120	224	1340	728	4350	728	4350	728	4350
11+	0.4120	336	1707	1091	5538	1091	5538	1091	5538
Total		106813	145283	866376	689018	75563	185174	75563	185174
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SOP1
Date and time : 01SEP93:12:13
Computation of ref. F: Simple mean, age 3 - 6
Prediction basis : F factors

Continued

Table 5.15 Continued

Saithe in the North-East Arctic (Fishing Areas I and II)
 Saithe in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 0.9617 Reference F: 0.4056						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	178	50	255500	71540	0	0	0	0
2	0.0414	7686	3561	209183	96921	0	0	0	0
3	0.3144	39056	28381	158910	115475	0	0	0	0
4	0.3586	40409	45527	147066	165694	0	0	0	0
5	0.3824	20294	34838	70019	120199	0	0	0	0
6	0.5669	4539	9894	11464	24992	11464	24992	11464	24992
7	0.6298	2446	6458	5716	15090	5716	15090	5716	15090
8	0.5562	1027	3459	2633	8864	2633	8864	2633	8864
9	0.3933	657	2617	2213	8822	2213	8822	2213	8822
10	0.4915	422	2524	1190	7112	1190	7112	1190	7112
11+	0.4915	137	695	386	1960	386	1960	386	1960
Total		116850	138003	864280	636670	23602	66841	23602	66841
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 1.1856 Reference F: 0.5000						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0009	220	61	255500	71540	0	0	0	0
2	0.0510	9424	4367	209025	96848	0	0	0	0
3	0.3876	48162	34997	164327	119411	0	0	0	0
4	0.4421	30995	34921	95008	107042	0	0	0	0
5	0.4714	28882	49581	84122	144409	0	0	0	0
6	0.6989	18032	39310	39111	85261	39111	85261	39111	85261
7	0.7764	2639	6967	5324	14056	5324	14056	5324	14056
8	0.6856	1134	3818	2493	8393	2493	8393	2493	8393
9	0.4849	434	1730	1236	4928	1236	4928	1236	4928
10	0.6060	509	3040	1223	7307	1223	7307	1223	7307
11+	0.6060	328	1667	789	4007	789	4007	789	4007
Total		140759	180459	858157	663202	50176	123952	50176	123952
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 1.1856 Reference F: 0.5000						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0009	220	61	255500	71540	0	0	0	0
2	0.0510	9423	4366	208987	96831	0	0	0	0
3	0.3876	47664	34636	162629	118177	0	0	0	0
4	0.4421	29789	33563	91312	102878	0	0	0	0
5	0.4714	17164	29465	49991	85818	0	0	0	0
6	0.6989	19819	43205	42986	93709	42986	93709	42986	93709
7	0.7764	7890	20831	15919	42025	15919	42025	15919	42025
8	0.6856	912	3071	2005	6751	2005	6751	2005	6751
9	0.4849	361	1439	1028	4099	1028	4099	1028	4099
10	0.6060	259	1549	623	3724	623	3724	623	3724
11+	0.6060	374	1898	899	4562	899	4562	899	4562
Total		133875	174083	831880	630116	63460	154871	63460	154871
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SOP1
 Date and time : 01SEP93:12:13
 Computation of ref. F: Simple mean, age 3 - 6
 Prediction basis : F factors

Table 5.15 Continued

Saithe in the North-East Arctic (Fishing Areas I and II)
Saithe in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1993 F-factor: 0.9617 Reference F: 0.4056						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	178	50	255500	71540	0	0	0	0
2	0.0414	7686	3561	209183	96921	0	0	0	0
3	0.3144	39056	28381	158910	115475	0	0	0	0
4	0.3586	40409	45527	147066	165694	0	0	0	0
5	0.3824	20294	34838	70019	120199	0	0	0	0
6	0.5669	4539	9894	11464	24992	11464	24992	11464	24992
7	0.6298	2446	6458	5716	15090	5716	15090	5716	15090
8	0.5562	1027	3459	2633	8864	2633	8864	2633	8864
9	0.3933	657	2617	2213	8822	2213	8822	2213	8822
10	0.4915	422	2524	1190	7112	1190	7112	1190	7112
11+	0.4915	137	695	386	1960	386	1960	386	1960
Total		116850	138003	864280	636670	23602	66841	23602	66841
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1994 F-factor: 1.0000 Reference F: 0.4217						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	185	52	255500	71540	0	0	0	0
2	0.0430	7979	3697	209025	96848	0	0	0	0
3	0.3269	41756	30343	164327	119411	0	0	0	0
4	0.3729	26969	30385	95008	107042	0	0	0	0
5	0.3976	25179	43223	84122	144409	0	0	0	0
6	0.5895	15943	34755	39111	85261	39111	85261	39111	85261
7	0.6549	2344	6188	5324	14056	5324	14056	5324	14056
8	0.5783	1002	3373	2493	8393	2493	8393	2493	8393
9	0.4090	379	1510	1236	4928	1236	4928	1236	4928
10	0.5111	447	2673	1223	7307	1223	7307	1223	7307
11+	0.5111	289	1466	789	4007	789	4007	789	4007
Total		122472	157664	858157	663202	50176	123952	50176	123952
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1995 F-factor: 1.0000 Reference F: 0.4217						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1	0.0008	185	52	255500	71540	0	0	0	0
2	0.0430	7979	3697	209018	96845	0	0	0	0
3	0.3269	41656	30270	163932	119124	0	0	0	0
4	0.3729	27542	31030	97024	109313	0	0	0	0
5	0.3976	16035	27527	53574	91968	0	0	0	0
6	0.5895	18864	41124	46278	100886	46278	100886	46278	100886
7	0.6549	7818	20640	17759	46884	17759	46884	17759	46884
8	0.5783	910	3064	2265	7624	2265	7624	2265	7624
9	0.4090	351	1398	1145	4564	1145	4564	1145	4564
10	0.5111	246	1470	672	4018	672	4018	672	4018
11+	0.5111	361	1835	988	5016	988	5016	988	5016
Total		121947	162106	848155	657782	69107	168992	69107	168992
Unit -		Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : SOP1
Date and time : 01SEP93:12:13
Computation of ref. F: Simple mean, age 3 - 6
Prediction basis : F factors

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

Country	1983	1984	1985	1986	1987
Denmark	-	-	-	-	+
Faroe Islands	-	-	-	29	450 ³
France	798	2,970	3,326	2,719	1,611
German Dem. Rep.	3,394	4,168	3,260	1,323	417
Germany, Fed. Rep.	3,395	3,289	3,306	3,561	5,412
Norway	11,083	18,650	20,456	23,255	18,051
Portugal	-	1,806	2,056	1,591	1,175
Spain	222	25	38	-	25
UK (England & Wales)	182	716	167	129	230
UK (Scotland)	-	-	-	14	9
USSR	105,459	69,689	59,943	20,694	7,215
Total	124,533	101,313	92,552	53,315	34,595

Country	1988	1989	1990	1991 ¹	1992 ¹
Denmark	-	-	37 ³	23	614
Faroe Islands	973	338	386	644	240
France	3,369	1,877 ¹	1,826 ¹	804	369 ³
German Dem. Rep.	994	1,978	5,351	-	-
Germany, Fed. Rep.	1,361	2,267	1,390	1,053	632 ²
Norway	24,662	25,295	34,090	44,228 ²	25,224 ²
Portugal	500	340	830	166	977
Spain	26	5 ²	-	1 ²	16 ²
UK (England & Wales)	468	259	332	285	479 ²
UK (Scotland)	2	13	1	64	3
USSR/Russia ⁴	9,139	14,344	18,918	15,354	4,335
Total	41,494	46,716	63,161	62,622	32,889

¹Provisional figures.

²Working Group figure.

³As reported to Norwegian authorities.

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

Country	1983	1984	1985	1986	1987
Faroe Islands	-	-	-	-	-
Germany, Fed. Rep.	-	1	143	50	10
Norway	580	1,472	2,378	4,260	2,331
UK (England & Wales)	48	22	43	32	14
UK (Scotland)	-	-	-	3	-
USSR	4,023	532	368	1,066	769
Total	4,651	2,027	2,932	5,411	3,124

Country	1988	1989	1990	1991 ¹	1992 ¹
Faroe Islands	1	13	7	-	-
Germany, Fed. Rep.	6	+	-	-	-
Norway	2,232	1,823 ²	1,263 ²	1,789 ²	2,605 ²
UK (England & Wales)	20	12	+	-	-
UK (Scotland)	-	2	-	-	-
USSR/Russia ³	199	594	114	512	582
Total	2,458	2,444	1,384	2,301	3,187

¹Provisional figures.

²Working Group figure.

³In 1991.

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

Country	1983	1984	1985	1986	1987
Faroe Islands	-	-	-	29	450 ²
France	798	2,970	3,326	2,719	1,611
German Dem. Rep.	2,500	2,570	2,800	1,252	375
Germany, Fed. Rep.	3,395	3,288	2,972	3,319	3,562
Norway	10,500	17,111	18,062	18,693	15,409
Portugal	-	1,134	1,327	1,273	1,156
Spain	-	-	-	-	-
UK (England & Wales)	134	672	120	94	205
UK (Scotland)	-	-	-	11	8
USSR	82,836	63,342	59,047	19,099	4,953
Total	100,163	91,087	87,654	46,489	27,729

Country	1988	1989	1990	1991 ¹	1992 ¹
Denmark	-	-	-	-	614 ⁵
Faroe Islands	970	315	371	639	228
France	3,349	1,849 ¹	1,821 ¹	791	364 ³
German Dem. Rep.	879	1,468	722	-	-
Germany, Fed. Rep.	1,320	2,144	1,338	735 ²	205 ²
Norway	22,288	23,406 ²	31,286 ²	41,708 ²	22,243 ²
Portugal	467	251	824	159	824
Spain	26	-	-	-	-
UK (England & Wales)	412	240	269	247	234 ²
UK (Scotland)	2	9	1	51	1
USSR/Russia ⁴	7,598	10,661	6,884	8,130	1,500
Total	37,311	40,343	43,516	52,460	26,213

¹Provisional figures.

²Working Group figure.

³As reported to Norwegian authorities.

⁴In 1991.

⁵Includes Division IIb.

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

Country	1983	1984	1985	1986	1987
Denmark	-	-	-	-	+
Faroe Islands	-	-	-	-	-
France	-	-	-	-	-
German Dem. Rep.	894	1,598	460	71	42
Germany, Fed. Rep.	-	-	190	192	1,840
Norway	3	67	16	302	311
Portugal	-	672	729	318	19
Spain	222	25	38	-	25 ²
UK (England & Wales)	-	22	4	3	11
UK (Scotland)	-	-	-	+	1
USSR	18,600	5,815	528	529	1,493
Total	19,719	8,199	1,965	1,415	3,742

Country	1988	1989	1990	1991 ¹	1992 ¹
Denmark	-	-	37 ³	23	5
Faroe Islands	2	10	8	5 ³	12 ³
France	20 ³	28 ³	5 ³	13 ³	5 ³
German Dem. Rep.	115	510	4,629	-	-
Germany, Fed. Rep.	35	123	52	318 ²	427 ²
Norway	142	66 ²	1,541 ²	731 ²	376 ²
Portugal	33	89	6	7	153
Spain	26 ²	5 ²	-	1 ²	16 ²
UK (England & Wales)	36	7	63	38	245 ²
UK (Scotland)	-	2	-	13	2
USSR/Russia ⁴	1,342	3,089	11,920	6,712	2,253
Total	1,751	3,929	18,261	7,861	3,489

¹Provisional figures.

²Working Group figure.

³As reported to Norwegian authorities.

⁴In 1991.

⁵Included in Division IIa.

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

Species	1982	1983	1984	1985	1986
<i>S. marinus</i>	16,366	19,260	28,379	29,484	30,203
<i>S. mentella</i>	115,383	105,273	72,934	63,068	23,112
Total	131,749	124,533	101,313	92,552	53,315

Species	1987	1988	1989	1990	1991 ¹	1992 ¹
<i>S. marinus</i>	24,077	25,908	23,222	28,091	17,443	16,694
<i>S. mentella</i>	10,518	15,586	23,494	35,070	45,179	16,195
Total	34,595	41,494	46,716	63,161	62,622	32,889

¹Provisional figures.

Table 6.6 REDFISH in sub-area IV (North Sea). Nominal catch (t) by countries as officially reported to ICES. Not included in the assessment.

Country	1985	1986	1987	1988	1989	1990	1991 ¹	1992 ¹
Belgium	-	-	-	-	1	+	5	4
Denmark	6	24	16	32	23	41	29	22
Faroe Islands	24	-	3	90	13	25	144	35
France	690	578	833	915	554 ¹	554 ¹	914	n/a
Germany, Fed.Rep.	162	183	70	188	111	47	213	170
Netherlands	-	-	-	-	-	-	2	1
Norway	1,204 ²	1,048	411	696	500 ²	483 ²	415 ²	278 ²
UK (England & Wales)	8	35	16	125	134	369	43	65
UK (Scotland)	+	1	55	9	6	6	38	121
Total	2,094	1,869	1,404	2,055	1,342	1,525	1,803	696

¹Provisional figures.

²Working Group figure.

n/a = not available.

Table 6.7 *Sebastes mentella* in Divisions IIa and IIb. Catch per unit effort and calculated total international effort.

Year	USSR/Russia		German Dem.Rep.		Total effort	
	catch/hour trawling (t/hr)		catch/day (t/day)		(USSR units)	
	RT ¹	PST ²	Freezer trawler	Factory trawler FVS IV (FAO code 090)	RT ¹	PST ²
1965	0.38	-	-	-	41,216	-
1966	0.39	-	-	-	26,008	-
1967	0.37	-	-	-	16,862	-
1968	0.45	-	-	-	12,029	-
1969	0.48	-	-	-	14,242	-
1970	0.46	-	-	-	49,817	-
1971	0.38	-	-	-	118,587	-
1972	0.38	-	-	-	75,953	-
1973	0.45	-	-	-	85,289	-
1974	0.69	-	-	-	100,539	-
1975	0.95	1.01	-	-	251,653	236,703
1976	0.99	1.26	-	-	271,653	213,442
1977	0.77	1.00	-	-	190,084	146,365
1978	0.63	0.86	-	-	147,002	107,688
1979	0.56	0.93	-	-	155,616	93,704
1980	0.70	0.91	-	-	113,363	87,202
1981	0.63	0.95	8.71	-	129,438	85,338
1982	0.63	1.05	9.58	-	183,148	109,889
1983	0.80	1.09	17.12	-	131,591	96,581
1984	0.70	1.30	13.62	-	104,191	56,103
1985	0.60	1.00	9.89	-	105,113	63,068
1986	0.43	0.68	7.90	-	53,749	33,988
1987	-	0.70	-	7.30	-	15,026
1988	-	0.70	-	11.78	-	22,266
1989	-	0.90	-	12.96	-	26,104
1990	-	1.00	-	14.77	-	35,070
1991	-	0.80	-	-	-	56,474
1992 ³	-	0.60	-	-	-	26,992
1993 ³	-	0.98	-	-	-	-

¹ Side trawlers, 800-1000 HP.

² Stern trawlers. For 1975-1979, the PST data have been included from RT data.

³ Provisional figure.

Table 6.8 *Sebastes mentella*. Catch per trawl-hour for one Norwegian factory trawler (ISSCFV-code 09, 1000-2000 GRT) in a directed fishery for this species. Preliminary results.

Year	January-April	October-December
1989	-	1.19
1990	1.36	0.83
1991	1.28	0.74
1992	1.29	0.81
1993	0.57	-

Table 6.9 *Sebastes marinus*. Catch and catch per unit effort for Norwegian stern trawlers (ISSCFV - Code 07, 250-499,9 GRT), and total international effort (Norwegian trawl units).¹

Year	Catch (t)	% of total international catch	CPUE (t/hour)	Effort hours trawling
1981	1,315	6.3	0.29	71,814
1982	2,014	12.3	0.34	48,135
1983	1,590	8.3	0.42	45,857
1984	3,963	14.0	0.39	72,767
1985	3,080	10.5	0.31	95,110
1986	4,500	14.9	0.41	73,666
1987	2,168	9.0	0.33	72,960
1988	4,349	16.8	0.53	48,883
1989	3,044	13.1	0.23	100,965
1990 ²	3,826	13.6	0.58	48,433
1991 ²	10,693	61.3	0.70	24,919
1992 ²	3,815	22.9	0.40	41,735

¹ Only including trips with more than 50% *S. marinus* in the catches, and put into a GLIM-analysis.

² Provisional figures.

Table 6.10 REDFISH in Sub-areas I and II. Year-class strength.

Year class	International 0-group survey abundance indices	Russian Young fish surveys ¹
1961	-	poor
1962	-	poor
1963	-	strong
1964	-	strong
1965	159	strong
1966	236	strong
1967	44	average
1968	21	average
1969	295	very strong
1970	247	strong
1971	172	strong
1972	177	average
1973	385	below average
1974	468	poor
1975	315	poor
1976	447	poor
1977	472	poor
1978	460	poor
1979	980	poor
1980	651	poor
1981	861	close to poor
1982	694	strong
1983	851	average
1984	732	poor
1985	795	poor
1986	702	poor
1987	631	poor
1988	949	average
1989	698	average
1990	670	poor
1991	200	poor
1992	150	-

¹ On the basis of the abundance of age groups 1+ to 6+.

Table 6.11 *Sebastes mentella*. Average catch (no. of specimens) of different year classes per hour trawling in the USSR survey in the Barents and Norwegian Sea (1976-1983 published in "Annales Biologiques"). These data are used as the only input in the recruitment program RCT3.

Year class	0	1	2	3	4	5	6	7	8	9	10	11
1965	-	-	-	-	-	-	-	-	-	-	-	0.4
1966	-	-	-	-	-	-	-	-	-	-	3.0	-
1967	-	-	-	-	-	-	-	-	-	11.7	-	0.3
1968	-	-	-	-	-	-	-	-	16.2	-	1.5	0.3
1969	-	-	-	-	-	-	-	43.4	-	8.7	12.2	3.1
1970	-	-	-	-	-	-	85.8	-	19.8	34.9	11.9	-
1971	-	-	-	-	-	22.7	-	19.5	51.9	18.0	5.7	-
1972	-	-	-	-	9.4	-	6.7	57.6	12.3	6.7	-	-
1973	-	-	-	0.6	-	4.3	37.3	8.6	5.6	-	-	-
1974	-	-	4.8	-	4.9	22.8	4.8	4.8	-	-	-	3.0
1975	-	7.4	-	1.7	6.4	2.4	3.5	5.0	-	-	4.0	-
1976	7.0	-	8.1	1.2	2.5	6.8	4.9	5.0	1.0	13.0	-	-
1977	-	0.2	0.2	0.2	0.9	5.1	3.7	1.0	19.0	2.0	-	-
1978	0.8	0.02	0.9	1.0	5.0	3.8	2.0	20.0	6.0	-	-	-
1979	-	1.9	1.4	3.6	2.3	9.0	11.0	16.0	1.0	-	-	0.1
1980	0.3	0.4	2.0	2.5	16.0	6.0	11.0	25.0	2.0	-	1.5	2.0
1981	-	2.2	3.9	20.0	6.0	12.0	47.0	18.0	6.3	1.6	0.5	1.0
1982	19.8	13.2	13.0	15.0	34.0	44.0	39.0	32.6	4.3	3.1	4.9	-
1983	12.5	3.0	5.0	6.0	31.0	34.0	32.3	13.3	4.0	4.2	-	-
1984	-	10.0	2.0	-	5.0	18.3	19.0	2.2	2.4	-	-	-
1985	107.0	7.0	-	1.0	5.2	16.2	1.7	1.7	-	-	-	-
1986	2.0	-	1.0	1.8	8.4	3.6	2.1	-	-	-	-	-
1987	-	3.0	37.9	1.3	8.0	4.1	-	-	-	-	-	-
1988	4.0	58.1	4.3	13.3	25.8	-	-	-	-	-	-	-
1989	8.7	9.0	17.0	23.4	-	-	-	-	-	-	-	-
1990	2.5	6.3	6.1	-	-	-	-	-	-	-	-	-
1991	0.3	1.0	-	-	-	-	-	-	-	-	-	-
1992	0.6	-	-	-	-	-	-	-	-	-	-	-

Table 6.12 Recruitment at age 6. Results from the analysis using RCT3.

Year Class	Weighted Average Prediction	Log WAP	Int. Std Error	Ext. Std Error	Var Ratio	VPA	Log VPA
1970	No valid	surveys					
1971	No valid	surveys					
1972	No valid	surveys					
1973	No valid	surveys					
1974	425	6.05	.34	.15	.18	185	5.22
1975	290	5.67	.41	.24	.33	106	4.67
1976	196	5.28	.46	.24	.28	86	4.47
1977	116	4.76	.48	.44	.84	94	4.54
1978	182	5.21	.41	.28	.47	75	4.33
1979	169	5.13	.44	.28	.42	69	4.23
1980	180	5.20	.48	.36	.58	81	4.39
1981	191 ¹	5.25	.52	.54	1.05		
1982	285 ¹	5.66	.56	.72	1.65		
1983	201 ¹	5.31	.53	.59	1.23		
1984	185 ¹	5.22	.51	.35	.47		
1985	98 ¹	4.59	.51	.39	.59		
1986	82 ¹	4.42	.50	.25	.26		
1987	118 ¹	4.77	.54	.32	.35		
1988	101 ¹	4.62	.56	.49	.76		
1989	96	4.57	.53	.46	.75		
1990	94	4.55	.46	.16	.13		

¹Adopted in the assessment

Table 6.13 *Sebastes mentella*. Maturity ogives from the USSR. Samples from research vessels. Sexes combined.

Age	1986	1987	1988	1989	1990	1991	1992	1993
7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.000	0.000	0.000	0.046	0.000	0.000
9	0.006	0.083	0.000	0.000	0.012	0.139	0.013	0.033
10	0.017	0.182	0.028	0.074	0.131	0.174	0.092	0.133
11	0.132	0.278	0.125	0.178	0.300	0.138	0.169	0.364
12	0.377	0.616	0.297	0.473	0.688	0.358	0.396	0.480
13	0.822	0.821	0.562	0.684	0.714	0.470	0.452	0.696
14	0.795	0.926	0.760	0.716	0.824	0.637	0.761	0.925
15	0.862	0.938	0.855	0.794	0.848	0.762	0.939	0.962
16	0.875	1.000	1.000	1.000	1.000	1.000	0.886	0.953
17	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.977
18	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 6.14 CPUE data for tuning.

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

SEBASTES MENTELLA : EFFORT AND CATCH DATA, USSR PST-TRAWLERS (code: FLT04)

Year	Effort	Catch, age 9	Catch, age 10	Catch, age 11	Catch, age 12	Catch, age 13	Catch, age 14	Catch, age 15	Catch, age 16	Catch, age 17	Catch, age 18
1982	107438	12274	46292	55860	45491	36890	15160	9280	5651	3293	2112
1983	93578	4434	16176	30337	49510	46805	29041	16599	8087	5075	1991
1984	51171	1823	7253	20429	34813	43613	23884	11197	3898	1383	418
1985	56802	3699	14997	28079	37598	30822	9769	3967	1826	617	318
1986	26976	587	2315	4522	8434	13164	5747	2010	522	309	52
1987	9093	637	1898	1618	2161	3751	2235	880	396	126	40
1988	11241	191	928	1773	2062	3513	3692	2031	990	496	166
1989	14533	2827	3274	2899	2891	5310	4882	2041	1250	730	320
1990	17355	4590	5031	4261	6224	8590	5580	1910	811	165	17
1991	17878	3998	4055	3694	3653	4949	4612	2030	724	178	150
1992	5962	983	850	654	596	614	572	488	306	194	80

Table 6.15

VPA Version 3.1 (MSDOS)

2-Sep-93 12:01

Extended Survivors Analysis

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU

CPUE data from file /users/ifad/ifapwork/wg_108/sebm_nor/FLEET.JU2

Data for 1 fleets over 28 years
Age range from 6 to 18

Fleet, Alpha, Beta
FLT04: SEBASTES MENT , .000 , 1.000

Time series weights :

Tapered time weighting applied
Power = 3 over 20 years

Catchability analysis :

Catchability independent of stock size for all ages

Catchability independent of age for ages >= 15

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 2 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = 1.500

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning converged after 41 iterations

Total absolute residual between iterations
40 and 41 = .000

Regression weights

, .670, .751, .820, .877, .921, .954, .976, .990, .997, 1.000, 1.000

Fishing mortalities

Age,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992
6,	.000,	.000,	.000,	.002,	.000,	.000,	.000,	.001,	.000,	.048,	.024
7,	.010,	.001,	.000,	.009,	.002,	.000,	.000,	.006,	.010,	.180,	.095
8,	.035,	.025,	.008,	.028,	.004,	.002,	.000,	.033,	.060,	.113,	.086
9,	.073,	.038,	.030,	.086,	.017,	.020,	.008,	.073,	.139,	.113,	.030
10,	.275,	.118,	.078,	.320,	.064,	.057,	.040,	.110,	.168,	.205,	.039
11,	.341,	.263,	.202,	.436,	.156,	.065,	.075,	.113,	.193,	.147,	.055
12,	.403,	.513,	.496,	.626,	.229,	.119,	.120,	.121,	.305,	.254,	.070
13,	.546,	.841,	1.148,	1.022,	.460,	.181,	.318,	.280,	.437,	.548,	.100
14,	.475,	1.015,	1.463,	.757,	.540,	.163,	.298,	.448,	.477,	.742,	.232
15,	.589,	1.360,	1.509,	.944,	.352,	.179,	.238,	.264,	.395,	.413,	.404
16,	.624,	1.513,	1.660,	1.020,	.340,	.131,	.344,	.278,	.137,	.399,	.440
17,	.747,	2.028,	1.213,	1.253,	.491,	.143,	.263,	.809,	.166,	1.913,	.621
18,	.759,	1.381,	1.271,	.911,	.416,	.126,	.309,	.883,	.986,	1.902,	.697

Table 6.15 (Continued)

Log catchability residuals.

Fleet : FLT04: SEBASTES MENT

Age	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
9	-.64	-1.16	-.91	-.11	-1.30	.07	-1.25	1.05	1.46	1.16	.86
10	-.22	-.94	-.81	.46	-.57	.19	-.54	.59	.76	.67	-.02
11	-.38	-.51	-.21	.41	-.03	-.04	-.30	.15	.55	.31	-.19
12	-.61	-.24	.31	.39	-.01	.16	-.22	-.26	.64	.29	-.61
13	-.93	-.37	.50	.28	.11	-.05	.13	.14	.39	.27	-.74
14	-1.19	-.30	.63	-.14	.14	-.27	-.06	.56	.37	.30	-.40
15	-.81	.15	.82	.25	-.14	-.01	-.12	-.36	.13	.04	.00
16	-.75	.25	.87	.32	-.26	-.33	.25	-.50	-1.16	-.38	-.23
17	-.58	.54	.59	.53	.18	-.24	-.02	.34	-2.38	-1.74	.00
18	-.56	.16	.50	.20	-.20	-.36	.14	-.08	-2.62	-1.53	-.10

Mean catchability and Standard error.

Age	6	7	8	9	10	11	12	13	14	15	16	17	18
Mean q				-13.5840	-12.6797	-12.3081	-11.9104	-11.2868	-11.1682	-11.3290	-11.3290	-11.3290	-11.3290
S.E				1.0752	.6158	.3370	.4098	.4452	.4886	.3717	.5931	1.0491	1.0488

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean q
9	-10.15	-13.73	10.71	.00	11	-13.58
10	3.25	16.27	1.74	.09	11	-12.68
11	1.35	12.78	.42	.70	11	-12.31
12	1.10	12.02	.47	.65	11	-11.91
13	1.08	11.34	.51	.55	11	-11.29
14	1.47	11.69	.73	.26	11	-11.17
15	1.31	11.91	.50	.46	11	-11.33
16	1.88	13.86	.98	.28	11	-11.52
17	4.65	24.13	3.69	.06	11	-11.62
18	1.57	14.30	1.46	.35	11	-11.75

Continued

Table 6.15 (Continued)

YEAR ,	AGE																
	6,	7,	8,	9,	10,	11,	12,	13,	14,	15,	16,	17,					
1982 ,	8.63E+04	9.46E+04	1.47E+05	1.88E+05	2.07E+05	2.08E+05	1.48E+05	9.43E+04	4.31E+04	2.24E+04	1.31E+04	6.73E+03	4.27E+03	8.21E+03			
1983 ,	9.34E+04	7.81E+04	8.48E+04	1.29E+05	1.58E+05	1.42E+05	1.34E+05	8.93E+04	4.94E+04	2.42E+04	1.13E+04	6.34E+03	2.89E+03	9.34E+02			
1984 ,	7.52E+04	8.45E+04	7.48E+04	1.12E+05	1.27E+05	9.89E+04	9.89E+04	7.25E+04	3.48E+04	1.62E+04	5.63E+03	2.24E+03	7.55E+02	6.82E+02			
1985 ,	6.76E+04	6.80E+04	6.33E+04	6.57E+04	9.38E+04	9.38E+04	9.38E+04	5.45E+04	2.08E+04	7.30E+03	3.24E+03	9.68E+02	6.03E+02	9.07E+01			
1986 ,	7.98E+04	6.10E+04	6.73E+04	5.26E+04	4.32E+04	5.49E+04	5.49E+04	4.54E+04	1.78E+04	8.84E+03	2.57E+03	1.06E+03	2.50E+02	2.06E+02			
1987 ,	7.66E+04	7.22E+04	5.51E+04	5.99E+04	4.47E+04	3.34E+04	3.34E+04	3.95E+04	2.59E+04	9.37E+03	5.62E+03	1.65E+03	5.86E+02	0.00E+00			
1988 ,	8.94E+04	6.93E+04	4.98E+04	4.88E+04	5.12E+04	3.79E+04	3.79E+04	2.69E+04	2.98E+04	1.99E+04	7.09E+03	4.47E+03	1.30E+03	4.18E+02			
1989 ,	9.02E+04	8.09E+04	6.27E+04	4.47E+04	4.24E+04	4.30E+04	4.30E+04	3.04E+04	1.77E+04	2.00E+04	1.42E+04	4.55E+03	3.11E+03	3.95E+03			
1990 ,	3.57E+04	8.16E+04	5.49E+04	4.97E+04	3.62E+04	3.42E+04	3.42E+04	3.44E+04	2.08E+04	1.02E+04	1.39E+04	9.75E+03	1.83E+03	2.59E+04			
1991 ,	3.46E+04	3.23E+04	6.20E+04	4.32E+04	3.80E+04	2.70E+04	2.70E+04	2.28E+04	2.01E+04	1.17E+04	1.17E+04	6.23E+03	1.10E+04	7.47E+03			
1992 ,	8.65E+04	2.99E+04	2.44E+04	5.01E+04	3.19E+04	2.97E+04	2.97E+04	1.90E+04	1.20E+04	8.67E+03	6.98E+03	3.78E+03	1.47E+03	2.14E+04			

Population estimates for 1993

, 0.00E+00, 7.64E+04, 2.46E+04, 2.03E+04, 5.19E+04, 4.36E+04, 2.73E+04, 2.50E+04, 1.55E+04, 8.57E+03, 5.23E+03, 4.07E+03, 1.84E+03, 1.03E+04,

Taper weighted geometric mean of the VPA populations:

, 8.58E+04, 8.27E+04, 8.59E+04, 8.90E+04, 8.24E+04, 7.06E+04, 5.86E+04, 4.25E+04, 2.51E+04, 1.42E+04, 8.02E+03, 4.34E+03, 1.95E+03,

Standard error of the weighted Log(VPA populations) :

, .6410, .7303, .7502, .6847, .7024, .7013, .6246, .5113, .4128, .4538, .6082, .8885, 1.1499,

Table 6.16

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: AP

At 30-Aug-93 19:17

Table 1	Catch numbers at age Numbers*10** ⁻³							
YEAR,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE								
6,	48,	0,	0,	7,	31,	0,	0,	466,
7,	285,	0,	0,	0,	94,	0,	0,	792,
8,	1592,	27,	7,	15,	409,	33,	114,	5728,
9,	2163,	279,	15,	89,	524,	131,	284,	3586,
10,	1141,	532,	182,	192,	838,	620,	681,	2049,
11,	1545,	465,	285,	355,	933,	2122,	1590,	1770,
12,	1972,	731,	343,	436,	954,	3428,	4429,	3865,
13,	2471,	1223,	394,	554,	849,	3983,	4884,	4564,
14,	2804,	1927,	489,	864,	618,	3526,	5451,	4704,
15,	1996,	2007,	496,	768,	482,	2808,	4940,	4098,
16,	2067,	1741,	628,	931,	807,	3983,	7496,	4704,
17,	1592,	1422,	613,	694,	451,	2743,	4486,	3632,
18,	1473,	944,	540,	665,	849,	3559,	7382,	3167,
+gp,	2589,	1980,	3254,	1802,	2536,	5714,	14934,	3447,
TOTALNUM,	23738,	13278,	7246,	7372,	10375,	32650,	56671,	46572,
TONSLAND,	15662,	10143,	6239,	5413,	6836,	22916,	45063,	28862,
SOPCOF %,	104,	102,	100,	94,	95,	94,	98,	101,

Table 1	Catch numbers at age Numbers*10** ⁻³									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
6,	172,	606,	5834,	18891,	0,	2905,	3633,	1065,	932,	5,
7,	1660,	4847,	19417,	29815,	2418,	30158,	20497,	7412,	3000,	854,
8,	4865,	15451,	42425,	59395,	17175,	65162,	43553,	26296,	8620,	4775,
9,	9729,	28781,	82480,	78241,	33454,	53391,	46996,	44131,	26716,	12554,
10,	4636,	30144,	108462,	110712,	52102,	33569,	37469,	40441,	48290,	47348,
11,	2633,	19843,	119075,	112524,	49617,	19909,	26298,	27089,	39206,	57134,
12,	3148,	10603,	57231,	93144,	53938,	17242,	20717,	19950,	33394,	46529,
13,	5208,	8634,	29651,	49550,	33287,	9270,	16341,	11172,	21178,	37731,
14,	5666,	8634,	20894,	26134,	19095,	7410,	6059,	6400,	11853,	15506,
15,	4578,	6514,	16499,	13881,	12605,	5456,	3589,	5607,	6038,	9492,
16,	5380,	5908,	13465,	9839,	5796,	4134,	3465,	6801,	2697,	5780,
17,	3777,	3332,	13668,	6300,	4874,	2134,	2465,	3441,	2172,	3368,
18,	2747,	2878,	12207,	7233,	5499,	1545,	1964,	3001,	1344,	2160,
+gp,	3053,	5300,	22366,	11439,	13906,	2917,	6579,	2546,	1910,	4184,
TOTALNUM,	57252,	151475,	563674,	627098,	303766,	255202,	239625,	205352,	207350,	247420,
TONSLAND,	38380,	69372,	239070,	269022,	146365,	92611,	87145,	79354,	81546,	115383,
SOPCOF %,	118,	99,	91,	98,	95,	101,	100,	97,	95,	100,

Table 1	Catch numbers at age Numbers*10** ⁻³									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
6,	20,	0,	98,	29,	0,	0,	48,	1,	1532,	1939,
7,	86,	34,	571,	117,	0,	0,	475,	748,	5055,	2568,
8,	1987,	525,	2009,	215,	109,	0,	1933,	4036,	7411,	1927,
9,	4576,	2106,	4949,	1049,	1055,	379,	3972,	6797,	6286,	1679,
10,	16695,	7969,	17096,	3079,	3145,	1838,	4432,	7297,	7626,	1821,
11,	31310,	22092,	31564,	5921,	2679,	3512,	4303,	6038,	4954,	1626,
12,	51099,	36763,	41511,	10701,	3580,	4084,	4667,	8568,	5773,	1920,
13,	48307,	47096,	33190,	15930,	6213,	6958,	7062,	11600,	9159,	1721,
14,	29973,	25468,	10519,	7051,	3702,	7313,	6068,	7499,	10034,	2358,
15,	17132,	12002,	4243,	2495,	1459,	4022,	4412,	3174,	3754,	2743,
16,	8347,	4336,	1971,	704,	656,	1960,	3282,	1698,	1951,	2364,
17,	5238,	1499,	658,	390,	210,	983,	2399,	1419,	8902,	1665,
18,	2055,	517,	343,	81,	66,	328,	1733,	1093,	6046,	700,
+gp,	673,	472,	52,	67,	0,	106,	2220,	15595,	17891,	10297,
TOTALNUM,	217498,	160879,	148774,	47829,	22874,	31483,	47006,	75563,	96374,	35328,
TONSLAND,	105273,	72934,	63068,	23112,	10518,	15586,	23494,	35070,	45179,	16195,
SOPCOF %,	99,	104,	101,	100,	100,	100,	99,	97,	100,	102,

Table 6.17

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: AP

At 30-Aug-93 19:17

Table 2	Catch weights at age (kg)							
YEAR,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE								
6,	.1680,	.1680,	.1680,	.1680,	.1680,	.1680,	.1680,	.1680,
7,	.1830,	.1830,	.1830,	.1830,	.1830,	.1830,	.1830,	.1830,
8,	.2250,	.2250,	.2250,	.2250,	.2250,	.2250,	.2250,	.2250,
9,	.3110,	.3110,	.3110,	.3110,	.3110,	.3110,	.3110,	.3110,
10,	.3670,	.3670,	.3670,	.3670,	.3670,	.3670,	.3670,	.3670,
11,	.4320,	.4320,	.4320,	.4320,	.4320,	.4320,	.4320,	.4320,
12,	.5080,	.5080,	.5080,	.5080,	.5080,	.5080,	.5080,	.5080,
13,	.6110,	.6110,	.6110,	.6110,	.6110,	.6110,	.6110,	.6110,
14,	.6790,	.6790,	.6790,	.6790,	.6790,	.6790,	.6790,	.6790,
15,	.7530,	.7530,	.7530,	.7530,	.7530,	.7530,	.7530,	.7530,
16,	.8210,	.8210,	.8210,	.8210,	.8210,	.8210,	.8210,	.8210,
17,	.8720,	.8720,	.8720,	.8720,	.8720,	.8720,	.8720,	.8720,
18,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,
+gp,	.9990,	.9930,	1.0320,	1.0100,	1.0260,	1.0000,	1.0220,	.9770,
SOPCOFAC,	1.0367,	1.0223,	1.0037,	.9372,	.9489,	.9357,	.9849,	1.0143,

Table 2	Catch weights at age (kg)									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
6,	.1680,	.1680,	.1680,	.1680,	.1680,	.1680,	.1070,	.1070,	.1020,	.1020,
7,	.1830,	.1830,	.1830,	.1830,	.1830,	.1830,	.1550,	.1550,	.1380,	.1380,
8,	.2250,	.2250,	.2250,	.2250,	.2250,	.2250,	.2000,	.2000,	.1880,	.1880,
9,	.3110,	.3110,	.3110,	.3110,	.3110,	.3110,	.2520,	.2520,	.2520,	.2520,
10,	.3670,	.3670,	.3670,	.3670,	.3670,	.3670,	.3100,	.3100,	.3100,	.3100,
11,	.4320,	.4320,	.4320,	.4320,	.4320,	.4320,	.3740,	.3740,	.3640,	.3640,
12,	.5080,	.5080,	.5080,	.5080,	.5080,	.5080,	.4720,	.4720,	.4400,	.4400,
13,	.6110,	.6110,	.6110,	.6110,	.6110,	.6110,	.5680,	.5680,	.5600,	.5600,
14,	.6790,	.6790,	.6790,	.6790,	.6790,	.6790,	.7150,	.7150,	.6800,	.6800,
15,	.7530,	.7530,	.7530,	.7530,	.7530,	.7530,	.8980,	.8980,	.8280,	.8280,
16,	.8210,	.8210,	.8210,	.8210,	.8210,	.8210,	.9340,	.9340,	.9060,	.9060,
17,	.8720,	.8720,	.8720,	.8720,	.8720,	.8720,	1.0240,	1.0240,	.9700,	.9700,
18,	.9100,	.9100,	.9100,	.9100,	.9100,	.9100,	1.0500,	1.0500,	1.0500,	1.0500,
+gp,	.9800,	1.0000,	1.0070,	1.0210,	1.0320,	1.0300,	1.1300,	1.1050,	1.1180,	1.1220,
SOPCOFAC,	1.1784,	.9888,	.9146,	.9847,	.9515,	1.0130,	.9966,	.9734,	.9503,	1.0022,

Table 2	Catch weights at age (kg)									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
6,	.1020,	.1020,	.1020,	.1020,	.1440,	.1440,	.1980,	.1400,	.1300,	.1900,
7,	.1380,	.1050,	.1350,	.1200,	.1800,	.1800,	.2020,	.1460,	.1800,	.2200,
8,	.1880,	.1650,	.1670,	.1370,	.1950,	.1950,	.2420,	.1580,	.2100,	.2600,
9,	.2520,	.2120,	.2150,	.2180,	.2190,	.2090,	.2820,	.2060,	.2700,	.2900,
10,	.3100,	.2830,	.3030,	.3010,	.2880,	.2800,	.3310,	.2800,	.3400,	.3100,
11,	.3200,	.3380,	.3520,	.3530,	.3300,	.3330,	.3780,	.3550,	.3500,	.3200,
12,	.4000,	.3830,	.4200,	.4480,	.4390,	.3970,	.4560,	.4710,	.4200,	.3700,
13,	.4660,	.4380,	.4810,	.5100,	.5110,	.4680,	.5140,	.5430,	.4600,	.4200,
14,	.5630,	.5020,	.5640,	.5810,	.5640,	.5370,	.5680,	.6110,	.5100,	.4100,
15,	.7300,	.5660,	.6730,	.6480,	.6360,	.5850,	.5890,	.6250,	.5800,	.4300,
16,	.9920,	.7110,	.8090,	.8450,	.7720,	.7470,	.6720,	.7220,	.5900,	.4500,
17,	1.1260,	.8610,	1.0140,	.9480,	.8090,	.8080,	.7080,	.5760,	.5800,	.5100,
18,	1.1490,	.9660,	1.0690,	1.0560,	.9540,	.9010,	.7740,	.6590,	.5900,	.5600,
+gp,	1.2280,	1.2910,	1.1600,	1.2610,	1.1800,	1.0470,	.8380,	.6590,	.7000,	.6800,
SOPCOFAC,	.9891,	1.0415,	1.0066,	1.0023,	.9976,	1.0000,	.9915,	.9668,	1.0034,	1.0190,

Table 6.18

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU

At 2-Sep-93 12:03

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age							
YEAR,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE								
6,	.0003,	.0000,	.0000,	.0000,	.0001,	.0000,	.0000,	.0009,
7,	.0021,	.0000,	.0000,	.0000,	.0005,	.0000,	.0000,	.0016,
8,	.0116,	.0002,	.0001,	.0001,	.0032,	.0002,	.0004,	.0125,
9,	.0237,	.0023,	.0001,	.0008,	.0049,	.0011,	.0017,	.0144,
10,	.0129,	.0065,	.0016,	.0019,	.0084,	.0065,	.0066,	.0138,
11,	.0175,	.0059,	.0039,	.0035,	.0101,	.0240,	.0186,	.0191,
12,	.0146,	.0093,	.0048,	.0066,	.0106,	.0422,	.0577,	.0519,
13,	.0226,	.0101,	.0056,	.0087,	.0144,	.0504,	.0703,	.0701,
14,	.0209,	.0199,	.0045,	.0136,	.0108,	.0688,	.0813,	.0807,
15,	.0210,	.0168,	.0057,	.0079,	.0085,	.0559,	.1168,	.0730,
16,	.0182,	.0207,	.0059,	.0120,	.0092,	.0810,	.1860,	.1397,
17,	.0244,	.0141,	.0082,	.0072,	.0065,	.0354,	.1109,	.1159,
18,	.0214,	.0163,	.0060,	.0099,	.0099,	.0583,	.1132,	.0960,
+gp,	.0214,	.0163,	.0060,	.0099,	.0099,	.0583,	.1132,	.0960,
FBAR 10-15,	.0182,	.0114,	.0044,	.0070,	.0105,	.0413,	.0586,	.0514,

Table 8	Fishing mortality (F) at age									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
6,	.0004,	.0015,	.0124,	.0353,	.0000,	.0075,	.0139,	.0061,	.0093,	.0001,
7,	.0036,	.0131,	.0547,	.0730,	.0051,	.0632,	.0607,	.0321,	.0192,	.0095,
8,	.0106,	.0381,	.1362,	.2110,	.0494,	.1648,	.1099,	.0929,	.0428,	.0347,
9,	.0239,	.0723,	.2605,	.3528,	.1581,	.1912,	.1541,	.1394,	.1158,	.0729,
10,	.0209,	.0866,	.3744,	.5822,	.3731,	.2107,	.1785,	.1725,	.1995,	.2751,
11,	.0199,	.1055,	.5027,	.7354,	.4964,	.2119,	.2269,	.1697,	.2253,	.3407,
12,	.0386,	.0939,	.4381,	.8317,	.8568,	.2835,	.3167,	.2403,	.2904,	.4026,
13,	.0826,	.1270,	.3629,	.7465,	.7181,	.2977,	.4206,	.2511,	.3836,	.5460,
14,	.1049,	.1716,	.4498,	.5553,	.6398,	.2990,	.2883,	.2566,	.4075,	.4754,
15,	.0947,	.1514,	.5033,	.5397,	.5038,	.3326,	.2065,	.4182,	.3639,	.5891,
16,	.1164,	.1528,	.4676,	.5640,	.4007,	.2710,	.3243,	.6544,	.3230,	.6243,
17,	.1428,	.0883,	.5482,	.3685,	.5359,	.2238,	.2296,	.5455,	.3947,	.7468,
18,	.1084,	.1384,	.4679,	.5569,	.5618,	.2855,	.2946,	.4265,	.3756,	.7592,
+gp,	.1084,	.1384,	.4679,	.5569,	.5618,	.2855,	.2946,	.4265,	.3756,	.7592,
FBAR 10-15,	.0603,	.1227,	.4385,	.6651,	.5980,	.2726,	.2729,	.2514,	.3117,	.4382,

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU

At 2-Sep-93 12:03

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age										
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	FBAR 90-92
AGE											
6,	.0002,	.0000,	.0015,	.0004,	.0000,	.0000,	.0006,	.0000,	.0476,	.0238,	.0251 .0238,
7,	.0012,	.0004,	.0089,	.0020,	.0000,	.0000,	.0062,	.0097,	.1795,	.0947,	.0315 .0947,
8,	.0249,	.0079,	.0280,	.0037,	.0021,	.0000,	.0329,	.0601,	.1127,	.0865,	.0140 .0864,
9,	.0381,	.0300,	.0857,	.0165,	.0204,	.0080,	.0733,	.1393,	.1127,	.0303,	.0126 .0941,
10,	.1179,	.0777,	.3196,	.0635,	.0568,	.0404,	.1101,	.1677,	.2051,	.0389,	.0106 .1372,
11,	.2632,	.2021,	.4364,	.1557,	.0651,	.0749,	.1129,	.1927,	.1474,	.0551,	.0171 .1317,
12,	.5129,	.4955,	.6257,	.2294,	.1194,	.1203,	.1212,	.3052,	.2544,	.0704,	.2100,
13,	.8411,	1.1477,	1.0215,	.4601,	.1808,	.3180,	.2802,	.4371,	.5475,	.1003,	.3616,
14,	1.0153,	1.4630,	.7571,	.5401,	.1626,	.2982,	.4477,	.4773,	.7424,	.2324,	.4840,
15,	1.3598,	1.5092,	.9444,	.3520,	.1789,	.2382,	.2635,	.3951,	.4131,	.4044,	.4042,
16,	1.5131,	1.6599,	1.0199,	.3398,	.1308,	.3436,	.2778,	.1373,	.3993,	.4401,	.3255,
17,	2.0276,	1.2130,	1.2527,	.4906,	.1432,	.2632,	.8088,	.1661,	1.9133,	.6214,	.9003,
18,	1.3811,	1.2711,	.9106,	.4157,	.1261,	.3090,	.8835,	.9860,	1.9021,	.6970,	1.1950,
+gp,	1.3811,	1.2711,	.9106,	.4157,	.1261,	.3090,	.8835,	.9860,	1.9021,	.6970,	
FBAR 10-15,	.6850,	.8159,	.6841,	.3001,	.1273,	.1817,	.2226,	.3292,	.3850,	.1503,	

Table 6.19

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU

At 2-Sep-93 12:03

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)					Numbers*10** ⁻³		
YEAR,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,
AGE								
6,	156453,	151003,	164100,	234922,	355989,	590797,	592687,	532708,
7,	145879,	141518,	136633,	148484,	212560,	322083,	534575,	536286,
8,	144798,	131726,	128051,	123631,	134354,	192243,	291433,	483704,
9,	97142,	129504,	119165,	115859,	111851,	121179,	173917,	263591,
10,	93404,	85840,	116915,	107810,	104749,	100709,	109523,	157096,
11,	93708,	83430,	77165,	105616,	97368,	93983,	90535,	98453,
12,	143331,	83321,	75049,	69551,	95228,	87215,	83021,	80407,
13,	116360,	127816,	74697,	67581,	62517,	85258,	75654,	70908,
14,	142661,	102937,	114489,	67214,	60622,	55761,	73356,	63809,
15,	100956,	126418,	91308,	103129,	59996,	54266,	47100,	61190,
16,	120314,	89450,	112479,	82147,	92584,	53828,	46430,	37919,
17,	69412,	106898,	79282,	101178,	73444,	83006,	44917,	34882,
18,	73032,	61293,	95373,	71154,	90889,	66026,	72498,	36375,
+gp,	128288,	128487,	574436,	192715,	271354,	105910,	146466,	39543,
TOTAL,	1625740,	1549642,	1959141,	1590990,	1823506,	2012263,	2382113,	2496871,

Table 10	Stock number at age (start of year)					Numbers*10** ⁻³				
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
6,	433737,	424088,	498120,	573341,	572284,	407285,	276754,	184440,	105515,	86275,
7,	481571,	392297,	383155,	445168,	500811,	517824,	365764,	246962,	165875,	94587,
8,	484498,	434165,	350355,	328223,	374444,	450852,	439860,	311459,	216410,	147236,
9,	432225,	433764,	378151,	276658,	240490,	322474,	345964,	356573,	256806,	187616,
10,	235096,	381839,	365109,	263708,	175905,	185782,	240999,	268337,	280662,	206955,
11,	140198,	208313,	316828,	227192,	133300,	109605,	136170,	182423,	204333,	208018,
12,	87400,	124351,	169615,	173410,	98535,	73418,	80237,	98197,	139296,	147594,
13,	69079,	76088,	102432,	99034,	68307,	37851,	50030,	52894,	69875,	94275,
14,	59819,	57551,	60635,	64479,	42476,	30143,	25431,	29725,	37234,	43080,
15,	53262,	48736,	43862,	34989,	33484,	20270,	20226,	17248,	20808,	22416,
16,	51469,	43839,	37902,	23993,	18456,	18307,	13151,	14887,	10273,	13085,
17,	29836,	41453,	34047,	21487,	12351,	11186,	12633,	8604,	7001,	6730,
18,	28107,	23404,	34339,	17806,	13450,	6539,	8092,	9086,	4512,	4269,
+gp,	31197,	43032,	62647,	28019,	33840,	12312,	27028,	7678,	6389,	8214,
TOTAL,	2617492,	2732922,	2837196,	2577507,	2318132,	2203849,	2042338,	1788512,	1524988,	1270349,

Terminal Fs derived using XSA (With F shrinkage)

Table 10	Stock number at age (start of year)					Numbers*10** ⁻³					GMST	
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	1993,	
AGE												
6,	93444,	75180,	67565,	79774,	76638,	89429,	90192,	35737,	34623,	86506,	0,	2071
7,	78060,	84532,	68025,	61042,	72155,	69345,	80919,	81563,	32335,	29871,	76430,	1911
8,	84774,	70550,	76456,	61009,	55122,	65288,	62746,	72767,	73090,	24450,	24586,	1752
9,	128683,	74816,	63337,	67269,	54998,	49772,	59075,	54936,	62003,	59085,	20290,	1557
10,	157820,	112084,	65693,	52602,	59870,	48761,	44675,	49675,	43243,	50123,	51866,	1341
11,	142222,	126921,	93837,	43180,	44667,	51181,	42372,	36208,	38007,	31874,	43621,	1104
12,	133875,	98905,	93828,	54883,	33438,	37868,	42969,	34247,	27019,	29678,	27294,	885
13,	89289,	72528,	54523,	45413,	39481,	26851,	30380,	34441,	22838,	18956,	25028,	656
14,	49412,	34841,	20827,	17763,	25938,	29814,	17677,	20771,	20129,	11952,	15516,	457
15,	24231,	16199,	7299,	8839,	9365,	19948,	20020,	10223,	11661,	8669,	8572,	321
16,	11253,	5629,	3241,	2569,	5625,	7086,	14224,	13918,	6231,	6981,	5235,	222
17,	6341,	2243,	968,	1057,	1655,	4465,	4547,	9749,	10979,	3782,	4068,	147
18,	2886,	755,	603,	250,	586,	1297,	3105,	1833,	7471,	1466,	1838,	102
+gp,	934,	682,	91,	206,	0,	418,	3948,	25929,	21772,	21434,	10321,	
TOTAL,	1003224,	775865,	616293,	495855,	479538,	501525,	516852,	481997,	411401,	384827,	314665,	

Table 6.20

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU

At 2-Sep-93 12:03

Terminal Fs derived using XSA (With F shrinkage)

Table 12 YEAR,	Stock biomass at age (start of year)					Tonnes			
	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,	
AGE									
6,	26284,	25368,	27569,	39467,	59806,	99254,	99571,	89495,	
7,	26696,	25898,	25004,	27173,	38898,	58941,	97827,	98140,	
8,	32580,	29638,	28812,	27817,	30230,	43255,	65572,	108833,	
9,	30211,	40276,	37060,	36032,	34786,	37687,	54088,	81977,	
10,	34279,	31503,	42908,	39566,	38443,	36960,	40195,	57654,	
11,	40482,	36042,	33335,	45626,	42063,	40601,	39111,	42532,	
12,	72812,	42327,	38125,	35332,	48376,	44305,	42175,	40847,	
13,	71096,	78095,	45640,	41292,	38198,	52093,	46225,	43325,	
14,	96867,	69894,	77738,	45638,	41163,	37861,	49809,	43326,	
15,	76020,	95193,	68755,	77656,	45177,	40862,	35466,	46076,	
16,	98778,	73439,	92345,	67443,	76012,	44193,	38119,	31131,	
17,	60528,	93215,	69134,	88227,	64043,	72381,	39167,	30417,	
18,	66459,	55776,	86789,	64750,	82709,	60084,	65973,	33101,	
+gp,	128160,	127588,	592818,	194642,	278409,	105910,	149688,	38633,	
TOTALBIO,	861252,	824253,	1266031,	830661,	918312,	774386,	862988,	785488,	

Table 12 YEAR,	Stock biomass at age (start of year)					Tonnes				
	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
6,	72868,	71247,	83684,	96321,	96144,	68424,	29613,	19735,	10763,	8800,
7,	88128,	71790,	70117,	81466,	91648,	94762,	56693,	38279,	22891,	13053,
8,	109012,	97687,	78830,	73850,	84250,	101442,	87972,	62292,	40685,	27680,
9,	134422,	134901,	117605,	86041,	74792,	100289,	87183,	89856,	64715,	47279,
10,	86280,	140135,	133995,	96781,	64557,	68182,	74710,	83185,	87005,	64156,
11,	60565,	89991,	136870,	98147,	57586,	47349,	50928,	68226,	74377,	75719,
12,	44399,	63171,	86164,	88092,	50056,	37296,	37872,	46349,	61290,	64941,
13,	42207,	46490,	62586,	60510,	41735,	23127,	28417,	30044,	39130,	52794,
14,	40617,	39077,	41171,	43781,	28841,	20467,	18183,	21253,	25319,	29295,
15,	40107,	36699,	33028,	26347,	25213,	15263,	18163,	15488,	17229,	18560,
16,	42256,	35992,	31118,	19699,	15152,	15030,	12283,	13904,	9307,	11855,
17,	26017,	36147,	29689,	18737,	10770,	9754,	12936,	8810,	6791,	6528,
18,	25578,	21297,	31249,	16203,	12239,	5951,	8496,	9540,	4737,	4482,
+gp,	30573,	43032,	63086,	28607,	34922,	12681,	30542,	8484,	7143,	9216,
TOTALBIO,	843028,	927656,	999191,	834582,	687907,	620018,	553990,	515446,	471383,	434358,

Terminal Fs derived using XSA (With F shrinkage)

Table 12 YEAR,	Stock biomass at age (start of year)					Tonnes				
	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
6,	9531,	7668,	6892,	8137,	11036,	12878,	17858,	5003,	4501,	16436,
7,	10772,	8876,	9183,	7325,	12988,	12482,	16346,	11908,	5820,	6572,
8,	15937,	11641,	12768,	8358,	10749,	12731,	15185,	11497,	15349,	6357,
9,	32428,	15861,	13617,	14665,	12045,	10402,	16659,	11317,	16741,	17135,
10,	48924,	31720,	19905,	15833,	17242,	13653,	14788,	13909,	14703,	15538,
11,	45511,	42899,	33031,	15242,	14740,	17043,	16017,	12854,	13302,	10200,
12,	53550,	37880,	39408,	24588,	14679,	15034,	19594,	16130,	11348,	10981,
13,	41609,	31767,	26225,	23161,	20175,	12566,	15615,	18701,	10505,	7962,
14,	27819,	17490,	11747,	10320,	14629,	16010,	10041,	12691,	10266,	4900,
15,	17689,	9169,	4912,	5728,	5956,	11670,	11792,	6389,	6763,	3728,
16,	11163,	4002,	2622,	2171,	4342,	5293,	9559,	8699,	3676,	3141,
17,	7140,	1931,	982,	1002,	1339,	3608,	3220,	6424,	6477,	1929,
18,	3315,	730,	645,	264,	559,	1169,	2404,	1208,	4408,	821,
+gp,	1147,	881,	105,	260,	0,	438,	3308,	18072,	15240,	15004,
TOTALBIO,	326537,	222515,	182042,	137054,	140479,	144978,	172384,	154804,	139101,	120703,
					156273	191150	252021	232334	255161	250378

Table 6.21

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU

At 2-Sep-93 12:03

Terminal Fs derived using XSA (With F shrinkage)

Table 13	Spawning stock biomass at age (spawning time)								Tonnes	
YEAR,	1965,	1966,	1967,	1968,	1969,	1970,	1971,	1972,		
AGE										
6,	0,	0,	0,	0,	0,	0,	0,	0,		
7,	0,	0,	0,	0,	0,	0,	0,	0,		
8,	977,	889,	864,	835,	907,	1298,	1967,	3265,		
9,	1813,	2417,	2224,	2162,	2087,	2261,	3245,	4919,		
10,	2742,	2520,	3433,	3165,	3075,	2957,	3216,	4612,		
11,	8906,	7929,	7334,	10038,	9254,	8932,	8604,	9357,		
12,	26212,	15238,	13725,	12719,	17415,	15950,	15183,	14705,		
13,	39103,	42952,	25102,	22710,	21009,	28651,	25424,	23829,		
14,	69744,	50324,	55971,	32859,	29637,	27260,	35862,	31195,		
15,	64617,	80914,	58442,	66008,	38400,	34733,	30146,	39165,		
16,	86924,	64626,	81264,	59350,	66890,	38889,	33545,	27396,		
17,	57501,	88554,	65677,	83816,	60841,	68762,	37209,	28896,		
18,	64466,	54103,	84186,	62808,	80228,	58281,	63994,	32108,		
+gp,	128160,	127588,	592818,	194642,	278409,	105910,	149688,	38633,		
TOTSPBIO,	551166,	538054,	991038,	551111,	608153,	393884,	408083,	258079,		

Table 13	Spawning stock biomass at age (spawning time)								Tonnes		
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,	
AGE											
6,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,	
7,	0,	0,	0,	733,	825,	853,	510,	345,	206,	117,	
8,	3270,	2931,	2365,	1182,	1348,	1623,	1408,	997,	651,	443,	
9,	8065,	8094,	7056,	8690,	7554,	10129,	8805,	9075,	6536,	4775,	
10,	6902,	11211,	10720,	18872,	12589,	13295,	14568,	16221,	16966,	12510,	
11,	13324,	19798,	30111,	29444,	17276,	14205,	15278,	20468,	22313,	22716,	
12,	15984,	22741,	31019,	47570,	27030,	20140,	20451,	25028,	33097,	35068,	
13,	23214,	25569,	34422,	42478,	29298,	16235,	19949,	21091,	27469,	37061,	
14,	29244,	28136,	29643,	37740,	24861,	17643,	15674,	18320,	21825,	25252,	
15,	34091,	31194,	28074,	25451,	24356,	14744,	17545,	14962,	16644,	17929,	
16,	37185,	31673,	27384,	19580,	15061,	14940,	12210,	13821,	9251,	11784,	
17,	24716,	34340,	28205,	18737,	10770,	9754,	12936,	8810,	6791,	6528,	
18,	24810,	20659,	30311,	16203,	12239,	5951,	8496,	9540,	4737,	4482,	
+gp,	30573,	43032,	63086,	28607,	34922,	12681,	30542,	8484,	7143,	9216,	
TOTSPBIO,	251380,	279377,	322395,	295287,	218130,	152194,	178372,	167162,	173630,	187881,	

Terminal Fs derived using XSA (With F shrinkage)

Table 13	Spawning stock biomass at age (spawning time)								Tonnes		
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	
AGE											
6,	0,	0,	0,	0,	0,	0,	0,	0,	0,	0,	
7,	97,	44,	0,	0,	0,	0,	0,	0,	0,	0,	
8,	255,	93,	0,	0,	0,	0,	0,	172,	230,	95,	
9,	3275,	904,	136,	499,	542,	863,	67,	566,	921,	1062,	
10,	9540,	5329,	1573,	1789,	1310,	1297,	1153,	1753,	1941,	2067,	
11,	13653,	12956,	7201,	3628,	2624,	3306,	3219,	2635,	2687,	2285,	
12,	28917,	20228,	17852,	12466,	6312,	6946,	9523,	8162,	5458,	4513,	
13,	29209,	22904,	20482,	18389,	14829,	8658,	10197,	11651,	5725,	4291,	
14,	23980,	15374,	9938,	8999,	12098,	12824,	7701,	9214,	7607,	3793,	
15,	17087,	8728,	4421,	5224,	5271,	10059,	9811,	5118,	5749,	3310,	
16,	11096,	3942,	2425,	2062,	4160,	5293,	9559,	8699,	3536,	2972,	
17,	7140,	1931,	982,	1002,	1339,	3608,	3220,	6424,	6477,	1913,	
18,	3315,	730,	645,	264,	559,	1169,	2404,	1208,	4408,	821,	
+gp,	1147,	881,	105,	260,	0,	438,	3308,	18072,	15204,	15004,	
TOTSPBIO,	148714,	94044,	65759,	54583,	49044,	54462,	60161,	73674,	59981,	42127,	
								74570,	65572,	54368,	

Table 6.22

Run title : *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan (run name: JU,

At 2-Sep-93 12:03

Table 16 Summary (without SOP correction)

	Terminal Fs derived using XSA (With F shrinkage)					
	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 10-15,
1965,	156453,	861252,	551166,	15662,	.0284,	.0182,
1966,	151003,	824253,	538054,	10143,	.0189,	.0114,
1967,	164100,	1266031,	991038,	6239,	.0063,	.0044,
1968,	234922,	830661,	551111,	5413,	.0098,	.0070,
1969,	355989,	918312,	608153,	6836,	.0112,	.0105,
1970,	590797,	774386,	393884,	22916,	.0582,	.0413,
1971,	592687,	862988,	408083,	45063,	.1104,	.0586,
1972,	532708,	785488,	258079,	28862,	.1118,	.0514,
1973,	433737,	843028,	251380,	38380,	.1527,	.0603,
1974,	424088,	927656,	279377,	69372,	.2483,	.1227,
1975,	498120,	999191,	322395,	239070,	.7415,	.4385,
1976,	573341,	834582,	295287,	269022,	.9111,	.6651,
1977,	572284,	687907,	218130,	146365,	.6710,	.5980,
1978,	407285,	620018,	152194,	92611,	.6085,	.2726,
1979,	276754,	553990,	178372,	87145,	.4886,	.2729,
1980,	184440,	515446,	167162,	79354,	.4747,	.2514,
1981,	105515,	471383,	173630,	81546,	.4697,	.3117,
1982,	86275,	434358,	187881,	115383,	.6141,	.4382,
1983,	93444,	326537,	148714,	105273,	.7079,	.6850,
1984,	75180,	222515,	94044,	72934,	.7755,	.8159,
1985,	67565,	182042,	65759,	63068,	.9591,	.6841,
1986,	79774,	137054,	54583,	23112,	.4234,	.3001,
1987,	76638,	140479,	49044,	10518,	.2145,	.1273,
1988,	89429,	144978,	54462,	15586,	.2862,	.1817,
1989,	90192,	172384,	60161,	23494,	.3905,	.2226,
1990,	35737,	154804,	73674,	35070,	.4760,	.3292,
1991,	34623,	139101,	59981,	45179,	.7532,	.3850,
1992,	86506,	120703,	42127,	16195,	.3844,	.1503,

Arith. Mean Units, (Thousands), 252485, (Tonnes), 562555, (Tonnes), 258140, (Tonnes), 63208, (Tonnes), .3966, .2684,

Adjusted for recruitment:

1987	190197	156273				
1988	285363	191150				
1989	200618	252021				
1990	183752	232334	74570			
1991	97761	255161	65572			.3619
1992	82184	250378	54368			.1392

Table 6.23

22:45 Thursday, September 2, 1993 1

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Island
 Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Island

Single option prediction: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
6	110000.00	0.1000	0.0000	0.0000	0.0000	0.160	0.0100	0.160
7	60523.000	0.1000	0.0000	0.0000	0.0000	0.200	0.0150	0.200
8	58322.000	0.1000	0.0075	0.0000	0.0000	0.235	0.0100	0.235
9	82356.000	0.1000	0.0425	0.0000	0.0000	0.280	0.0100	0.280
10	227254.00	0.1000	0.1230	0.0000	0.0000	0.325	0.0350	0.325
11	313933.00	0.1000	0.2455	0.0000	0.0000	0.335	0.0600	0.335
12	160263.00	0.1000	0.4245	0.0000	0.0000	0.395	0.1050	0.395
13	25015.000	0.1000	0.5565	0.0000	0.0000	0.440	0.1800	0.440
14	15497.000	0.1000	0.8085	0.0000	0.0000	0.460	0.2400	0.460
15	8553.000	0.1000	0.9195	0.0000	0.0000	0.505	0.2000	0.505
16	5215.000	0.1000	0.9330	0.0000	0.0000	0.520	0.1650	0.520
17	4051.000	0.1000	0.9905	0.0000	0.0000	0.550	0.4500	0.545
18	1828.000	0.1000	1.0000	0.0000	0.0000	0.575	0.4500	0.575
19+	10317.000	0.1000	1.0000	0.0000	0.0000	0.700	.	0.690
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
6	110000.00	0.1000	0.0000	0.0000	0.0000	0.160	0.0100	0.160
7	.	0.1000	0.0000	0.0000	0.0000	0.200	0.0150	0.200
8	.	0.1000	0.0075	0.0000	0.0000	0.235	0.0100	0.235
9	.	0.1000	0.0425	0.0000	0.0000	0.280	0.0100	0.280
10	.	0.1000	0.1230	0.0000	0.0000	0.325	0.0350	0.325
11	.	0.1000	0.2455	0.0000	0.0000	0.335	0.0600	0.335
12	.	0.1000	0.4245	0.0000	0.0000	0.395	0.1050	0.395
13	.	0.1000	0.5565	0.0000	0.0000	0.440	0.1800	0.440
14	.	0.1000	0.8085	0.0000	0.0000	0.460	0.2400	0.460
15	.	0.1000	0.9195	0.0000	0.0000	0.505	0.2000	0.505
16	.	0.1000	0.9330	0.0000	0.0000	0.520	0.1650	0.520
17	.	0.1000	0.9905	0.0000	0.0000	0.550	0.4500	0.545
18	.	0.1000	1.0000	0.0000	0.0000	0.575	0.4500	0.575
19+	.	0.1000	1.0000	0.0000	0.0000	0.700	.	0.690
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
6	110000.00	0.1000	0.0000	0.0000	0.0000	0.160	0.0100	0.160
7	.	0.1000	0.0000	0.0000	0.0000	0.200	0.0150	0.200
8	.	0.1000	0.0075	0.0000	0.0000	0.235	0.0100	0.235
9	.	0.1000	0.0425	0.0000	0.0000	0.280	0.0100	0.280
10	.	0.1000	0.1230	0.0000	0.0000	0.325	0.0350	0.325
11	.	0.1000	0.2455	0.0000	0.0000	0.335	0.0600	0.335
12	.	0.1000	0.4245	0.0000	0.0000	0.395	0.1050	0.395
13	.	0.1000	0.5565	0.0000	0.0000	0.440	0.1800	0.440
14	.	0.1000	0.8085	0.0000	0.0000	0.460	0.2400	0.460
15	.	0.1000	0.9195	0.0000	0.0000	0.505	0.2000	0.505
16	.	0.1000	0.9330	0.0000	0.0000	0.520	0.1650	0.520
17	.	0.1000	0.9905	0.0000	0.0000	0.550	0.4500	0.545
18	.	0.1000	1.0000	0.0000	0.0000	0.575	0.4500	0.575
19+	.	0.1000	1.0000	0.0000	0.0000	0.700	.	0.690
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : MARCH
 Date and time: 02SEP93:22:59

Table 6.24

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan
 Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.6238	0.0853	344466	84507	13000	0.2000	0.0273	347012	119718	6289	361673	160195
.	.	.	.	.	0.2200	0.0301	.	119718	6908	361044	159784
.	.	.	.	.	0.2400	0.0328	.	119718	7525	360416	159373
.	.	.	.	.	0.2600	0.0355	.	119718	8140	359790	158965
.	.	.	.	.	0.2800	0.0383	.	119718	8754	359165	158557
.	.	.	.	.	0.3000	0.0410	.	119718	9365	358543	158151
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : FEBRUARY
 Date and time : 02SEP93:23:20
 Computation of ref. F: Simple mean, age 10 - 15
 Basis for 1993 : TAC constraints

22:45 Thursday, September 2, 1993 8

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan
 Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.6238	0.0853	344466	84507	13000	1.0000	0.1367	347012	119718	29690	337815	144730
.	.	.	.	.	1.1000	0.1503	.	119718	32432	335014	142932
.	.	.	.	.	1.2000	0.1640	.	119718	35135	332250	141163
.	.	.	.	.	1.3000	0.1777	.	119718	37800	329525	139421
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : FEBRUARY
 Date and time : 02SEP93:23:20
 Computation of ref. F: Simple mean, age 10 - 15
 Basis for 1993 : TAC constraints

22:45 Thursday, September 2, 1993 7

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan
 Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.6238	0.0853	344466	84507	13000	4.2000	0.5740	347012	119718	101431	264166	98883
.	.	.	.	.	4.2500	0.5808	.	119718	102333	263235	98325
.	.	.	.	.	4.3000	0.5877	.	119718	103231	262310	97771
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : FEBRUARY
 Date and time : 02SEP93:23:20
 Computation of ref. F: Simple mean, age 10 - 15
 Basis for 1993 : TAC constraints

Table 6.25

Run title : *Sebastes marinus* in the Barents and Norwegian Seas (Fishing Areas (run name: JAN

At 3-Sep-93 00:24

Table 1	Catch numbers at age Numbers*10** ⁻³									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
11,	8,	0,	66,	145,	25,	306,	1339,	266,	294,	367,
12,	86,	199,	880,	251,	123,	389,	1948,	1488,	320,	532,
13,	249,	101,	1009,	838,	332,	841,	1591,	1708,	1270,	747,
14,	581,	601,	2697,	3150,	413,	1458,	1527,	1854,	1888,	1668,
15,	1358,	1623,	5720,	3697,	1281,	1304,	2013,	1722,	1152,	3029,
16,	2186,	1425,	5300,	5264,	1735,	907,	1331,	1571,	2286,	2456,
17,	831,	701,	2275,	2827,	1141,	1305,	1619,	1894,	1552,	2080,
18,	2241,	4572,	4421,	7309,	1409,	2886,	1575,	1895,	2263,	1796,
19,	1314,	1624,	2632,	3188,	1570,	3368,	1413,	1921,	1053,	1008,
20,	1109,	2124,	1818,	1866,	1635,	2954,	1457,	1808,	939,	834,
21,	1803,	4551,	2242,	3237,	2810,	2887,	976,	1935,	565,	651,
22,	864,	1475,	1168,	496,	1372,	1649,	932,	1304,	389,	525,
23,	643,	2599,	975,	447,	1678,	2061,	1053,	908,	603,	266,
+gp,	2839,	3403,	1329,	282,	3859,	3869,	5625,	6346,	3654,	3008,
TOTALNUM,	16112,	24998,	32532,	32997,	19383,	26184,	24399,	26620,	18228,	18967,
TONSLAND,	19260,	28379,	29484,	30203,	24077,	25908,	23222,	28091,	17443,	16694,
SOPCOF %,	99,	101,	100,	100,	99,	100,	86,	102,	103,	101,

Table 6.26

18:37 Wednesday, September 1, 1993

Sebastes marinus in the Barents and Norwegian Seas (Fishing Areas

SEBASTES MARINUS : EFFORT AND CATCH DATA, NORWEGIAN TRAWLERS (code: FLT01)

Year	Effort	Catch, age 12	Catch, age 13	Catch, age 14	Catch, age 15	Catch, age 16	Catch, age 17	Catch, age 18	Catch, age 19	Catch, age 20	Catch, age 21	Catch, age 22	Catch, age 23	Catch, age 24
1986	28244	34	241	1230	1427	2090	1096	2987	1302	763	1340	206	186	117
1987	20403	11	21	41	134	175	175	268	392	486	941	505	778	371
1988	23877	0	107	427	569	427	675	1493	1742	1528	1493	853	1066	782
1989	58126	1203	889	994	1282	785	1072	968	942	994	575	575	602	366
1990	29226	962	979	1050	911	832	1058	1047	1011	1004	1191	721	643	1104
1991	9894	164	580	1059	373	1123	686	1490	311	245	83	85	143	216
1992	15938	244	275	673	1094	976	907	667	451	320	220	132	131	102

Table 6.27

VPA Version 3.1 (MSDOS)

1-Sep-93 08:31

Extended Survivors Analysis

Sebastes marinus in the Barents and Norwegian Seas (Fishing Areas (run name: JAN

CPUE data from file /users/ifad/ifapwork/wg_108/sebi_nor/FLEET.JAN

Data for 1 fleets over 28 years

Age range from 11 to 23

Fleet,	Alpha,	Beta
FLT01: SEBASTES MARI	, .000	, 1.000

Time series weights :

Tapered time weighting applied

Power = 3 over 20 years

Catchability analysis :

Catchability dependent on stock size for ages < 13

Regression type = C

Minimum of 5 points used for regression

Survivor estimates shrunk to the population mean for ages < 13

Catchability independent of age for ages >= 21

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 5 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = .300

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning converged after 27 iterations

Total absolute residual between iterations

26 and 27 = .000

Continued

Table 6.27 (Continued)

Regression weights								
Age,	1986,	1987,	1988,	1989,	1990,	1991,	1992	
11,	.004,	.001,	.005,	.026,	.007,	.008,	.009	
12,	.011,	.004,	.010,	.037,	.033,	.010,	.016	
13,	.046,	.016,	.032,	.048,	.037,	.032,	.026	
14,	.197,	.026,	.082,	.067,	.066,	.048,	.049	
15,	.239,	.103,	.097,	.139,	.090,	.048,	.090	
16,	.324,	.151,	.088,	.122,	.137,	.148,	.123	
17,	.196,	.096,	.145,	.201,	.228,	.175,	.175	
18,	.468,	.127,	.331,	.234,	.340,	.414,	.281	
19,	.270,	.153,	.442,	.239,	.438,	.286,	.291	
20,	.165,	.193,	.420,	.309,	.480,	.352,	.343	
21,	.304,	.354,	.538,	.212,	.757,	.239,	.391	
22,	.055,	.182,	.322,	.293,	.428,	.290,	.325	
23,	.275,	.235,	.402,	.312,	.457,	.318,	.293	

Fishing mortalities

XSA population numbers

YEAR,	AGE												
	11,	12,	13,	14,	15,	16,	17,	18,	19,	20,	21,	22,	
1986,	3.51E+04,	2.46E+04,	1.95E+04,	1.86E+04,	1.83E+04,	1.83E+04,	1.83E+04,	1.83E+04,	1.83E+04,	1.83E+04,	1.83E+04,	1.83E+04,	1.83E+04,
1987,	4.37E+04,	3.16E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,	2.20E+04,
1988,	6.25E+04,	3.95E+04,	2.85E+04,	1.96E+04,	1.48E+04,	1.48E+04,	1.48E+04,	1.48E+04,	1.48E+04,	1.48E+04,	1.48E+04,	1.48E+04,	1.48E+04,
1989,	5.42E+04,	5.63E+04,	3.54E+04,	2.49E+04,	1.63E+04,	1.63E+04,	1.63E+04,	1.63E+04,	1.63E+04,	1.63E+04,	1.63E+04,	1.63E+04,	1.63E+04,
1990,	3.79E+04,	4.77E+04,	4.91E+04,	3.05E+04,	2.11E+04,	2.11E+04,	2.11E+04,	2.11E+04,	2.11E+04,	2.11E+04,	2.11E+04,	2.11E+04,	2.11E+04,
1991,	4.00E+04,	3.41E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,	4.18E+04,
1992,	4.08E+04,	3.59E+04,	3.05E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,	3.66E+04,

Population estimates for 1993

0.00E+00, 3.66E+04, 3.20E+04, 2.69E+04, 3.15E+04, 3.05E+04, 1.78E+04, 1.04E+04, 5.26E+03, 2.84E+03, 1.94E+03, 1.30E+03, 1.30E+03, 9.12E+03,

Taper weighted geometric mean of the VPA populations:

4.01E+04, 3.64E+04, 3.28E+04, 2.97E+04, 2.51E+04, 2.03E+04, 1.63E+04, 1.38E+04, 1.07E+04, 8.88E+03, 7.39E+03, 5.54E+03, 4.59E+03,

Standard error of the weighted Log(VPA populations) :

.3023, .3178, .3322, .3540, .3887, .4147, .4481, .5279, .5886, .6257, .6621, .6790, .7346,

Table 6.27 (Continued)

Log catchability residuals.

Fleet : FL101: SEBASTES MARI

Age	1986	1987	1988	1989	1990	1991	1992
12	-.01	-.45	99.99	-.17	.11	.28	.21
13	.19	-2.06	-.84	.18	.63	1.35	.44
14	.98	-2.08	-.02	-.31	.23	.97	.20
15	.73	-1.09	.12	-.03	.03	.00	.26
16	.65	-1.16	-.31	-.65	.05	1.13	.26
17	-.13	-1.44	.03	-.29	.36	.94	.45
18	-.19	-1.56	.25	-.82	.14	1.59	.16
19	-.30	-1.03	.60	-.65	.40	.49	.44
20	-.85	-.68	.49	-.43	.49	.51	.39
21	-.31	-.05	.65	-1.04	.96	-.54	.31
22	-2.02	-.62	.14	-.67	.28	.05	-.17
23	-.40	-.13	.36	-.68	.60	.23	.40

Mean catchability and standard error.

Age	11	12	13	14	15	16	17	18	19	20	21	22	23
Mean Q			-14.7622	-13.7993	-13.3633	-12.9551	-12.7013	-12.0943	-12.1576	-12.0987	-12.0136	-12.0136	
S.E			1.1110	1.0261	.5421	.7774	.7513	.9824	.6495	.6108	.7023	.8981	.4757

Regression statistics :

Age	Slope	Intercept	S.e.	RSquare	No Pts	Fleet Mean Q
12	.23	11.67	.30	.55	6	-15.39
13	.32	11.74	.30	.60	7	-14.76
14	.39	11.59	.37	.53	7	-13.80
15	.61	12.00	.33	.58	7	-13.36
16	.34	10.76	.22	.65	7	-12.96
17	39.01	139.98	30.90	.00	7	-12.70
18	3.57	19.62	3.69	.01	7	-12.09
19	4.42	23.31	2.60	.04	7	-12.16
20	4.21	22.99	2.04	.08	7	-12.10
21	1.16	12.56	.89	.40	7	-12.01
22	2.88	20.11	2.01	.12	7	-12.43
23	1.19	12.69	.60	.63	7	-11.95

Table 6.28

Run title : Sebastes marinus in the Barents and Norwegian Seas (Fishing Areas (run name: JAN

At 1-Sep-93 08:32

Terminal Fs derived using XSA (With F shrinkage)

Table 8	Fishing mortality (F) at age							
YEAR,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE								
11,	.0000,	.0819,	.0377,	.0120,	.0028,	.0119,	.0209,	.0060,
12,	.0133,	.0771,	.0537,	.0367,	.0158,	.0163,	.0318,	.0217,
13,	.0176,	.0366,	.0463,	.0528,	.0190,	.0140,	.0227,	.0240,
14,	.0307,	.0624,	.1093,	.1184,	.0764,	.0566,	.0475,	.0538,
15,	.0755,	.0649,	.1534,	.2140,	.0871,	.0990,	.0704,	.0775,
16,	.2165,	.2191,	.1630,	.2257,	.1583,	.1138,	.0809,	.0888,
17,	.1076,	.1029,	.0996,	.0864,	.0857,	.0589,	.0336,	.0512,
18,	.1586,	.1493,	.1662,	.1972,	.0898,	.1440,	.1625,	.0904,
19,	.2434,	.1357,	.1517,	.1708,	.1588,	.0662,	.0978,	.1003,
20,	.0747,	.0434,	.0464,	.0937,	.1477,	.1200,	.0842,	.1241,
21,	.1864,	.3197,	.2136,	.0980,	.1718,	.1952,	.1596,	.1523,
22,	.1169,	.1306,	.2191,	.0426,	.0657,	.1013,	.1005,	.1362,
23,	.1562,	.1560,	.1597,	.1206,	.1269,	.1255,	.1211,	.1208,
+gp,	.1562,	.1560,	.1597,	.1206,	.1269,	.1255,	.1211,	.1208,
FBAR 15-21,	.1518,	.1478,	.1420,	.1551,	.1285,	.1139,	.0984,	.0978,

Table 8	Fishing mortality (F) at age										
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,	FBAR 90-9:
AGE											
11,	.0003,	.0000,	.0026,	.0044,	.0006,	.0052,	.0263,	.0074,	.0078,	.0095,	.0082,
12,	.0032,	.0087,	.0421,	.0108,	.0041,	.0104,	.0371,	.0333,	.0099,	.0157,	.0197,
13,	.0074,	.0042,	.0504,	.0463,	.0160,	.0316,	.0485,	.0373,	.0325,	.0261,	.0319,
14,	.0194,	.0201,	.1311,	.1965,	.0262,	.0815,	.0665,	.0661,	.0475,	.0491,	.0542,
15,	.0432,	.0622,	.2405,	.2386,	.1027,	.0970,	.1388,	.0896,	.0481,	.0903,	.0760,
16,	.0859,	.0526,	.2636,	.3237,	.1506,	.0884,	.1221,	.1374,	.1480,	.1233,	.1362,
17,	.0329,	.0323,	.1001,	.1958,	.0960,	.1451,	.2014,	.2284,	.1754,	.1748,	.1928,
18,	.1028,	.2273,	.2600,	.4679,	.1268,	.3310,	.2335,	.3404,	.4137,	.2812,	.3451,
19,	.0716,	.0907,	.1771,	.2700,	.1527,	.4419,	.2386,	.4379,	.2864,	.2907,	.3383,
20,	.1167,	.1423,	.1249,	.1647,	.1932,	.4202,	.3088,	.4797,	.3522,	.3429,	.3916,
21,	.2245,	.8237,	.1965,	.3036,	.3538,	.5378,	.2116,	.7572,	.2391,	.3907,	.4623,
22,	.0770,	.2582,	.4506,	.0545,	.1817,	.3219,	.2932,	.4276,	.2898,	.3248,	.3474,
23,	.1187,	.3092,	.2424,	.2754,	.2352,	.4017,	.3120,	.4570,	.3184,	.2930,	.3562,
+gp,	.1187,	.3092,	.2424,	.2754,	.2352,	.4017,	.3120,	.4570,	.3184,	.2930,	
FBAR 15-21,	.0968,	.2044,	.1947,	.2806,	.1680,	.2945,	.2078,	.3530,	.2375,	.2420,	

Table 6.29

Sebastes marinus W.G.1993 SHOT forecast spreadsheet version 3
 Sub-area I and Divisions IIa and IIb January 1989

running recruitment weights

older	0.30	G-M =	-0.05
central	0.40	exp(d)	0.95
younger	0.30	ex p(d/2)	0.98

Year	Land -ings	Recrt Index	W'td Index	Y/B Ratio	Hang -over	Act'l Prodn	Est'd Prodn	Est'd SQC.	Act'l Expl Biom	Est'd Expl Biom	Est'd Land -ings	
1978	32	1		0.09	0.86				345			0.1
1979	26	1	1	0.09	0.86	-17			280			0.1
1980	22	1	1	0.09	0.86	-4			237			0.1
1981	21	1	1	0.09	0.86	22			226			0.1
1982	16	1	1	0.08	0.87	-27	1	18	191	195	16	0.09
1983	19	1	1	0.12	0.84	47	-6	13	160	159	19	0.13
1984	28	1	1	0.20	0.76	68	4	16	140	138	28	0.23
1985	29	1	1	0.24	0.72	37	15	24	122	120	29	0.28
1986	30	1	1	0.28	0.68	37	18	25	107	106	30	0.34
1987	24	1	1	0.26	0.70	12	21	26	92	93	24	0.31
1988	26	1	1	0.31	0.65	34	20	22	84	84	26	0.38
1989	23	1	1	0.30	0.66	20	21	23	76	76	23	0.37
1990	28	1	1	0.40	0.56	38	21	21	71	71	28	0.52
1991	17	1	1	0.27	0.69	-9	22	25	64	62	17	0.32
1992	17	1	1	0.27	0.69	20	20	17	64	63	17	0.32
1993	15	1	1	0.24	0.72		20	17		63	15	0.28
1994		1	1	0.24	0.72		20	16		65	16	0.28
1995		1	1	0.24	0.72		20	16		67	16	0.28

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

Country	1983	1984	1985	1986	1987
Denmark	-	-	-	-	+
Faroe Islands	-	-	-	42	-
France	67	138	239	13	13
German Dem. Rep.	1,913	2,089	3,807	2,659	1,855
Germany, Fed. Rep.	130	76	193	59	169
Norway	4,883	4,376	5,464	7,890	7,261
UK (England & Wales)	2	23	5	10	61
UK (Scotland)	-	-	-	2	20
USSR	15,152	15,181	10,237	12,200	9,733
Spain	-	-	-	-	-
Total	22,147	21,883	19,945	22,875	19,112

Country	1988	1989	1990	1991	1992 ¹
Denmark	-	-	-	11	-
Faroe Islands	186	67	163	314	63
France	67	31	49	119	56
German Dem. Rep.	712	589	909	-	-
Germany, Fed. Rep.	32	11	45	101	27
Greenland					13
Norway	9,076	11,043 ²	16,825 ²	26,400 ²	7,506 ²
Portugal					31
UK (England & Wales)	82	6	10	+	+
UK (Scotland)	2	-	-	2	-
UK (Scotland)	9,430	8,812	4,764 ²	2,490 ²	718
USSR/Russia	-	-	-	132 ²	23
Spain					
Total	19,587	20,559	20,559	29,569	8,437

¹Provisional figures.

²Working Group figure.

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

Country	1983	1984	1985	1986	1987
Faroe Islands	-	-	-	-	-
Germany, Fed. Rep.	-	-	-	1	2
Norway	490	593	602	557	984
UK (England & Wales)	1	17	1	5	10
UK (Scotland)	-	-	-	1	+
USSR	196	81	122	615	259
Total	687	691	725	1,179	1,255

Country	1988	1989	1990	1991	1992 ¹
Faroe Islands	9	-	7	-	-
Germany, Fed. Rep.	4	-	-	-	+
Norway	978	335 ²	304 ²	1,946 ²	2,221 ²
UK (England & Wales)	7	+	-	-	-
UK (Scotland)	-	-	-	-	-
USSR/Russia	420	482	321 ²	522 ²	467 ²
Total	1,418	817	632	2,468	2,688

¹Provisional figures.

²Working Group figures.

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

Country	1983	1984	1985	1986	1987
Faroe Islands	-	-	-	6	-
France	67	138	239	13	13
German Dem. Rep.	14	189	82	55	12
Germany, Fed. Rep.	130	76	172	42	63
Norway	4,257	3,703	4,791	6,389	5,705
UK (England & Wales)	1	1	2	5	44
UK (Scotland)	-	-	-	1	10
USSR	5,031	5,459	6,894	5,553	4,739
Total	9,500	9,566	12,180	12,064	10,586

Country	1988	1989	1990	1991	1992 ¹
Faroe Islands	177	67	133	314	63
France	67	31	49	119 ¹	53 ³
German Dem. Rep.	130	94	10		
Germany, Fed. Rep.	20	10	2	21	16 ²
Greenland					13 ⁴
Norway	7,859	7,208 ²	8,025 ²	9,826 ²	3,456 ²
Portugal					15 ³
UK (England & Wales)	56	6	1	+	-
UK (Scotland)	2	-	-	1	-
USSR/Russia	4,002	4,964	1,246 ²	305 ²	58
Total	12,313	12,380	9,466	10,585	3,674

¹Provisional figures.

²Working Group figure.

³As reported to Norwegian authorities.

⁴Includes Division IIb.

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

Country	1983	1984	1985	1986	1987
Denmark	-	-	-	-	+
Faroe Islands	-	-	-	36	-
German Dem. Rep.	1,899	1,900	3,725	2,604	1,843
Germany, Fed. Rep.	-	-	21	16	104
Norway	136	80	71	944	572
UK (England & Wales)	+	5	2	+	7
UK (Scotland)	-	-	-	-	10
USSR	9,925	9,641	3,221	6,032	4,735
					-
Total	11,960	11,626	7,040	9,632	7,271

Country	1988	1989	1990	1991	1992 ¹
Denmark	-	-	-	11	-
Faroe Islands	-	-	23	-	-
France					3 ²
German Dem. Rep.	582	495	899	-	-
Germany, Fed. Rep.	8	1	43	80	11 ²
Norway	239	3,500 ²	8,496 ²	14,629 ²	1,829 ²
Portugal					16 ³
UK (England & Wales)	19	-	9	+	+ ²
UK (Scotland)	+	-	-	1	-
UK (Scotland)	5,008	3,366	3,197 ²	1,663 ²	193
USSR/Russia	-	-	-	132 ²	23 ²
Spain					
Total	5,856	7,362	12,667	16,516	2,075

¹Provisional figures.

²Working Group figure.

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

Year	USSR catch/hour trawling (t)		Norway ⁹ catch/hour trawling (t)	Average CPUE		Total effort (in '000 hrs trawling) ⁶	CPUE 7+ ⁷	GDR ⁸ (catch/day tonnage (kg))
	RT ²	PST ³		A ⁴	B ⁵			
1965	0.80	-	-	0.80	-	-	-	-
1966	0.77	-	-	0.77	-	-	-	-
1967	0.70	-	-	0.70	-	-	-	-
1968	0.65	-	-	0.65	-	-	-	-
1969	0.53	-	-	0.53	-	-	-	-
1970	0.53	-	-	0.53	-	169	0.50	-
1971	0.46	-	-	0.46	-	172	0.43	-
1972	0.37	-	-	0.37	-	116	0.33	-
1973	0.37	-	0.34	0.36	-	83	0.36	-
1974	0.40	-	0.36	0.38	-	100	0.36	-
1975	0.39	0.51	0.38	0.39	0.45	99	0.37	-
1976	0.40	0.56	0.33	0.37	0.45	100	0.34	-
1977	0.27	0.41	0.33	0.30	0.37	96	0.26	-
1978	0.21	0.32	0.21	0.21	0.27	123	0.17	-
1979	0.23	0.35	0.28	0.26	0.32	67	0.19	-
1980	0.24	0.33	0.32	0.28	0.33	47	0.25	-
1981	0.30	0.36	0.36	0.33	0.36	42	0.28	-
1982	0.26	0.45	0.41	0.34	0.43	39	0.37	-
1983	0.26	0.40	0.35	0.31	0.38	58	0.32	-
1984	0.27	0.41	0.32	0.30	0.37	59	0.30	-
1985	0.28	0.52	0.37	0.33	0.45	44	0.37	-
1986	0.23	0.42	0.37	0.30	0.40	57	0.32	-
1987	0.25	0.50	0.35	0.30	0.43	44	0.35	-
1988	0.20	0.30	0.31	0.26	0.31	63	0.26	4.26
1989	0.20	0.30	0.26	0.23	0.28	73	0.19	2.95
1990	-	0.20	0.27	-	0.24	95	0.16	1.66
1991	-	-	0.24	-	-	124	0.17	-
1992 ¹	-	-	0.40	-	-	22	0.27	-

¹ Provisional.

² Side trawlers, 800-1000 hp. From 1983 onwards, side trawlers (SRTM), 1,000 hp.

³ Stern trawlers, up to 2,000 HP.

⁴ Arithmetic average of CPUE from USSR RT (or SRTM trawlers) and Norwegian trawlers.

⁵ Arithmetic average of CPUE from USSR PST and Norwegian trawlers.

⁶ For the years 1981-1990, based on average CPUE type B. For 1991-1992, based on the Norwegian CPUE.

⁷ Total catch (t) of seven years and older fish divided by total effort.

⁸ For the years 1988-1989, frost-trawlers 995 BRT (FAO Code 095). For 1990, factory trawlers FVS IV, 1943 BRT (FAO Code 090).

⁹ Norwegian trawlers, ISSCFV-code 07, 250-499.9 GRT.

¹⁰ Based on 10% legal by-catches and research fishing.

Table 7.6

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

GREENLAND HALIBUT : USSR - NORWAY EFFORT (hours trawling) AND TR (code: FLT04)

Year	Effort	Catch, age 3	Catch, age 4	Catch, age 5	Catch, age 6	Catch, age 7
1984	1	2924	8573	6847	5657	4345
1985	1	4294	6674	8793	8622	3920
1986	1	1967	7314	4671	1754	2301
1987	1	3076	4409	4786	3141	964
1988	1	6191	6696	12289	2396	6015
1989	1	7200	8500	6590	2660	1670
1990	1	5050	7130	7730	4490	2330
1991	1	3080	6720	9270	5450	2800
1992	1	338	1190	3520	4420	2280

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

CATCH AT AGE FROM NORWEGIAN TRAWL FISHERY (code: FLT08) (Catch: Number)

Year	Effort	Catch, age 6	Catch, age 7	Catch, age 8	Catch, age 9	Catch, age 10	Catch, age 11	Catch, age 12
1979	3542	26	123	66	53	32	64	55
1980	5029	14	95	90	55	25	107	64
1981	8936	89	263	148	103	110	183	109
1982	8077	192	252	206	129	142	122	100
1983	14476	30	154	336	295	333	129	60
1984	14116	70	193	219	268	241	128	193
1985	14768	40	169	239	438	379	269	199
1986	15774	202	308	265	244	361	223	202
1987	12333	446	821	375	117	188	92	46
1988	16526	794	1123	715	295	73	25	54
1989	29152	1554	1359	586	276	57	88	57
1990	49622	3160	2895	997	606	145	145	178
1991	78075	2837	3412	1430	402	616	403	270
1992	6345	398	462	265	49	144	40	31

Table 7.7

VPA Version 3.1 (MSDOS)

1-Sep-93 20:02

Extended Survivors Analysis

Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

CPUE data from file /users/ifad/ifapwork/wg_108/ghal_nor/FLEET.045

Data for 2 fleets over 22 years

Age range from 3 to 14

Fleet,	Alpha,	Beta
FLT04: GREENLAND HAL	, .650	, .750
FLT08: CATCH AT AGE	, .000	, 1.000

Time series weights :

Tapered time weighting applied
Power = 3 over 20 years

Catchability analysis :

Catchability independent of stock size for all ages

Catchability independent of age for ages \geq 13

Terminal population estimation :

Survivor estimates shrunk towards the mean F
of the final 2 years or the 5 oldest ages.

S.E. of the mean to which the estimates are shrunk = 2.000

Minimum standard error for population
estimates derived from each fleet = .300

Prior weighting not applied

Tuning converged after 175 iterations

Total absolute residual between iterations

74 and 175 = .000

Continued

Table 7.7 Continued

Regression weights
 , .482, .579, .670, .751, .820, .877, .921, .954, .976, .990, .997, 1.000, 1.000

Fishing mortalities

Age,	1979,	1980,	1981,	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991
3,	.004,	.003,	.026,	.002,	.011,	.000,	.004,	.005,	.002,	.000,	.005,	.004,	.013
4,	.044,	.014,	.056,	.026,	.059,	.002,	.019,	.047,	.018,	.009,	.028,	.022,	.062
5,	.105,	.044,	.120,	.080,	.090,	.055,	.061,	.086,	.072,	.044,	.097,	.077,	.104
6,	.194,	.068,	.148,	.124,	.148,	.304,	.229,	.223,	.205,	.200,	.298,	.337,	.166
7,	.231,	.141,	.149,	.131,	.210,	.405,	.336,	.331,	.373,	.327,	.467,	.525,	.484
8,	.209,	.161,	.104,	.125,	.346,	.335,	.312,	.325,	.348,	.368,	.274,	.438,	.457
9,	.087,	.232,	.076,	.228,	.211,	.253,	.264,	.371,	.248,	.396,	.222,	.303,	.367
10,	.070,	.107,	.155,	.272,	.280,	.246,	.394,	.445,	.482,	.467,	.166,	.192,	.495
11,	.087,	.145,	.144,	.454,	.230,	.203,	.183,	.338,	.270,	.542,	.205,	.186,	.423
12,	.077,	.103,	.145,	.207,	.493,	.155,	.172,	.180,	.196,	.373,	.249,	.436,	.788
13,	.075,	.097,	.195,	.168,	.141,	.300,	.097,	.209,	.103,	.182,	.227,	.112,	.388
14,	.080,	.137,	.076,	.073,	.141,	.099,	.336,	.252,	.056,	.100,	.281,	.261,	1.582

XSA population numbers

YEAR ,	3,	AGE 4,	5,	6,	7,	8,	9,	10,				
1979 ,	2.49E+04,	2.22E+04,	2.40E+04,	1.92E+04,	1.43E+04,	7.05E+03,	6.37E+03,	5.08E+03,	3.82E+03,	3.55E+03,	1.53E+03,	6.35
1980 ,	2.63E+04,	2.14E+04,	1.83E+04,	1.86E+04,	1.36E+04,	9.75E+03,	4.92E+03,	5.02E+03,	4.07E+03,	3.02E+03,	2.83E+03,	1.22
1981 ,	2.75E+04,	2.26E+04,	1.81E+04,	1.50E+04,	1.50E+04,	1.02E+04,	7.15E+03,	3.36E+03,	3.89E+03,	3.03E+03,	2.34E+03,	2.21
1982 ,	2.67E+04,	2.31E+04,	1.84E+04,	1.38E+04,	1.12E+04,	1.11E+04,	7.90E+03,	5.70E+03,	2.47E+03,	2.90E+03,	2.26E+03,	1.66
1983 ,	3.03E+04,	2.29E+04,	1.93E+04,	1.46E+04,	1.05E+04,	8.43E+03,	8.45E+03,	5.42E+03,	3.74E+03,	1.35E+03,	2.03E+03,	1.64
1984 ,	3.02E+04,	2.58E+04,	1.86E+04,	1.52E+04,	1.08E+04,	7.34E+03,	5.13E+03,	5.89E+03,	3.52E+03,	2.56E+03,	7.11E+02,	1.52
1985 ,	2.68E+04,	2.60E+04,	2.22E+04,	1.51E+04,	9.67E+03,	6.23E+03,	4.52E+03,	3.43E+03,	3.96E+03,	2.48E+03,	1.89E+03,	4.54
1986 ,	3.15E+04,	2.30E+04,	2.19E+04,	1.80E+04,	1.04E+04,	5.94E+03,	3.93E+03,	2.99E+03,	1.99E+03,	2.84E+03,	1.79E+03,	1.47
1987 ,	3.33E+04,	2.70E+04,	1.89E+04,	1.73E+04,	1.24E+04,	6.41E+03,	3.70E+03,	2.33E+03,	1.65E+03,	1.22E+03,	2.04E+03,	1.25
1988 ,	4.23E+04,	2.86E+04,	2.28E+04,	1.51E+04,	1.21E+04,	7.34E+03,	3.90E+03,	2.48E+03,	1.24E+03,	1.08E+03,	8.63E+02,	1.59
1989 ,	4.43E+04,	3.64E+04,	2.44E+04,	1.88E+04,	1.07E+04,	7.54E+03,	4.37E+03,	2.26E+03,	1.34E+03,	6.21E+02,	6.42E+02,	6.20
1990 ,	3.86E+04,	3.79E+04,	3.05E+04,	1.91E+04,	1.20E+04,	5.76E+03,	4.93E+03,	3.01E+03,	1.65E+03,	9.40E+02,	4.16E+02,	4.41
1991 ,	2.77E+04,	3.31E+04,	3.19E+04,	2.43E+04,	1.17E+04,	6.12E+03,	3.20E+03,	3.14E+03,	2.14E+03,	1.18E+03,	5.23E+02,	3.20

Population estimates for 1992

, 0.00E+00, 2.35E+04, 2.68E+04, 2.48E+04, 1.77E+04, 6.22E+03, 3.33E+03, 1.91E+03, 1.64E+03, 1.21E+03, 4.60E+02, 3.05E

Taper weighted geometric mean of the VPA populations:

, 3.17E+04, 2.73E+04, 2.25E+04, 1.74E+04, 1.20E+04, 7.62E+03, 5.11E+03, 3.66E+03, 2.49E+03, 1.73E+03, 1.23E+03, 9.69E

Standard error of the weighted Log(VPA populations) :

, .1868, .1892, .1933, .1726, .1751, .2593, .3389, .3791, .4756, .5678, .6523, .6

Continued

Table 7.7 Continued

Log catchability residuals.

Fleet : FLT04: GREENLAND HAL

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
3						-.18	.33	-.62	-.23	.23	.34	.12	-.03
4						.34	.09	.32	-.36	-.01	.00	-.22	-.11
5						.16	.24	-.36	-.20	.53	-.12	-.19	-.04
6						.61	.98	-.79	-.18	-.32	-.36	.17	.00
7						.53	.50	-.11	-1.13	.69	-.36	-.11	.07
8	No data for this fleet at this age												
9	No data for this fleet at this age												
10	No data for this fleet at this age												
11	No data for this fleet at this age												
12	No data for this fleet at this age												

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q	-2.0502	-1.3328	-1.0183	-1.2777	-1.0589					
S.E	.3282	.2427	.2931	.5584	.5916					

Regression statistics :

Age, Slope, Intercept, S.e., RSquare, No Pts, Fleet Mean Q

3	.61	5.36	.20	.52	8	-2.05
4	3.91	-24.70	.86	.05	8	-1.33
5	1.31	-1.74	.41	.22	8	-1.02
6	-17.88	161.84	10.30	.00	8	-1.28
7	-.81	16.05	.49	.04	8	-1.06

Fleet : FLT08: CATCH AT AGE

Age	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
3	No data for this fleet at this age												
4	No data for this fleet at this age												
5	No data for this fleet at this age												
6	-.84	-1.84	-.31	.63	-1.85	-.95	-1.58	-.20	.86	1.28	1.21	1.39	.51
7	-.11	-.72	-.37	-.02	-1.00	-.69	-.79	-.32	.74	.76	.58	.71	.43
8	-.14	-.53	-.67	-.32	-.03	-.30	-.11	-.02	.51	.74	-.10	.24	.10
9	-.25	-.23	-.63	-.33	-.16	.29	.86	.40	-.08	.56	-.26	-.09	-.49
10	-.54	-1.11	.22	.11	.43	.03	1.05	1.09	.95	-.36	-1.21	-1.09	.00
11	.29	.42	.43	.72	-.33	-.26	.31	.82	.33	-.85	-.39	-.64	-.22
12	.04	.02	-.01	.08	-.12	.28	.30	.12	-.26	-.19	-.21	.07	-.04

Mean catchability and Standard error.

Age	3	4	5	6	7	8	9	10	11	12
Mean Q				-13.7692	-12.6275	-12.5308	-12.5981	-12.5915	-12.4375	-12.2686
S.E				1.2088	.6666	.3891	.4454	.8279	.5442	.1835

Regression statistics :

Age, Slope, Intercept, S.e., RSquare, No Pts, Fleet Mean Q

6	.31	10.98	.37	.17	13	-13.77
7	.42	10.72	.28	.17	13	-12.63
8	-20.16	-64.46	6.81	.00	13	-12.53
9	1.72	15.54	.77	.15	13	-12.60
10	.91	12.19	.79	.18	13	-12.59
11	.66	10.83	.34	.66	13	-12.44
12	.83	11.43	.12	.96	13	-12.27

Table 7.8

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 1	Catch numbers at age Numbers*10**-3		
YEAR,	1970,	1971,	1972,
AGE			
3,	1,	1,	1,
4,	34,	1,	461,
5,	526,	80,	1109,
6,	2792,	4486,	3521,
7,	10464,	12712,	9605,
8,	18562,	12283,	6438,
9,	10034,	6130,	2775,
10,	6671,	4339,	1734,
11,	2517,	2703,	1368,
12,	1250,	1660,	1234,
13,	616,	1044,	675,
14,	1104,	300,	200,
+gp,	281,	143,	80,
TOTALNUM,	54852,	45882,	29201,
TONSLAND,	89484,	79034,	43055,
SOPCOF %,	94,	104,	97,

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	1,	1,	22,	1,	62,	78,	88,	64,	664,	48,
4,	19,	276,	334,	98,	755,	532,	887,	275,	1146,	551,
5,	212,	917,	840,	830,	2037,	1897,	2218,	731,	1896,	1304,
6,	1117,	2519,	2337,	2982,	3255,	3589,	3155,	1138,	1917,	1494,
7,	3923,	6204,	6520,	5824,	4200,	4118,	2727,	1665,	1919,	1276,
8,	3515,	3838,	4118,	5002,	2524,	2365,	1234,	1341,	933,	1208,
9,	2551,	1834,	2265,	3000,	1610,	1509,	495,	944,	484,	1493,
10,	1919,	1942,	1654,	1350,	1104,	946,	319,	473,	448,	1258,
11,	1536,	1622,	1857,	915,	1062,	934,	296,	511,	482,	838,
12,	1127,	1338,	1536,	1212,	858,	438,	243,	275,	380,	502,
13,	716,	734,	1122,	698,	595,	349,	103,	242,	384,	324,
14,	251,	531,	600,	526,	384,	147,	45,	145,	150,	108,
+gp,	126,	216,	368,	358,	180,	112,	51,	78,	62,	46,
TOTALNUM,	17013,	21972,	23573,	22796,	18626,	17014,	11861,	7882,	10865,	10450,
TONSLAND,	29938,	37763,	38172,	36074,	28827,	24617,	17312,	13284,	15018,	16789,
SOPCOF %,	92,	98,	88,	92,	100,	104,	100,	108,	102,	98,

Continued

Table 7.8 Continued

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 1	Catch numbers at age Numbers*10**-3									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
3,	314,	0,	88,	141,	50,	5,	216,	152,	344,	148,
4,	1212,	36,	461,	985,	435,	233,	933,	777,	1844,	573,
5,	1543,	915,	1219,	1672,	1212,	907,	2101,	2097,	2931,	1143,
6,	1864,	3698,	2874,	3335,	2972,	2540,	4498,	5062,	3441,	1142,
7,	1851,	3350,	2561,	2712,	3572,	3141,	3692,	4551,	4173,	918,
8,	2287,	1938,	1548,	1531,	1746,	2096,	1674,	1894,	2083,	647,
9,	1491,	1064,	972,	1128,	752,	1182,	809,	1197,	912,	324,
10,	1228,	1191,	1037,	997,	828,	860,	321,	489,	1136,	537,
11,	713,	602,	614,	530,	362,	481,	230,	259,	685,	169,
12,	488,	340,	363,	434,	202,	313,	127,	308,	595,	129,
13,	247,	171,	161,	314,	186,	133,	121,	41,	156,	70,
14,	201,	132,	120,	305,	63,	140,	141,	94,	236,	82,
+gp,	64,	71,	63,	239,	7,	47,	28,	43,	457,	47,
TOTALNUM,	13503,	13508,	12081,	14323,	12387,	12078,	14891,	16964,	18993,	5929,
TONSLAND,	22147,	21883,	19945,	22875,	19112,	19587,	20559,	22765,	29569,	8437,
SOPCOF %,	95,	100,	98,	96,	100,	99,	101,	100,	101,	99,

Table 7.9

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 2	Catch weights at age (kg)		
YEAR,	1970,	1971,	1972,
AGE			
3,	.2000,	.2000,	.2000,
4,	.4410,	.4410,	.4410,
5,	.5670,	.5670,	.5670,
6,	.7370,	.7370,	.7370,
7,	1.0790,	1.0790,	1.0790,
8,	1.4210,	1.4210,	1.4210,
9,	1.8480,	1.8480,	1.8480,
10,	2.2810,	2.2810,	2.2810,
11,	2.8870,	2.8870,	2.8870,
12,	3.2470,	3.2470,	3.2470,
13,	4.3030,	4.3030,	4.3030,
14,	4.9310,	4.9310,	4.9310,
+gp,	5.7940,	5.8410,	6.0370,
SOPCOFAC,	.9435,	1.0434,	.9707,

Table 2	Catch weights at age (kg)									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	.2000,	.2000,	.2000,	.2000,	.2000,	.2000,	.3000,	.2000,	.2000,	.2700,
4,	.4410,	.4410,	.4410,	.4410,	.4410,	.4410,	.6000,	.4820,	.5000,	.6200,
5,	.5670,	.5670,	.5670,	.5670,	.5670,	.5670,	.9000,	.7020,	.6600,	.6900,
6,	.7370,	.7370,	.7370,	.7370,	.7370,	.7370,	1.2000,	.8720,	.8400,	.8400,
7,	1.0790,	1.0790,	1.0790,	1.0790,	1.0790,	1.0790,	1.5000,	1.1410,	1.1500,	1.0300,
8,	1.4210,	1.4210,	1.4210,	1.4210,	1.4210,	1.4210,	1.8000,	1.4680,	1.5600,	1.3100,
9,	1.8480,	1.8480,	1.8480,	1.8480,	1.8480,	1.8480,	2.2000,	1.7780,	2.0400,	1.7400,
10,	2.2810,	2.2810,	2.2810,	2.2810,	2.2810,	2.2810,	2.6000,	2.3020,	2.5700,	2.2400,
11,	2.8870,	2.8870,	2.8870,	2.8870,	2.8870,	2.8870,	3.0000,	2.6640,	2.9800,	2.7700,
12,	3.2470,	3.2470,	3.2470,	3.2470,	3.2470,	3.2470,	3.5000,	3.0460,	3.4300,	3.3700,
13,	4.3030,	4.3030,	4.3030,	4.3030,	4.3030,	4.3030,	4.1000,	3.3680,	4.1300,	4.3200,
14,	4.9310,	4.9310,	4.9310,	4.9310,	4.9310,	4.9310,	4.8000,	4.2850,	4.6800,	5.3500,
+gp,	6.0060,	5.9640,	5.9100,	5.9230,	6.0270,	5.9060,	6.1760,	5.3460,	5.9990,	5.8330,
SOPCOFAC,	.9229,	.9794,	.8774,	.9245,	.9974,	1.0375,	1.0029,	1.0766,	1.0169,	.9829,

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 2	Catch weights at age (kg)									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
3,	.3100,	.3000,	.3000,	.3400,	.3070,	.4140,	.3100,	.2800,	.2900,	.2300,
4,	.4500,	.4800,	.3800,	.4700,	.5740,	.5540,	.6300,	.5500,	.6000,	.4500,
5,	.7500,	.6300,	.6000,	.6200,	.7090,	.7400,	.7600,	.7100,	.7700,	.6900,
6,	1.0400,	.9600,	.8900,	.9200,	1.0030,	.9620,	1.0300,	1.0600,	1.0500,	.9800,
7,	1.3400,	1.1800,	1.2000,	1.2800,	1.2660,	1.2490,	1.3200,	1.2900,	1.3800,	1.2900,
8,	1.5700,	1.5300,	1.8500,	1.9000,	1.6830,	1.6260,	1.8000,	1.7000,	1.7500,	1.8200,
9,	1.9700,	2.3100,	2.5900,	2.4800,	2.4820,	2.1640,	2.4200,	2.1000,	2.2000,	2.2700,
10,	2.7300,	2.8700,	3.1800,	3.1100,	2.9820,	2.8970,	3.1300,	2.6100,	2.6000,	2.6300,
11,	3.2900,	3.4600,	3.6200,	3.3500,	3.5470,	3.4060,	3.3700,	2.8700,	2.7900,	3.1300,
12,	4.2200,	3.7700,	3.9500,	3.7200,	3.8000,	3.6610,	4.0500,	3.4500,	3.2800,	3.6600,
13,	4.7100,	3.9900,	4.4800,	4.0000,	4.5600,	4.2470,	4.2900,	3.7200,	3.8900,	3.8300,
14,	6.0800,	4.3500,	4.2500,	4.1800,	5.0020,	4.1870,	4.5000,	4.0900,	4.3800,	4.3100,
+gp,	6.1220,	4.5250,	4.8250,	4.5260,	5.9530,	4.4630,	4.7200,	4.5200,	5.2900,	4.8900,
SOPCOFAC,	.9513,	1.0001,	.9760,	.9572,	.9976,	.9907,	1.0123,	1.0010,	1.0071,	.9854,

Table 7.10

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 5	Proportion mature at age		
YEAR,	1970,	1971,	1972,
AGE			
3,	.0000,	.0000,	.0000,
4,	.0500,	.0500,	.0500,
5,	.2300,	.2300,	.2300,
6,	.4900,	.4900,	.4900,
7,	.6600,	.6600,	.6600,
8,	.7800,	.7800,	.7800,
9,	.8900,	.8900,	.8900,
10,	.9500,	.9500,	.9500,
11,	.9900,	.9900,	.9900,
12,	.9900,	.9900,	.9900,
13,	.9900,	.9900,	.9900,
14,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,

Table 5	Proportion mature at age									
YEAR,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,	1982,
AGE										
3,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
4,	.0500,	.0500,	.0500,	.0500,	.0500,	.0500,	.0500,	.0500,	.0500,	.0500,
5,	.2300,	.2300,	.2300,	.2300,	.2300,	.2300,	.2300,	.2300,	.2300,	.2300,
6,	.4900,	.4900,	.4900,	.4900,	.4900,	.4900,	.4900,	.4900,	.4900,	.4900,
7,	.6600,	.6600,	.6600,	.6600,	.6600,	.6600,	.6600,	.6600,	.6600,	.6600,
8,	.7800,	.7800,	.7800,	.7800,	.7800,	.7800,	.7800,	.7800,	.7800,	.7800,
9,	.8900,	.8900,	.8900,	.8900,	.8900,	.8900,	.8900,	.8900,	.8900,	.8900,
10,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,	.9500,
11,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,
12,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,
13,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,	.9900,
14,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:17

Table 5	Proportion mature at age									
YEAR,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	1992,
AGE										
3,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,	.0000,
4,	.0500,	.0500,	.0500,	.0500,	.0500,	.0200,	.0300,	.0500,	.0500,	.0500,
5,	.2300,	.2300,	.2300,	.2300,	.2300,	.1100,	.1400,	.2000,	.2000,	.2000,
6,	.4900,	.4900,	.4900,	.4900,	.4900,	.5100,	.5300,	.5900,	.5900,	.5900,
7,	.6600,	.6600,	.6600,	.6600,	.6600,	.6700,	.6600,	.7000,	.7000,	.7000,
8,	.7800,	.7800,	.7800,	.7800,	.7800,	.6800,	.6900,	.7200,	.7200,	.7200,
9,	.8900,	.8900,	.8900,	.8900,	.8900,	.8000,	.7300,	.7600,	.7600,	.7600,
10,	.9500,	.9500,	.9500,	.9500,	.9500,	.9200,	.8600,	.8500,	.8500,	.8500,
11,	.9900,	.9900,	.9900,	.9900,	.9900,	.9800,	.9600,	.9400,	.9400,	.9400,
12,	.9900,	.9900,	.9900,	.9900,	.9900,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
13,	.9900,	.9900,	.9900,	.9900,	.9900,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
14,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,
+gp,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,	1.0000,

Table 7.11

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:04

Terminal Fs derived using XSA (With F shrinkage)

Table 8 YEAR,	Fishing mortality (F) at age	
	1970,	1971,
AGE		
3,	.0000,	.0000,
4,	.0009,	.0000,
5,	.0135,	.0026,
6,	.0648,	.1448,
7,	.2800,	.4371,
8,	.6397,	.5811,
9,	.5490,	.4213,
10,	.5227,	.4582,
11,	.4384,	.3904,
12,	.4291,	.5476,
13,	.5362,	.7340,
14,	.4979,	.5132,
+gp,	.4979,	.5132,
FBAR 6-10,	.4113,	.4085,

Table 8 YEAR,	Fishing mortality (F) at age									
	1972,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,
AGE										
3,	.0000,	.0000,	.0000,	.0007,	.0000,	.0020,	.0033,	.0038,	.0026,	.0264,
4,	.0118,	.0006,	.0097,	.0140,	.0035,	.0283,	.0203,	.0441,	.0140,	.0562,
5,	.0306,	.0064,	.0331,	.0350,	.0415,	.0884,	.0875,	.1047,	.0441,	.1196,
6,	.1417,	.0371,	.0922,	.1049,	.1587,	.2145,	.2098,	.1945,	.0681,	.1478,
7,	.4903,	.2195,	.2795,	.3431,	.3861,	.3304,	.4333,	.2308,	.1411,	.1485,
8,	.3894,	.3134,	.3271,	.2859,	.4538,	.2709,	.2960,	.2092,	.1605,	.1039,
9,	.2318,	.2474,	.2525,	.3083,	.3287,	.2418,	.2435,	.0875,	.2317,	.0758,
10,	.1889,	.2352,	.2854,	.3581,	.2878,	.1820,	.2067,	.0701,	.1070,	.1553,
11,	.2394,	.2409,	.3016,	.4572,	.3240,	.3636,	.2184,	.0871,	.1452,	.1435,
12,	.2921,	.2996,	.3224,	.4898,	.5789,	.5393,	.2359,	.0767,	.1035,	.1451,
13,	.4223,	.2596,	.3070,	.4632,	.4060,	.5929,	.4123,	.0754,	.0967,	.1946,
14,	.2759,	.2575,	.2949,	.4174,	.3869,	.3857,	.2643,	.0795,	.1372,	.0759,
+gp,	.2759,	.2575,	.2949,	.4174,	.3869,	.3857,	.2643,	.0795,	.1372,	.0759,
FBAR 6-10,	.2884,	.2105,	.2473,	.2801,	.3230,	.2479,	.2778,	.1584,	.1417,	.1263,

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:04

Terminal Fs derived using XSA (With F shrinkage)

Table 8 YEAR,	Fishing mortality (F) at age										
	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,	FBAR 89-91
AGE											
3,	.0019,	.0112,	.0000,	.0035,	.0048,	.0016,	.0001,	.0053,	.0043,	.0135,	.0077,
4,	.0261,	.0587,	.0015,	.0193,	.0472,	.0175,	.0088,	.0280,	.0223,	.0619,	.0374,
5,	.0795,	.0899,	.0545,	.0610,	.0858,	.0717,	.0438,	.0973,	.0771,	.1042,	.0929,
6,	.1237,	.1479,	.3037,	.2288,	.2231,	.2047,	.1995,	.2982,	.3369,	.1658,	.2669,
7,	.1314,	.2101,	.4047,	.3363,	.3311,	.3726,	.3269,	.4667,	.5248,	.4840,	.4918,
8,	.1245,	.3461,	.3347,	.3118,	.3252,	.3475,	.3679,	.2737,	.4377,	.4573,	.3896,
9,	.2276,	.2110,	.2530,	.2635,	.3706,	.2476,	.3958,	.2224,	.3032,	.3671,	.2976,
10,	.2716,	.2801,	.2459,	.3944,	.4452,	.4823,	.4672,	.1663,	.1923,	.4952,	.2846,
11,	.4541,	.2300,	.2035,	.1827,	.3384,	.2700,	.5418,	.2046,	.1859,	.4232,	.2712,
12,	.2067,	.4925,	.1547,	.1721,	.1798,	.1964,	.3730,	.2492,	.4359,	.7880,	.4910,
13,	.1680,	.1407,	.2999,	.0965,	.2091,	.1033,	.1816,	.2270,	.1122,	.3879,	.2424,
14,	.0728,	.1414,	.0985,	.3356,	.2524,	.0557,	.1000,	.2813,	.2613,	1.5816,	.7081,
+gp,	.0728,	.1414,	.0985,	.3356,	.2524,	.0557,	.1000,	.2813,	.2613,	1.5816,	.7081,
FBAR 6-10,	.1758,	.2390,	.3084,	.3070,	.3391,	.3309,	.3515,	.2855,	.3590,	.3939,	

Table 7.12

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:04

Terminal Fs derived using XSA (With F shrinkage)

Table 10 YEAR,	Stock number at age (start of year)		Numbers*10**-3
	1970,	1971,	
AGE			
3,	53475,	49240,	
4,	38909,	46025,	
5,	42244,	33458,	
6,	47971,	35872,	
7,	46180,	38699,	
8,	42338,	30039,	
9,	25599,	19220,	
10,	17664,	12724,	
11,	7643,	9015,	
12,	3862,	4243,	
13,	1600,	2164,	
14,	3034,	806,	
+gp,	767,	381,	
TOTAL,	331285,	281886,	

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3				
	1972,	1973,	1974,	1975,	1976,	1977,	1978,	1979,	1980,	1981,
AGE										
3,	41020,	35925,	30132,	35168,	33882,	33192,	25845,	24905,	26320,	27516,
4,	42381,	35305,	30920,	25934,	30249,	29162,	28511,	22173,	21354,	22595,
5,	39613,	36050,	30370,	26357,	22012,	25945,	24399,	24046,	18261,	18124,
6,	28723,	33067,	30832,	25289,	21906,	18176,	20441,	19241,	18639,	15039,
7,	26713,	21455,	27424,	24200,	19598,	16088,	12624,	14264,	13634,	14987,
8,	21515,	14081,	14827,	17849,	14780,	11465,	9951,	7045,	9747,	10190,
9,	14460,	12545,	8859,	9201,	11542,	8081,	7526,	6371,	4919,	7145,
10,	10856,	9871,	8431,	5923,	5818,	7151,	5462,	5078,	5024,	3358,
11,	6926,	7735,	6716,	5455,	3564,	3755,	5131,	3823,	4075,	3885,
12,	5251,	4692,	5233,	4275,	2972,	2219,	2247,	3550,	3016,	3033,
13,	2112,	3375,	2993,	3262,	1895,	1767,	1293,	682,	635,	1219,
14,	894,	1192,	2241,	1895,	1767,	1293,	682,	635,	1219,	2211,
+gp,	356,	596,	907,	1155,	1196,	603,	518,	718,	654,	912,
TOTAL,	240820,	215889,	199884,	185965,	171542,	158563,	144450,	133375,	129693,	131337,

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4

At 1-Sep-93 20:04

Terminal Fs derived using XSA (With F shrinkage)

Table 10 YEAR,	Stock number at age (start of year)					Numbers*10**-3					GMST	
	1982,	1983,	1984,	1985,	1986,	1987,	1988,	1989,	1990,	1991,		1992,
AGE												
3,	26657,	30348,	30156,	26828,	31509,	33321,	42304,	44290,	38616,	27709,	0,	327
4,	23067,	22899,	25830,	25955,	23010,	26989,	28633,	36407,	37920,	33096,	23530,	282
5,	18384,	19343,	18585,	22199,	21912,	18891,	22826,	24429,	30470,	31918,	26775,	245
6,	13841,	14614,	15217,	15147,	17976,	17309,	15135,	18805,	19077,	24280,	24753,	209
7,	11166,	10527,	10849,	9667,	10371,	12378,	12141,	10670,	12013,	11723,	17706,	165
8,	11119,	8427,	7343,	6230,	5944,	6410,	7340,	7536,	5759,	6117,	6219,	115
9,	7905,	8449,	5131,	4523,	3926,	3696,	3898,	4373,	4933,	3200,	3333,	78
10,	5701,	5419,	5889,	3430,	2991,	2332,	2483,	2258,	3013,	3135,	1908,	57
11,	2475,	3740,	3525,	3964,	1990,	1649,	1239,	1340,	1646,	2140,	1645,	40
12,	2897,	1353,	2557,	2475,	2842,	1221,	1084,	621,	940,	1176,	1206,	28
13,	2258,	2028,	711,	1886,	1794,	2044,	863,	642,	416,	523,	460,	18
14,	1659,	1643,	1516,	454,	1474,	1253,	1586,	620,	441,	320,	305,	13
+gp,	705,	522,	814,	237,	1150,	139,	531,	123,	201,	608,	164,	
TOTAL,	127833,	129311,	128124,	122994,	126888,	127632,	140065,	152113,	155444,	145946,	108005,	

Table 7.13

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: B4,

At 1-Sep-93 20:04

Table 16 Summary (without SOP correction)

	Terminal Fs derived using XSA (With F shrinkage)					
	RECRUITS,	TOTALBIO,	TOTSPBIO,	LANDINGS,	YIELD/SSB,	FBAR 6-10,
1970,	53475,	345644,	244364,	89484,	.3662,	.4113,
1971,	49240,	279852,	193194,	79034,	.4091,	.4085,
1972,	41020,	234097,	158883,	43055,	.2710,	.2884,
1973,	35925,	217970,	151356,	29938,	.1978,	.2105,
1974,	30132,	211585,	149806,	37763,	.2521,	.2473,
1975,	35168,	193885,	137533,	38172,	.2775,	.2801,
1976,	33882,	170930,	118520,	36074,	.3044,	.3230,
1977,	33192,	146727,	97525,	28827,	.2956,	.2479,
1978,	25845,	134091,	88477,	24617,	.2782,	.2778,
1979,	24905,	164438,	103321,	17312,	.1676,	.1584,
1980,	26320,	133101,	89625,	13284,	.1482,	.1417,
1981,	27516,	145203,	101605,	15018,	.1478,	.1263,
1982,	26657,	137762,	91751,	16789,	.1830,	.1758,
1983,	30348,	148939,	100267,	22147,	.2209,	.2390,
1984,	30156,	135508,	88997,	21883,	.2459,	.3084,
1985,	26828,	126102,	82914,	19945,	.2406,	.3070,
1986,	31509,	131037,	82376,	22875,	.2777,	.3391,
1987,	33321,	125964,	72594,	19112,	.2633,	.3309,
1988,	42304,	128425,	62028,	19587,	.3158,	.3515,
1989,	44290,	133051,	58982,	20559,	.3486,	.2855,
1990,	38616,	129257,	61694,	22765,	.3690,	.3590,
1991,	27709,	136520,	68384,	29569,	.4324,	.3939,
Arith.						
Mean	34016,	168640,	109282,	30355,	.2733,	.2823,
Units,	(Thousands),	(Tonnes),	(Tonnes),	(Tonnes),		

Table 7.14

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)
 Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table: Input data

Year: 1993								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	10000.000	0.1500	0.0000	0.0000	0.0000	0.260	0.0251	0.260
4	8470.000	0.1500	0.0500	0.0000	0.0000	0.525	0.1156	0.525
5	6878.000	0.1500	0.2000	0.0000	0.0000	0.730	0.0732	0.730
6	21987.000	0.1500	0.5900	0.0000	0.0000	1.015	0.0792	1.015
7	20248.000	0.1500	0.7000	0.0000	0.0000	1.335	0.0894	1.335
8	14390.000	0.1500	0.7200	0.0000	0.0000	1.785	0.1846	1.785
9	4754.000	0.1500	0.7600	0.0000	0.0000	2.235	0.1720	2.235
10	2569.000	0.1500	0.8500	0.0000	0.0000	2.615	0.1712	2.615
11	1147.000	0.1500	0.9400	0.0000	0.0000	2.960	0.1821	2.960
12	1260.000	0.1500	1.0000	0.0000	0.0000	3.470	0.1901	3.470
13	919.000	0.1500	1.0000	0.0000	0.0000	3.860	0.2771	3.860
14	331.000	0.1500	1.0000	0.0000	0.0000	4.345	0.5293	4.345
15+	285.000	0.1500	1.0000	0.0000	0.0000	5.090	0.5293	5.090
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1994								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	10000.000	0.1500	0.0000	0.0000	0.0000	0.260	0.0251	0.260
4	.	0.1500	0.0500	0.0000	0.0000	0.525	0.1156	0.525
5	.	0.1500	0.2000	0.0000	0.0000	0.730	0.0732	0.730
6	.	0.1500	0.5900	0.0000	0.0000	1.015	0.0792	1.015
7	.	0.1500	0.7000	0.0000	0.0000	1.335	0.0894	1.335
8	.	0.1500	0.7200	0.0000	0.0000	1.785	0.1846	1.785
9	.	0.1500	0.7600	0.0000	0.0000	2.235	0.1720	2.235
10	.	0.1500	0.8500	0.0000	0.0000	2.615	0.1712	2.615
11	.	0.1500	0.9400	0.0000	0.0000	2.960	0.1821	2.960
12	.	0.1500	1.0000	0.0000	0.0000	3.470	0.1901	3.470
13	.	0.1500	1.0000	0.0000	0.0000	3.860	0.2771	3.860
14	.	0.1500	1.0000	0.0000	0.0000	4.345	0.5293	4.345
15+	.	0.1500	1.0000	0.0000	0.0000	5.090	0.5293	5.090
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1995								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	10000.000	0.1500	0.0000	0.0000	0.0000	0.260	0.0251	0.260
4	.	0.1500	0.0500	0.0000	0.0000	0.525	0.1156	0.525
5	.	0.1500	0.2000	0.0000	0.0000	0.730	0.0732	0.730
6	.	0.1500	0.5900	0.0000	0.0000	1.015	0.0792	1.015
7	.	0.1500	0.7000	0.0000	0.0000	1.335	0.0894	1.335
8	.	0.1500	0.7200	0.0000	0.0000	1.785	0.1846	1.785
9	.	0.1500	0.7600	0.0000	0.0000	2.235	0.1720	2.235
10	.	0.1500	0.8500	0.0000	0.0000	2.615	0.1712	2.615
11	.	0.1500	0.9400	0.0000	0.0000	2.960	0.1821	2.960
12	.	0.1500	1.0000	0.0000	0.0000	3.470	0.1901	3.470
13	.	0.1500	1.0000	0.0000	0.0000	3.860	0.2771	3.860
14	.	0.1500	1.0000	0.0000	0.0000	4.345	0.5293	4.345
15+	.	0.1500	1.0000	0.0000	0.0000	5.090	0.5293	5.090
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : HS2
 Date and time: 15OCT93:16:19

Table 7.15

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)
 Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Input data

Year: 1992								
Age	Stock size	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	10000.000	0.1500	0.0000	0.0000	0.0000	0.260	0.0161	0.260
4	8607.000	0.1500	0.0500	0.0000	0.0000	0.525	0.0743	0.525
5	26775.000	0.1500	0.2000	0.0000	0.0000	0.730	0.0470	0.730
6	24753.000	0.1500	0.5900	0.0000	0.0000	1.015	0.0509	1.015
7	17706.000	0.1500	0.7000	0.0000	0.0000	1.335	0.0574	1.335
8	6219.000	0.1500	0.7200	0.0000	0.0000	1.785	0.1186	1.785
9	3333.000	0.1500	0.7600	0.0000	0.0000	2.235	0.1105	2.235
10	1908.000	0.1500	0.8500	0.0000	0.0000	2.615	0.3590	2.615
11	1645.000	0.1500	0.9400	0.0000	0.0000	2.960	0.1170	2.960
12	1206.000	0.1500	1.0000	0.0000	0.0000	3.470	0.1221	3.470
13	460.000	0.1500	1.0000	0.0000	0.0000	3.860	0.1780	3.860
14	305.000	0.1500	1.0000	0.0000	0.0000	4.345	0.3400	4.345
15+	164.000	0.1500	1.0000	0.0000	0.0000	5.090	0.3680	5.090
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Year: 1993								
Age	Recruitment	Natural mortality	Maturity ogive	Prop.of F bef.spaw.	Prop.of M bef.spaw.	Weight in stock	Exploit. pattern	Weight in catch
3	10000.000	0.1500	0.0000	0.0000	0.0000	0.260	0.0161	0.260
4	.	0.1500	0.0500	0.0000	0.0000	0.525	0.0743	0.525
5	.	0.1500	0.2000	0.0000	0.0000	0.730	0.0470	0.730
6	.	0.1500	0.5900	0.0000	0.0000	1.015	0.0509	1.015
7	.	0.1500	0.7000	0.0000	0.0000	1.335	0.0574	1.335
8	.	0.1500	0.7200	0.0000	0.0000	1.785	0.1186	1.785
9	.	0.1500	0.7600	0.0000	0.0000	2.235	0.1105	2.235
10	.	0.1500	0.8500	0.0000	0.0000	2.615	0.3590	2.615
11	.	0.1500	0.9400	0.0000	0.0000	2.960	0.1170	2.960
12	.	0.1500	1.0000	0.0000	0.0000	3.470	0.1221	3.470
13	.	0.1500	1.0000	0.0000	0.0000	3.860	0.1780	3.860
14	.	0.1500	1.0000	0.0000	0.0000	4.345	0.3400	4.345
15+	.	0.1500	1.0000	0.0000	0.0000	5.090	0.3680	5.090
Unit	Thousands	-	-	-	-	Kilograms	-	Kilograms

Notes: Run name : HS1
 Date and time: 15OCT93:15:24

Continued

Table 7.15 Continued

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)
 Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Detailed tables

Year: 1992 F-factor: 1.0000 Reference F: 0.1393						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0161	148	39	10000	2600	0	0	0	0
4	0.0743	573	301	8607	4519	430	226	430	226
5	0.0470	1142	834	26775	19546	5355	3909	5355	3909
6	0.0509	1141	1159	24753	25124	14604	14823	14604	14823
7	0.0574	918	1225	17706	23638	12394	16546	12394	16546
8	0.1186	647	1155	6219	11101	4478	7993	4478	7993
9	0.1105	324	725	3333	7449	2533	5661	2533	5661
10	0.3590	537	1404	1908	4989	1622	4241	1622	4241
11	0.1170	169	500	1645	4869	1546	4577	1546	4577
12	0.1221	129	447	1206	4185	1206	4185	1206	4185
13	0.1780	70	269	460	1776	460	1776	460	1776
14	0.3400	82	356	305	1325	305	1325	305	1325
15+	0.3680	47	240	164	835	164	835	164	835
Total		5927	8653	103081	111955	45098	66097	45098	66097
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Year: 1993 F-factor: 1.0000 Reference F: 0.1393						1 January		Spawning time	
Age	Absolute F	Catch in numbers	Catch in weight	Stock size	Stock biomass	Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
3	0.0161	148	39	10000	2600	0	0	0	0
4	0.0743	564	296	8470	4447	423	222	423	222
5	0.0470	293	214	6878	5021	1376	1004	1376	1004
6	0.0509	1014	1029	21987	22317	12973	13167	12973	13167
7	0.0574	1050	1401	20248	27031	14173	18922	14173	18922
8	0.1186	1497	2671	14390	25685	10360	18493	10360	18493
9	0.1105	462	1034	4754	10625	3613	8075	3613	8075
10	0.3590	723	1890	2569	6717	2183	5709	2183	5709
11	0.1170	118	349	1147	3395	1078	3191	1078	3191
12	0.1221	135	467	1260	4371	1260	4371	1260	4371
13	0.1780	139	538	919	3546	919	3546	919	3546
14	0.3400	89	387	331	1440	331	1440	331	1440
15+	0.3680	82	416	285	1448	285	1448	285	1448
Total		6313	10731	93236	118643	48974	79589	48974	79589
Unit	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HS1
 Date and time : 15OCT93:15:24
 Computation of ref. F: Simple mean, age 6 - 10
 Prediction basis : F factors

Table 7.16

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)
 Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

Prediction with management option table

Year: 1993					Year: 1994					Year: 1995	
F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	F Factor	Reference F	Stock biomass	Sp.stock biomass	Catch in weight	Stock biomass	Sp.stock biomass
0.7906	0.1101	118648	79594	11500	0.0000	0.0000	120358	84618	0	132801	98054
.	0.0500	0.0070	.	84618	904	131785	97223
.	0.1000	0.0139	.	84618	1799	130780	96402
.	0.1500	0.0209	.	84618	2685	129786	95589
.	0.2000	0.0279	.	84618	3562	128801	94785
.	0.2500	0.0348	.	84618	4430	127826	93990
.	0.3000	0.0418	.	84618	5289	126861	93203
.	0.3500	0.0487	.	84618	6140	125905	92425
.	0.4000	0.0557	.	84618	6982	124959	91654
.	0.4500	0.0627	.	84618	7816	124022	90892
.	0.5000	0.0696	.	84618	8642	123095	90138
.	0.5500	0.0766	.	84618	9459	122177	89392
.	0.6000	0.0836	.	84618	10269	121267	88654
.	0.6500	0.0905	.	84618	11070	120367	87923
.	0.7000	0.0975	.	84618	11864	119475	87200
.	0.7500	0.1045	.	84618	12650	118592	86484
.	0.8000	0.1114	.	84618	13429	117717	85776
.	0.8500	0.1184	.	84618	14199	116851	85075
.	0.9000	0.1254	.	84618	14963	115993	84381
.	0.9500	0.1323	.	84618	15719	115144	83694
.	1.0000	0.1393	.	84618	16468	114302	83015
.	1.0500	0.1462	.	84618	17210	113469	82342
.	1.1000	0.1532	.	84618	17945	112643	81676
.	1.1500	0.1602	.	84618	18673	111825	81016
.	1.2000	0.1671	.	84618	19394	111015	80363
.	1.2500	0.1741	.	84618	20108	110213	79717
.	1.3000	0.1811	.	84618	20816	109418	79077
.	1.3500	0.1880	.	84618	21517	108630	78444
.	1.4000	0.1950	.	84618	22211	107850	77816
.	1.4500	0.2020	.	84618	22899	107077	77195
.	1.5000	0.2089	.	84618	23581	106311	76580
.	1.5500	0.2159	.	84618	24256	105553	75971
.	1.6000	0.2228	.	84618	24925	104801	75368
.	1.6500	0.2298	.	84618	25588	104056	74771
.	1.7000	0.2368	.	84618	26245	103318	74180
.	1.7500	0.2437	.	84618	26896	102586	73595
.	1.8000	0.2507	.	84618	27542	101862	73015
.	1.8500	0.2577	.	84618	28181	101144	72440
.	1.9000	0.2646	.	84618	28814	100432	71872
.	1.9500	0.2716	.	84618	29442	99727	71308
.	2.0000	0.2786	.	84618	30064	99028	70750
-	-	Tonnes	Tonnes	Tonnes	-	-	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes

Notes: Run name : HS2
 Date and time : 15OCT93:16:19
 Computation of ref. F: Simple mean, age 6 - 10
 Basis for 1993 : TAC constraints

Table 7.17

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)
 Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	1.0000	0.1393	8865	14286	93238	118648	48976	79594	48976	79594
1994	1.0000	0.1393	8781	15943	82049	117172	43816	82130	43816	82130
1995	1.0000	0.1393	8286	16397	72497	111578	38072	80753	38072	80753
1996	1.0000	0.1393	7089	14979	64735	102492	33370	76944	33370	76944
1997	1.0000	0.1393	6371	14046	59161	93566	29768	72428	29768	72428
1998	1.0000	0.1393	5953	13619	55029	85343	26528	66537	26528	66537
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HE1
 Date and time : 15OCT93:16:51
 Computation of ref. F: Simple mean, age 6 - 10
 Prediction basis : F factors

Greenland Halibut in the North-East Arctic (Fishing Areas I and II)
 Greenland Halibut in the North-East Arctic (Fishing Areas I and II)

Single option prediction: Summary table

Year	F Factor	Reference F	Catch in numbers	Catch in weight	Stock size	Stock biomass	1 January		Spawning time	
							Sp.stock size	Sp.stock biomass	Sp.stock size	Sp.stock biomass
1993	0.0000	0.0000	0	0	93238	118648	48976	79594	48976	79594
1994	0.0000	0.0000	0	0	90251	133496	49539	94951	49539	94951
1995	0.0000	0.0000	0	0	87679	146327	49504	109462	49504	109462
1996	0.0000	0.0000	0	0	85466	155382	50049	122940	50049	122940
1997	0.0000	0.0000	0	0	83562	162119	50513	134994	50513	134994
1998	0.0000	0.0000	0	0	81922	167776	50165	144079	50165	144079
Unit	-	-	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes	Thousands	Tonnes

Notes: Run name : HE1
 Date and time : 15OCT93:16:51
 Computation of ref. F: Simple mean, age 6 - 10
 Prediction basis : F factors

Table 8.1 Landings of Coastal cod in:

A) Norway in Division IIa - area: 05, 00, 06 and 07. (In '000 tonnes).

1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
43	32	30	40	46	24	29	33	47	52
1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
49	1	1	1	1	1	1	1	1	1
1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
40	49	42	38	33	28	26	31	22	17
1990	1991	1992							
24	25	41 ²							

¹No data ²Provisional data

B) USSR/Russia of Murman cod in USSR in Division I. (In '000 t)

1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
71	108	114	127	63	52	73	79	118	122
1970	1971	1972	1973	1974					
70	48	23	122	99					

Table 8.2 Length (cm) at age (year) for Coastal cod from the survey during the autumn of 1992.

Area	Age (year)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Målangen 0504	20,8	28,2	38,1	43,4	46,9	52,1	51,0	55,0		102,5	98,0				
West - Troms (1)	17,0	27,7	41,0	52,3	49,5	63,0	65,0	60,0	89,0		86,0				
Balsfjord 0539	20,8	25,8	34,4	41,8	47,3	58,0	55,0	80,5	73,5						
Ullsfjord 0428	18,9	26,6	33,0	39,7	42,5	50,4	60,3	55,5	60,0	92,0					
Lyngenfjord 0429	19,2	27,6	36,1	42,4	51,4	61,8	65,5		74,5	67,8					
Loppa - Sarsøya (2)	19,5	29,0	42,2	50,7	57,3	64,1	73,8	69,0	63,0		58,5				
Kvenangen 0427	19,2	27,5	34,7	44,3	56,1	63,1	62,4	63,9	69,5	79,0					111,0
Ræssa 0411,0412		31,5	45,4	54,4	58,8	63,2	66,5		87,0	66,0					
Altafjord 0415	18,7	29,2	37,8	45,4	51,8	56,8	60,0		58,0						
Revsbotn 0414	20,4	27,8	34,9	45,0	57,8	65,4	74,0		85,0						
Hjelmsøy (3)	18,2	28,2	39,3	52,5	57,5	65,7	68,0	69,3			62,0				
Steppen (4)	16,8	28,9	45,3	57,1	63,9	68,1	84,3	85,0	73,0	79,0					
Tanafjord 0305	18,0	27,6	36,0	49,2	54,3	59,1	61,0	58,5	59,3						
Porsanger 0324	19,3	28,0	34,4	46,3	49,2	54,7	55,7	58,6	58,6	57,9	56,3		60,0		
Østhavet (5)	14,0	28,5	41,4	54,9	64,6	68,6	68,5		78,5						
Laksefjord 0325	18,0	30,3	37,4	47,0	53,4	57,8	60,4								
Varanger 0302	17,0	26,4	40,9	53,7	61,0	64,4	70,5	69,0	63,2	82,0					

(1) includes 0530,0531,0535,0401,0402,0403,0409,0410

(2) includes 0404,0405,0413

(3) includes 0424,0425,0428

(4) includes 0310,0311,0312

(5) includes 0306,0307,0308,0313,0301,0303

Table 8.3 Weight (gram) at age (year) for Coastal cod from the survey during the autumn of 1992.

Area	Age (year)														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Målangen 0504	81	212	455	833	1061	1523	1393	1640		12100	9950				
West - Troms (1)	35	230	693	1286	1504	2727	2675	1960	7343		5140				
Balsfjord 0539	72	152	378	710	1063	1828	1350	4465	4100						
Ullsfjord 0428	65	177	345	670	803	1317	2153	1710	2380	7885					
Lyngenfjord 0429	57	189	455	766	1385	2343	2763		3810	5101					
Loppa - Sarsøya (2)	60	228	695	1221	1784	2414	3635	3345	2346		1620				
Kvenangen 0427	62	183	392	812	1709	2431	2296	2703	2941	4080					15500
Ræssa 0411,0412		296	875	1507	1909	2499	2895		7643	2760					
Altafjord 0415	58	225	465	817	1404	1786	2163		2195						
Revsbotn 0414	44	147	340	840	1867	2638	4000		5370						
Hjelmsøy (3)	48	193	549	1301	1780	2710	2667	3050			2220				
Steppen (4)	33	216	843	1665	2380	2963	5307	5050	3660	4230					
Tanafjord 0305	50	218	442	1176	1611	2082	2471	1775	2105						
Porsanger 0324	65	205	376	1014	1236	1683	1626	2068	2025	1941	1846		1860		
Østhavet (5)	20	195	680	1626	2582	3098	2415		4100						
Laksefjord 0325	40	239	489	961	1430	1566	2044								
Varanger 0302	11	170	657	1432	2180	2479	3508	3200	2473	6660					

(1) includes 0530,0531,0535,0401,0402,0403,0409,0410

(2) includes 0404,0405,0413

(3) includes 0424,0425,0428

(4) includes 0310,0311,0312

(5) includes 0306,0307,0308,0313,0301,0303

Table 8.4 . Percent maturity at age (year) for Coastal cod from the survey during the autumn of 1992.

Area	Age (year)															N
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Malangen 0504	0	0	3	11	50	85	86	100		100	100					244
West - Troms (1)	0	0	33	57	80	100	100	100	100		100					113
Balefjord 0539	0	0	17	55	50	80	100	100	100		100					377
Ullsfjord 0428	0	0	5	53	75	75	100	100	100	100						364
Lyngenfjord 0429	0	0	2	34	84	100	100		100	100						320
Loppa - Sarøya (2)	0	0	3	8	70	92	100	100	100		100					112
Kvenangen 0427	0	0	0	23	78	95	100	86	100	100				100		309
Roasa 0411,0412	0	0	9	72	90	100	100		100	100						174
Altafjord 0415	0	2	10	46	83	92	100		100							141
Revsbotn 0414	0	0	5	31	93	100	100		100							111
Hjelmsøy (3)	0	0	7	15	68	72	67	100			100					161
Steppen (4)	0	0	0	42	8	86	100	100	100	100						93
Tanaifjord 0305	0	0	4	22	71	92	100	100	100							227
Porsanger 0324	0	0	1	17	64	94	100	100	100	93	100		100			245
Østhavet (5)	0	0	8	59	89	94	100		100							163
Laksefjord 0325	0	0	8	47	85	98	100									209
Varanger 0302	0	0	6	41	72	63	100	100	100	100						324

- (1) includes 0530,0531,0535,0401,0402,0403,0409,0410
- (2) includes 0404,0405,0413
- (3) includes 0424,0425,0426
- (4) includes 0310,0311,0312
- (5) includes 0306,0307,0308,0313,0301,0303

Tot. N = 4407 othol.
 Coastal cod = 83,7 %
 N-E Arctic cod = 16,3 %

Table 8.5 Biomass (tonnes) of Coastal cod and N-E Arctic cod in each yearclass from the survey during the autumn of 1992 .

Area	Age (year)															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
Malangen 0540	3	31	46	57	302	85	28	5		66	28					651
West - Troms (1)	4	74	668	3108	5381	7927	224	586	833	355	562					19722
Balefjord 0539	6	51	76	336	343	59	15	43	123							1052
Ullsfjord 0428	10	43	64	243	708	72	29	15	11	71						1266
Lyngenfjord 0429	19	182	257	178	1069	771	53		113	303						2945
Loppa - Sarøya (2)	30	115	792	753	1981	1469	134	326	548		63					6211
Kvenangen 0427	4	68	118	183	393	445	134	112	104	48					91	1700
Roasa 0411,0412		60	585	1656	2821	1171	265	125	340	44						7067
Altafjord 0415	19	168	135	148	276	288	77		25							1136
Revsbotn 0414	9	61	286	290	604	624	253	111	189							2427
Hjelmsøy (3)	14	143	1466	1290	3318	640	486	729	166		59					8311
Steppen (4)	5	174	675	3922	4642	1832	628	964	209	142						13193
Tanaifjord 0305	1	88	247	471	796	574	252	21	70							2520
Porsanger 0324		98	771	789	1276	2281	529	381	532	696	557		62			7979
Østhavet (5)	107	251	2098	6691	6799	3973	381	0	1182							21482
Laksefjord 0325	2	11	192	509	778	507		57								2056
Varanger 0302	28	295	2486	3621	3669	876	673	311	485	307						12751
TOTAL	268	1913	10962	24245	35156	23594	4161	3786	4930	2032	1269	0	62	0	91	112469

- (1) includes 0530,0531,0535,0401,0402,0403,0409,0410
- (2) includes 0404,0405,0413
- (3) includes 0424,0425,0426
- (4) includes 0310,0311,0312
- (5) includes 0306,0307,0308,0313,0301,0303

Table 8.6 Biomass (tonnes) of Coastal cod in each yearclass from the survey during the autumn of 1992.

Area	Age (year)															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
Malangen 0540	3	31	40	57	208	85	28	5		66	28					551
West - Troms (1)	4	74	369	2077	4629	5546	149	586	833		562					14829
Balsfjord 0539	6	51	70	292	280	28	4	43	40							814
Utsifjord 0428	7	30	42	112	416	50	20	11	8	50						746
Lyngholmen 0429	18	182	257	174	1043	771	53		90	303						2891
Loppa - Serøya (2)	23	115	777	614	1687	1189	61	157	548		63					5234
Kvenangen 0427	3	64	113	158	367	430	120	112	104	31					91	1593
Roasa 0411,0412		60	466	886	1713	854	114	125		44						4262
Altafjord 0415	14	151	108	125	239	248	75		25							985
Revsbotn 0414	9	61	286	290	604	624	87	111	117							2189
Hjelmsøy (3)	14	92	1200	1081	2129	455	282	337	166		59					5815
Steppen (4)	5	85	420	1957	1721	846	338	226	67	142						5807
Tanaifjord 0305	1	79	227	358	568	573	223	9	70							2108
Porsanger 0324	6	86	503	505	1003	1754	433	305	468	613	491		55			6222
Østhavet (5)	18	176	1823	3231	4409	3497	132									13286
Laksefjord 0325	2	11	192	481	699	473										1858
Varanger 0302	28	278	2285	2336	1936	551	436	149	173	307						8479
TOTAL	161	1626	9178	14734	23651	17974	2555	2176	2709	1556	1203	0	55	0	91	77669

(1) includes 0530,0531,0535,0401,0402,0403,0409,0410

(2) includes 0404,0405,0413

(3) includes 0424,0425,0426

(4) includes 0310,0

(5) includes 0306,0307,0308,0313,0301,0303

Table 8.7 Numbers (x1000) of Coastal cod in each yearclass from the survey during the autumn of 1992.

Area	Age (year)															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
Malangen 0540	37	146	88	68	196	56	20	3		6	3					623
West - Troms (1)	114	322	532	1615	3078	2034	56	299	113		109					8272
Balsfjord 0539	83	336	185	411	263	15	3	10	10							1316
Utsifjord 0428	108	169	122	167	518	38	9	6	3	6						1146
Lyngholmen 0429	316	963	565	227	753	329	19		24	59						3255
Loppa - Serøya (2)	383	504	1118	503	946	493	17	47	234		39					4284
Kvenangen 0427	48	350	288	195	215	177	52	41	35	8					6	1415
Roasa 0411,0412		203	533	588	897	342	39			16						2618
Altafjord 0415	241	671	232	153	170	139	35		11							1652
Revsbotn 0414	205	415	841	345	324	237	22		22							2411
Hjelmsøy (3)	292	477	2186	831	1196	168	106	110			27					5393
Steppen (4)	152	394	498	1175	723	286	64	45	18	34						3389
Tanaifjord 0305	20	362	514	304	353	275	90	5	33							1956
Porsanger 0324	92	420	1338	498	811	1042	266	147	231	316	266		30			5457
Østhavet (5)	900	903	2681	1987	1708	1129	55									9363
Laksefjord 0325	50	46	397	501	489	302	0									1785
Varanger 0302	636	1635	3478	1631	888	222	124	47	70	46						8777
TOTAL	3677	8316	15596	11199	13528	7284	977	760	804	491	444	0	30	0	6	63112

(1) includes 0530,0531,0535,0401,0402,0403,0409,0410

(2) includes 0404,0405,0413

(3) includes 0424,0425,0426

(4) includes 0310,0311,0312

(5) includes 0306,0307,0308,0313,0301,0303

Table 8.8 Spawning Stock Biomass (tonnes) of Coastal cod in each yearclass from the survey during the autumn of 1992.

Area	Age (year)															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
Malangen 0540			1	6	123	72	24	5		68	28					327
West - Troms (1)			122	1184	3703	5546	149	586	833		562					12685
Balsfjord 0539			12	161	210	22	4	43	40							492
Ullsfjord 0428			2	59	349	38	20	11	8	50						537
Lyngholmen 0429			5	59	730	771	53		90	303						2011
Loppa - Serøya (2)			23	49	1181	1094	61	157	548		63					3176
Kvenangen 0427				36	286	409	120	96	104	31					91	1173
Røasa 0411,0412			42	638	1541	854	114	125		44						3358
Allafjord 0415		3	11	58	198	228	75		25							598
Revsboin 0414			14	90	562	626	87	111	117							1607
Hjelmsøy (3)			84	162	1448	328	189	337	166		59					2773
Steppen (4)				822	138	728	338	226	67	142						2461
Tanafjord 0305			9	79	403	527	223	9	70							1320
Porsanger 0324			5	86	642	1649	433	305	468	570	491		55			4704
ØstHAVet (5)			146	1906	3924	3287	132									9395
Laksefjord 0325			16	226	594	464										1300
Varanger 0302			137	958	1393	347	436	149	173	307						3900
TOTAL	0	3	629	6579	17425	16990	2458	2160	2709	1515	1203	0	55	0	91	51817

(1) includes 0530,0531,0535,0401,0402,0403,0409,0410

(2) includes 0404,0405,0413

(3) includes 0424,0425,0426

(4) includes 0310,0311,0312

(5) includes 0306,0307,0308,0313,0301,0303

Table 8.9 Spawning Stock (in numbers x 1000) of Coastal cod in each yearclass from the survey during the autumn of 1992.

Area	Age (year)															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	
Malangen 0540			2	7	116	47	17	3		6	3					201
West - Troms (1)			176	921	2462	2034	56	299	113		109					6170
Balsfjord 0539			32	227	198	12	3	10	10							492
Ullsfjord 0428			6	88	435	29	9	6	3	6						582
Lyngholmen 0429			11	77	527	329	19		24	59						1046
Loppa - Serøya (2)			33	40	662	453	17	47	234		39					1525
Kvenangen 0427				44	167	168	52	36	35	8					6	516
Røasa 0411,0412			48	423	807	342	39			16						1675
Allafjord 0415		13	24	71	141	128	35		11							423
Revsboin 0414			41	107	301	237	22		22							730
Hjelmsøy (3)			153	125	813	121	71	110			27					1420
Steppen (4)				494	58	246	64	45	18	34						959
Tanafjord 0305			20	67	250	253	90	5	33							718
Porsanger 0324			13	85	519	980	266	147	231	294	266		30			2831
ØstHAVet (5)			215	1172	1520	1061	55									4023
Laksefjord 0325			33	235	415	296										979
Varanger 0302			209	669	639	140	124	47	70	46						1944
TOTAL	0	13	1016	4852	10030	6876	939	755	804	469	444	0	30	0	6	26234

(1) includes 0530,0531,0535,0401,0402,0403,0409,0410

(2) includes 0404,0405,0413

(3) includes 0424,0425,0426

(4) includes 0310,0311,0312

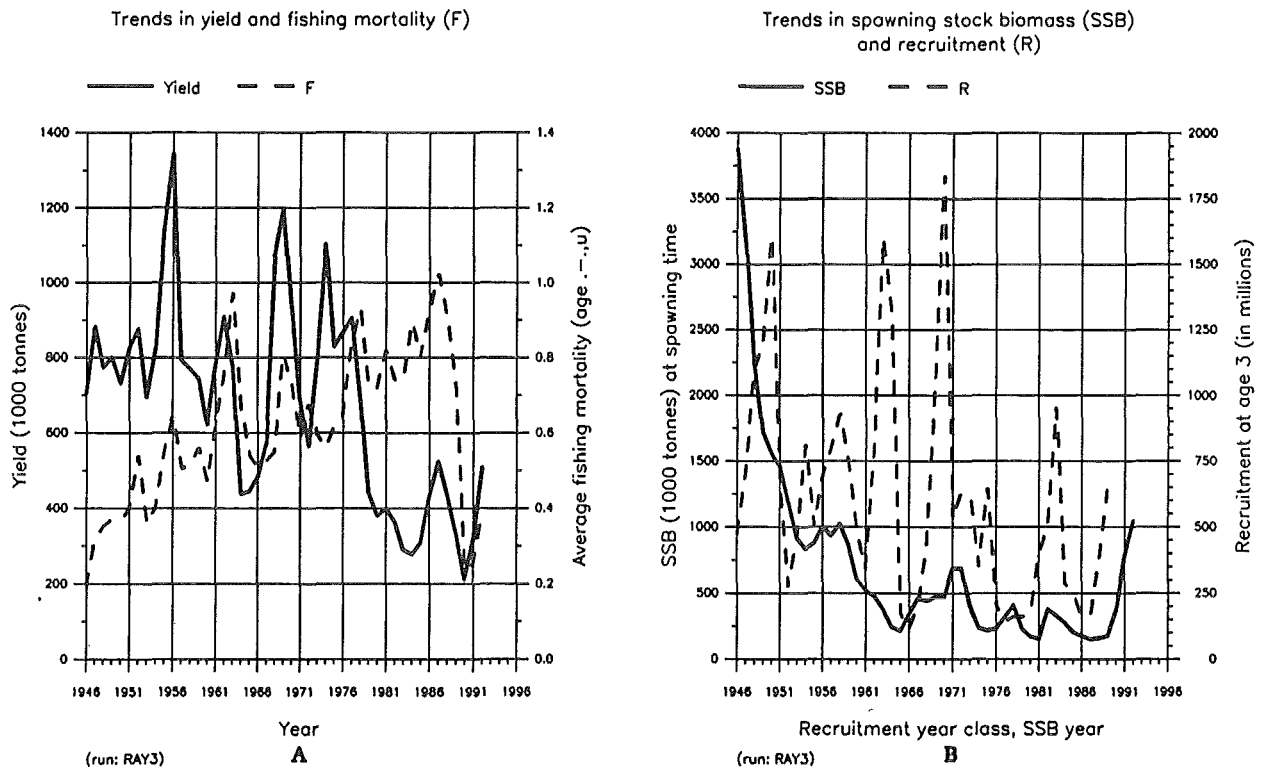
(5) includes 0306,0307,0308,0313,0301,0303

Table 8.10

Coastal cod W.G. 1993.			SHOT forecast spreadsheet version 3														
Division IIa			1993 SEPTEMBER, 1.														
running recruitment weights			G=0,41 (From coastal cod age 3-7, table 8.2). M=0,2.														
	older	0.25					G-M=	0,21									
	central	0.50					exp(d)	1,23						91SEP	92SEP		
	younger	0.25					exp(d/2)	1,11						W.G.	W.G.		
														1992	1993		
Year	Land-ings	Recrt Index	W'td Index	Y/B Ratio	Hang-over	Act'l Prodn	Est'd Prodn	Est'd SQC	Act'l Expl	Est'd Expl	Est'd Land-ings	F	Est'd Land-ings	Est'd Land-ings			
1980	40	1		0,60	0,57							0,80					
1981	49	1	1	0,60	0,57	44						0,80					
1982	42	1	1	0,60	0,57	23						0,80					
1983	38	1	1	0,60	0,57	23						0,80					
1984	33	1	1	0,49	0,69	30	30	40	67	67	33	0,60					
1985	28	1	1	0,40	0,79	24	25	35	70	71	28	0,45					
1986	26	1	1	0,33	0,87	24	26	32	80	81	26	0,35					
1987	31	1	1	0,32	0,88	28	27	31	97	96	31	0,34					
1988	22	1	1	0,20	1,01	24	25	35	109	111	22	0,20					
1989	17	1	1	0,13	1,09	25	25	27	135	136	17	0,12					
1990	24	1	1	0,14	1,08	29	26	22	177	175	24	0,13					
1991	25	1	1	0,12	1,11	24	25	29	216	218	25	0,11	26				
1992	41	1	1	0,15	1,06	26	26	31	265	265	41	0,15	28	27			
1993		1	1	0,15	1,06		20	47		302	47	0,15		30			
1994		1	1	0,15	1,06		13	51		333	51	0,15					

Figure 3.1

FISH STOCK SUMMARY
STOCK: Cod in the North - East Arctic (Fishing Areas I and II)
1 - 9 - 1993



FISH STOCK SUMMARY
STOCK: Cod in the North - East Arctic (Fishing Areas I and II)
12 - 10 - 1993

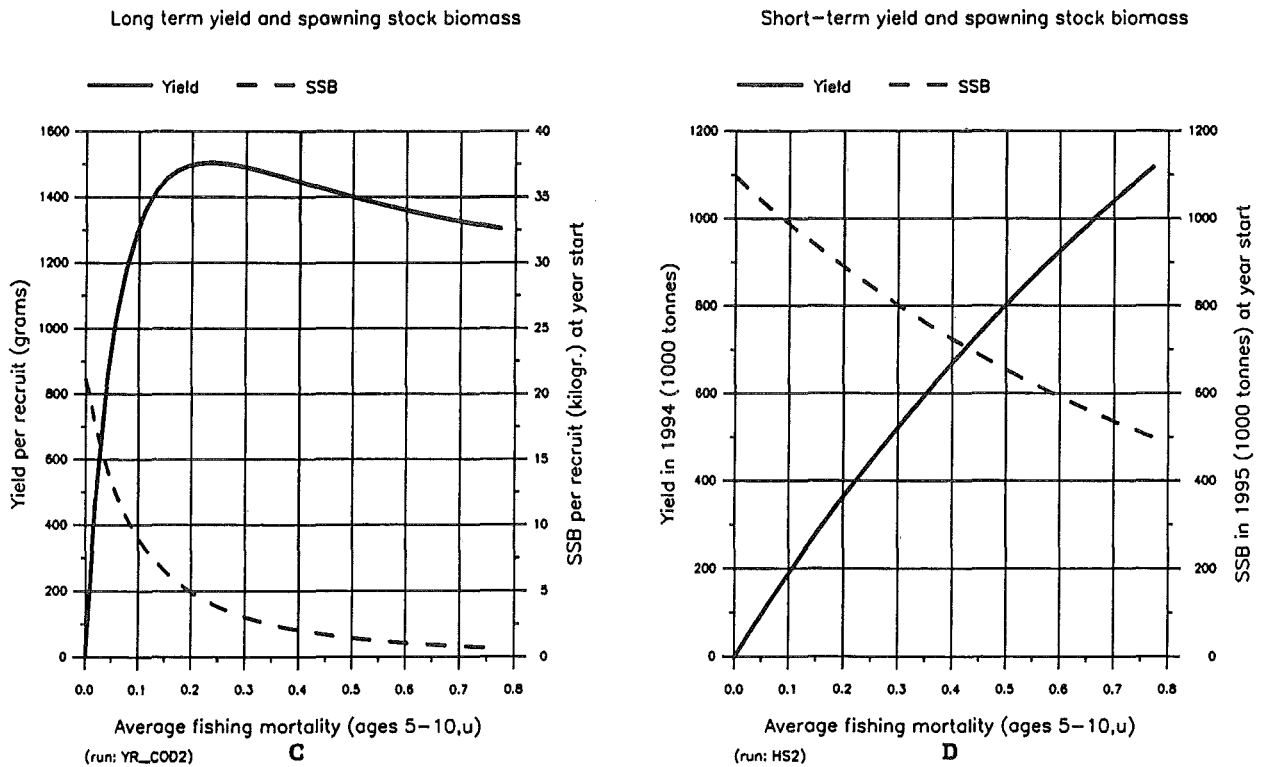


Figure 3.2

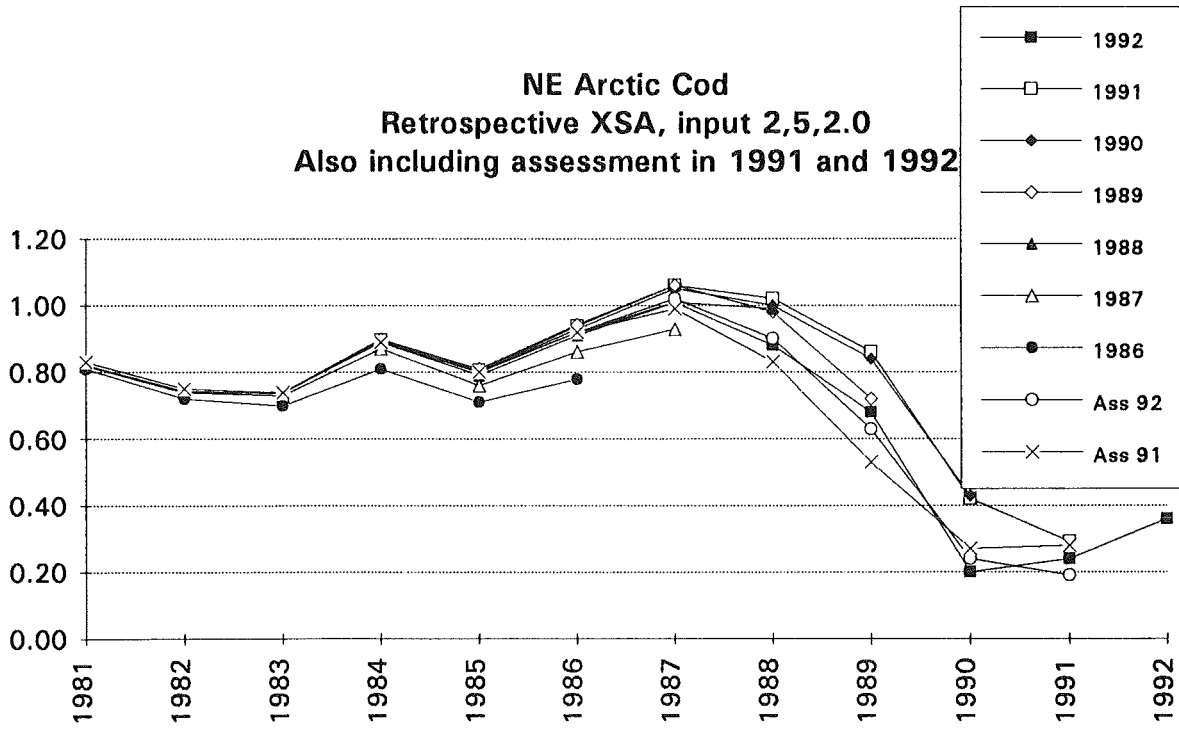
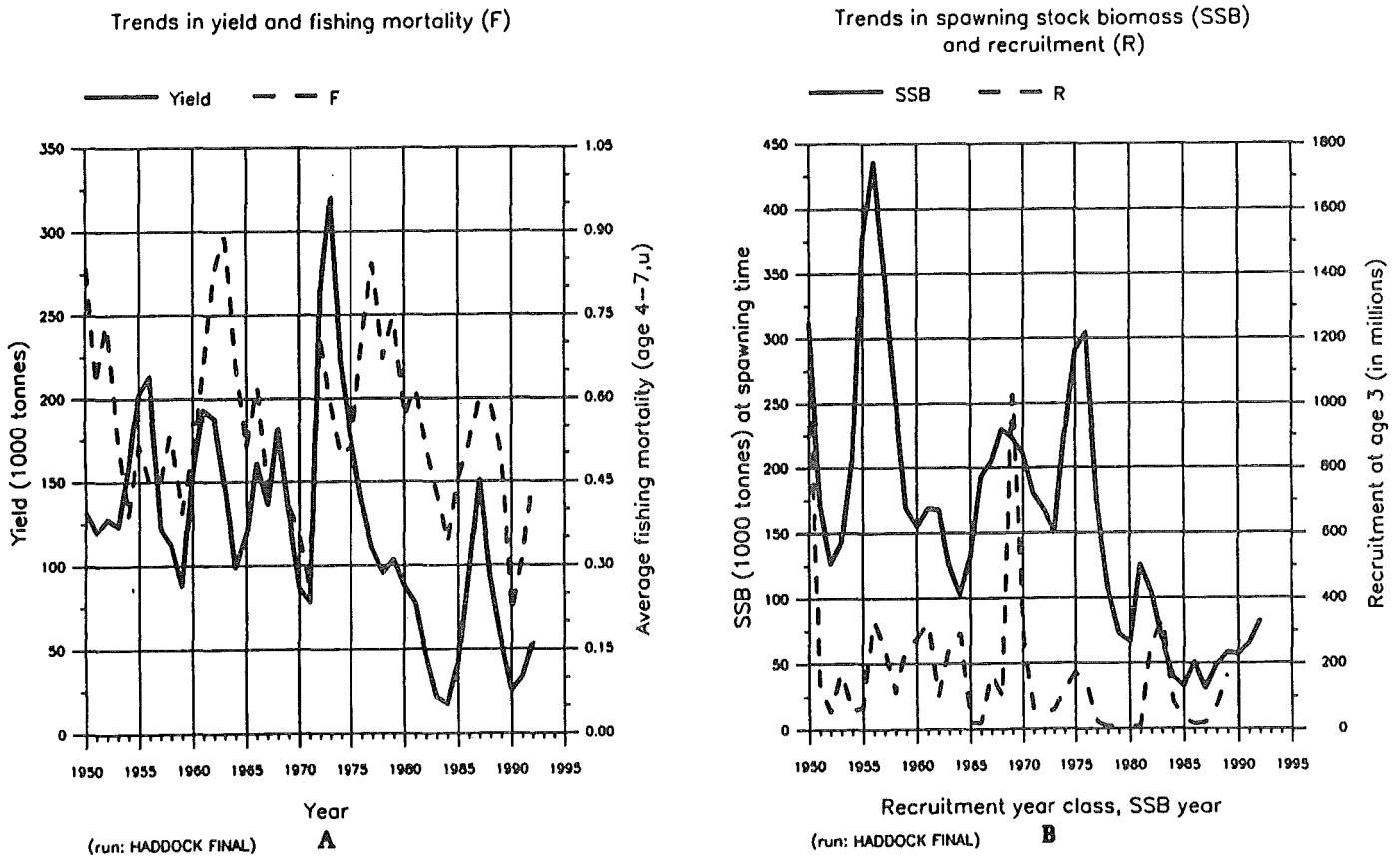


Figure 4.1

FISH STOCK SUMMARY
STOCK: Haddock in the North-East Arctic (Fishing Areas I and II)
31-8-1993



FISH STOCK SUMMARY
STOCK: Haddock in the North-East Arctic (Fishing Areas I and II)
1-9-1993

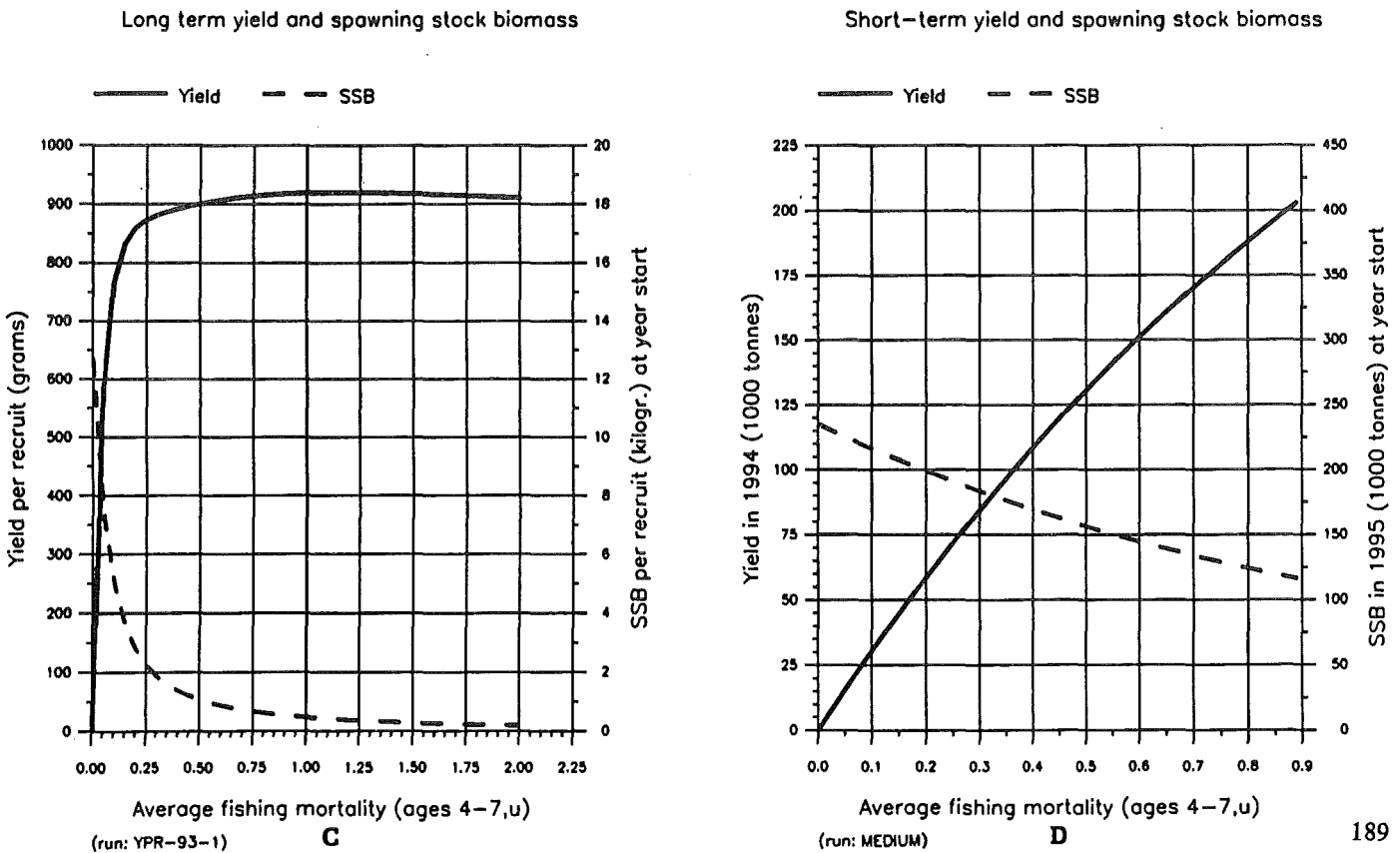


Figure 4.2

NE Arctic Haddock
Retrospective XSA, input 2,5,0.7
Fbar 4-7

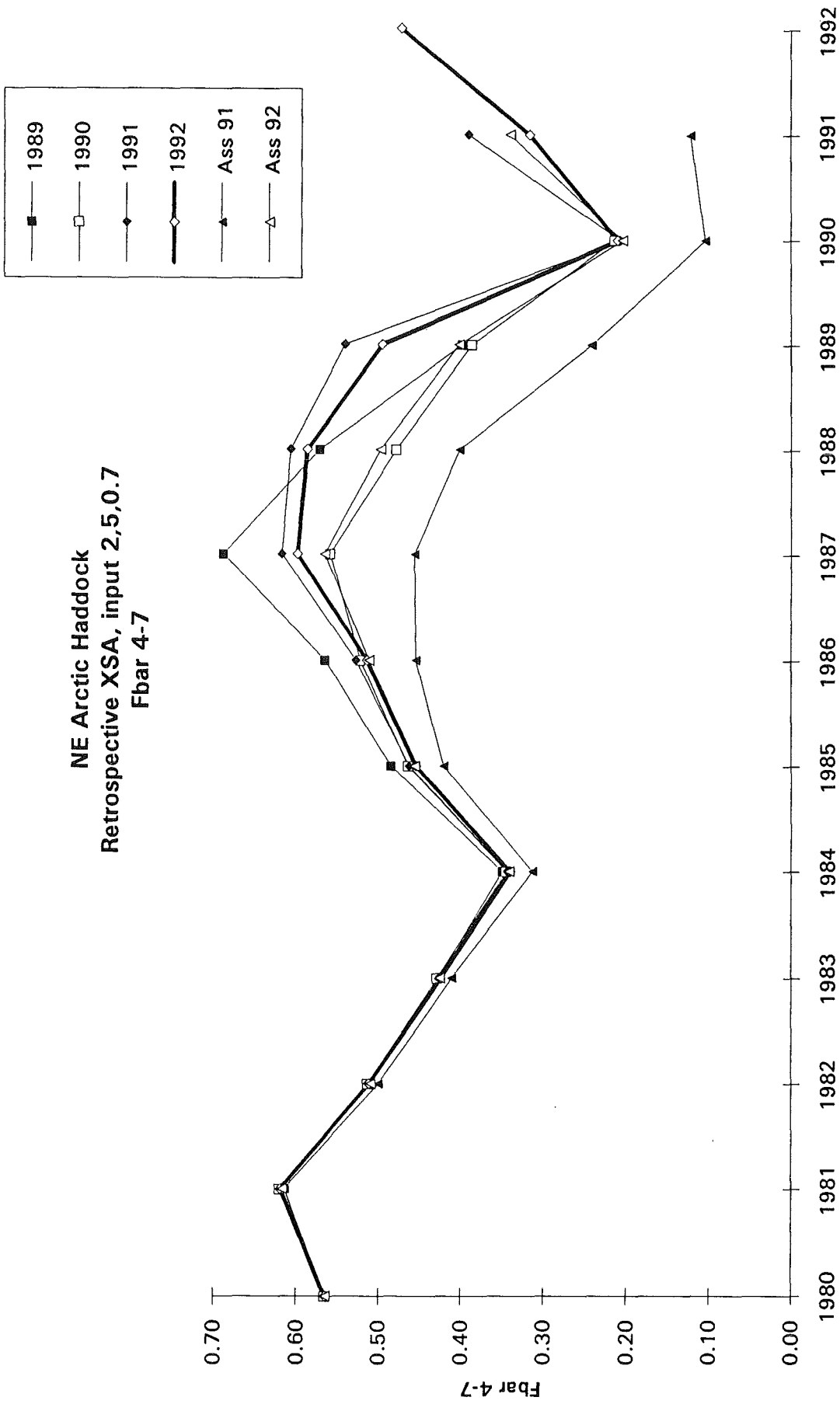


Figure 5.1

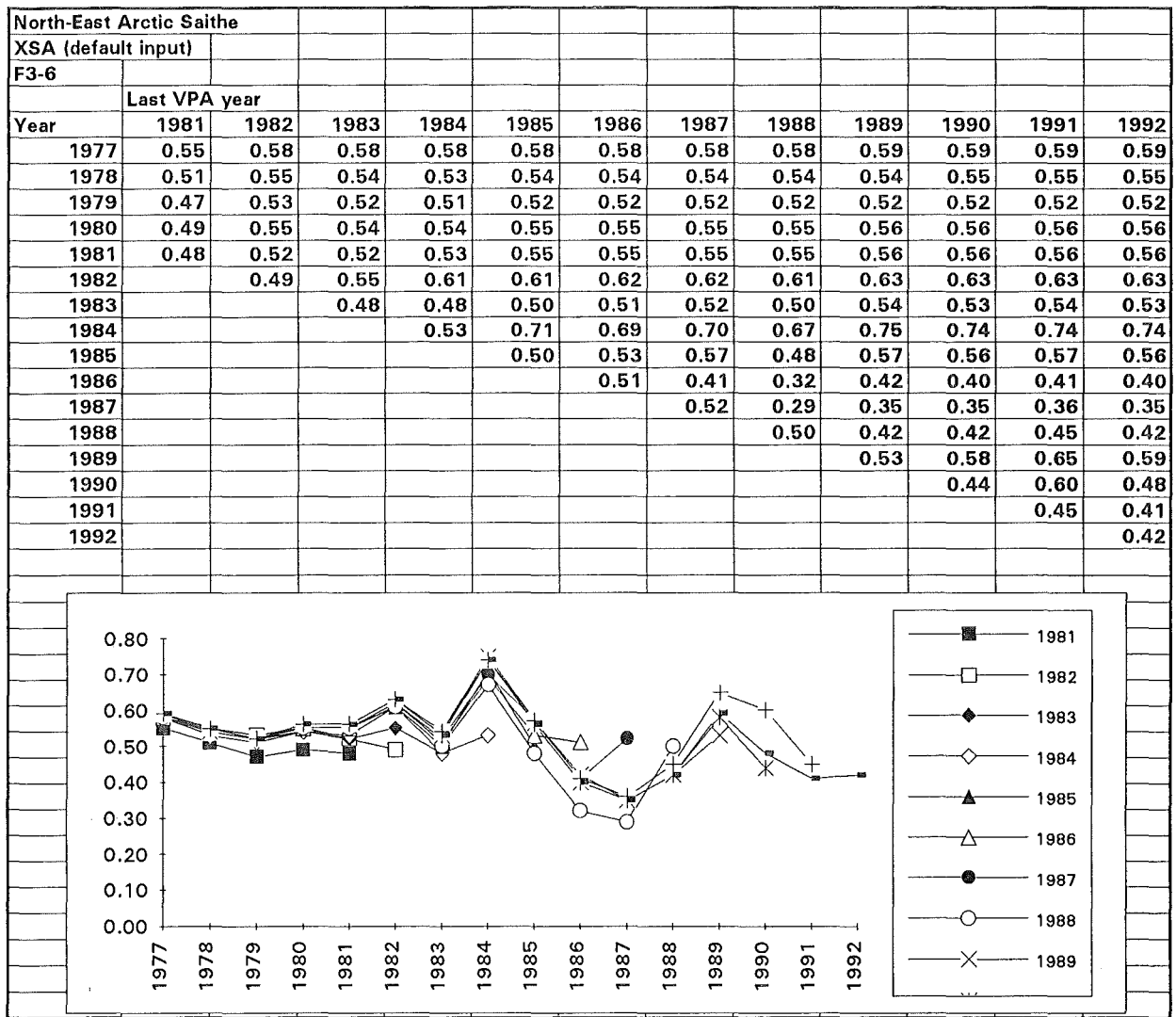


Figure 5.2

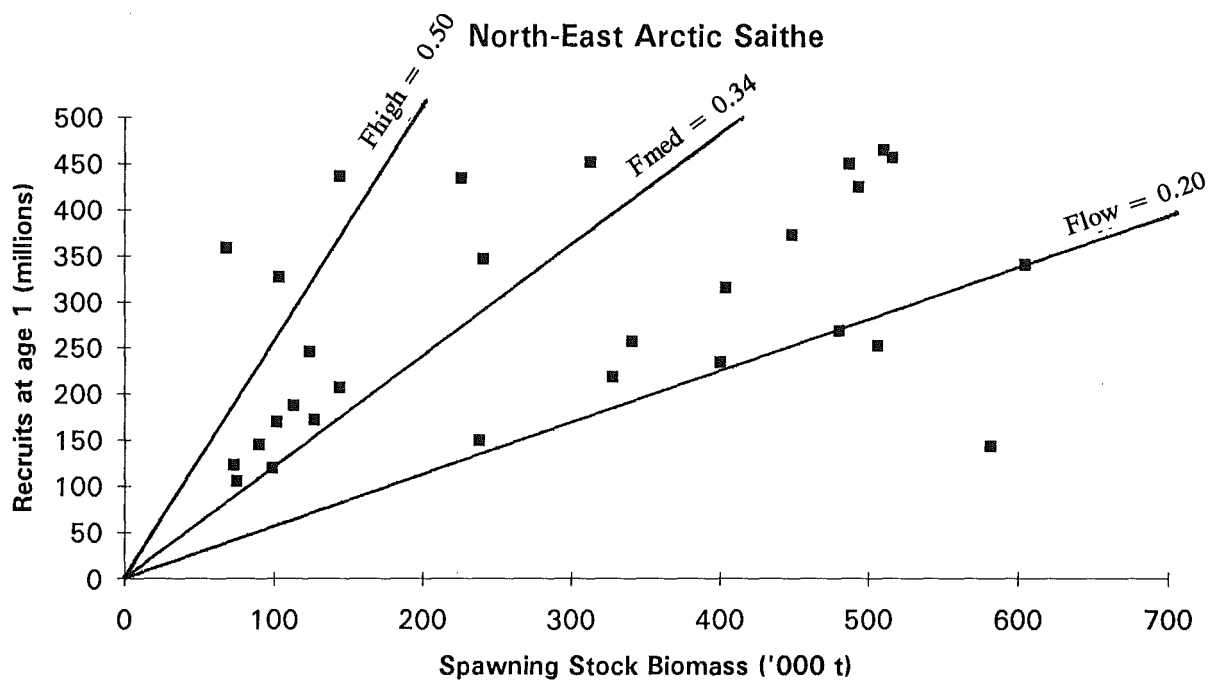
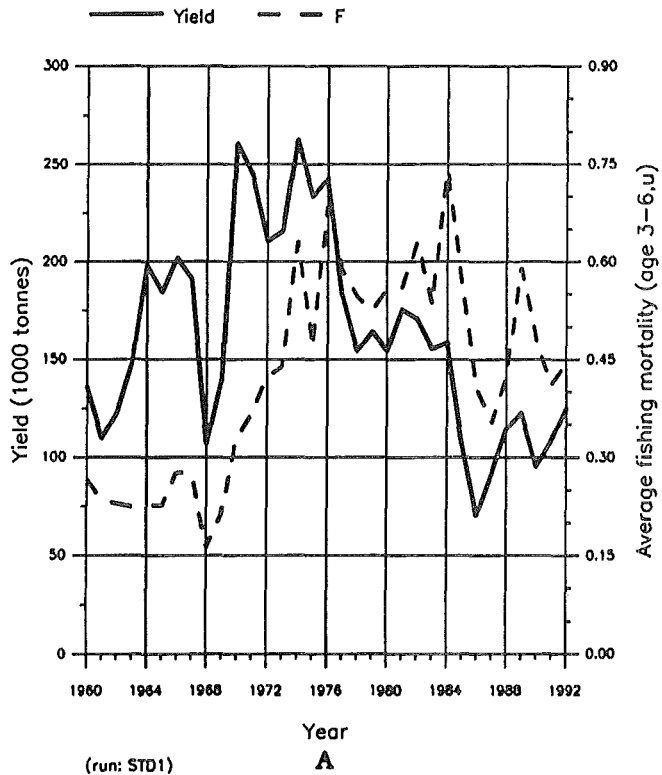


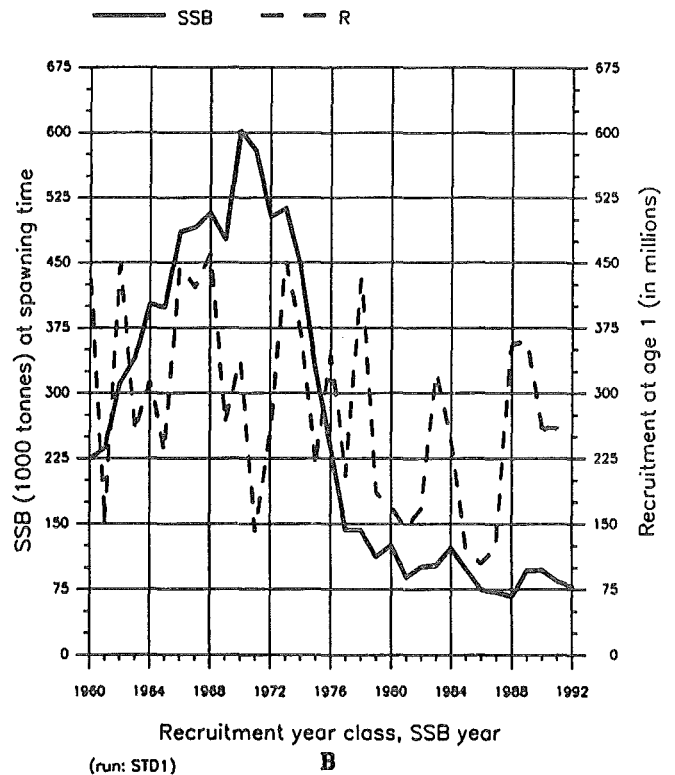
Figure 5.3

FISH STOCK SUMMARY
STOCK: Saithe in the North-East Arctic (Fishing Areas I and II)
1-9-1993

Trends in yield and fishing mortality (F)

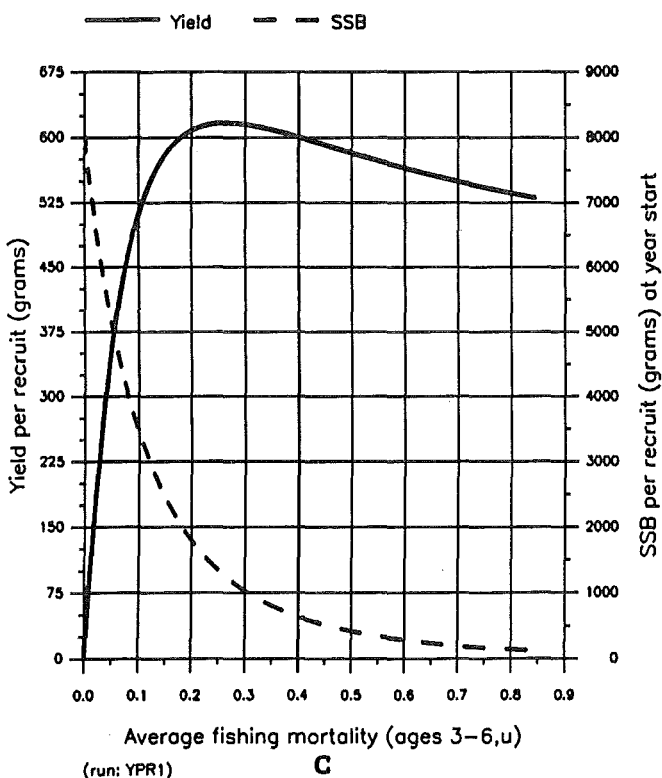


Trends in spawning stock biomass (SSB) and recruitment (R)



FISH STOCK SUMMARY
STOCK: Saithe in the North-East Arctic (Fishing Areas I and II)
1-9-1993

Long term yield and spawning stock biomass



Short-term yield and spawning stock biomass

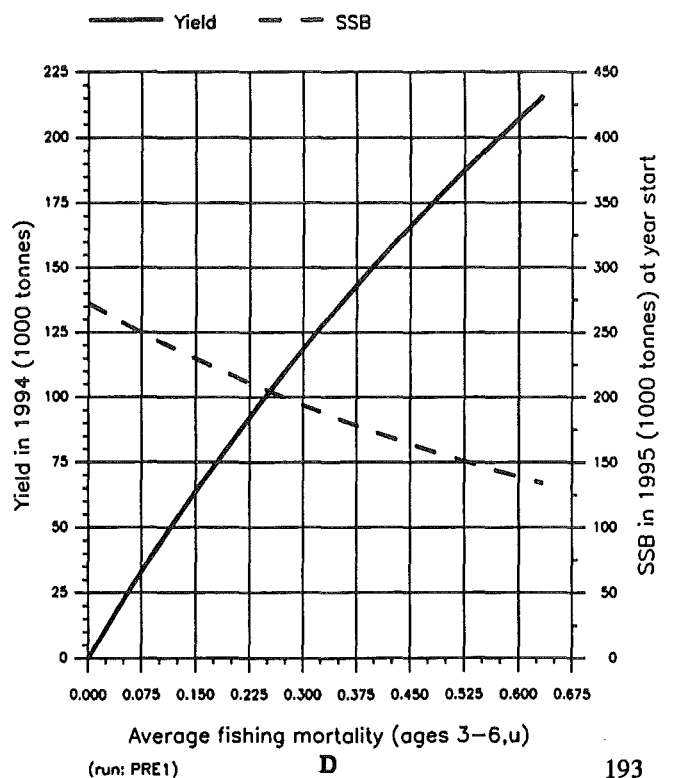


Figure 6.1

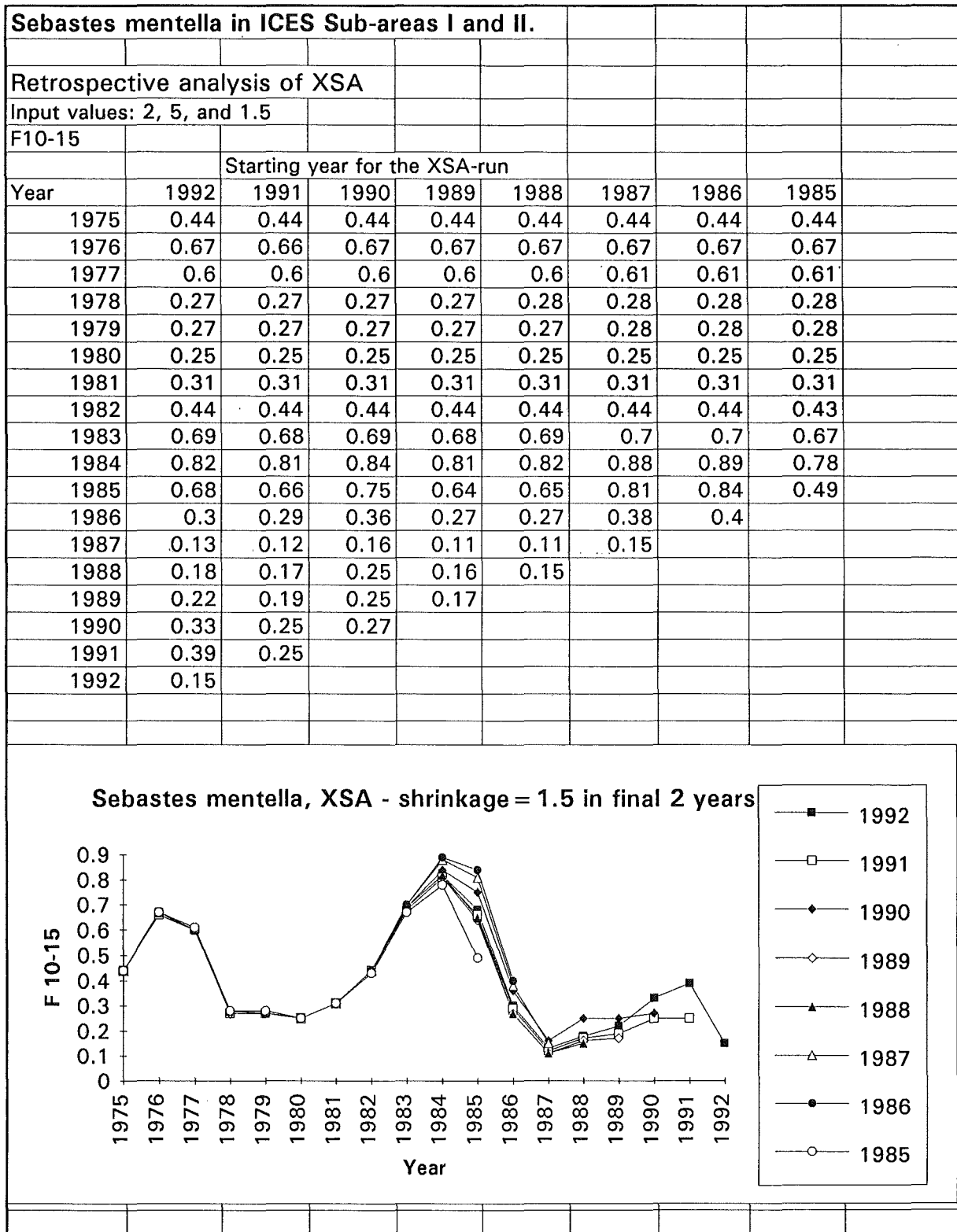
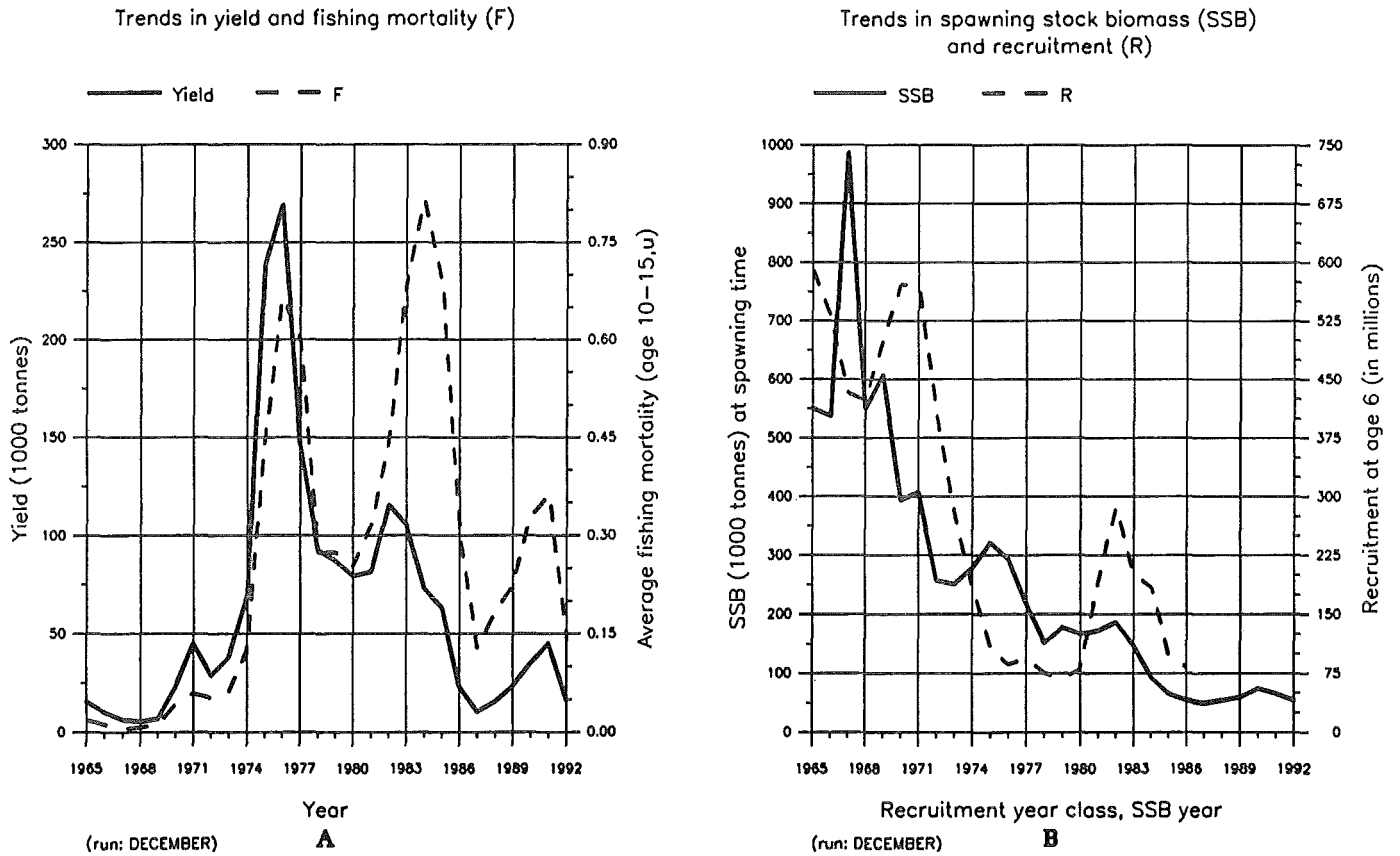


Figure 6.2

FISH STOCK SUMMARY
STOCK: *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan
2-9-1993



FISH STOCK SUMMARY
STOCK: *Sebastes mentella* in the Norwegian Sea, Spitzbergen and Bear Islan
2-9-1993

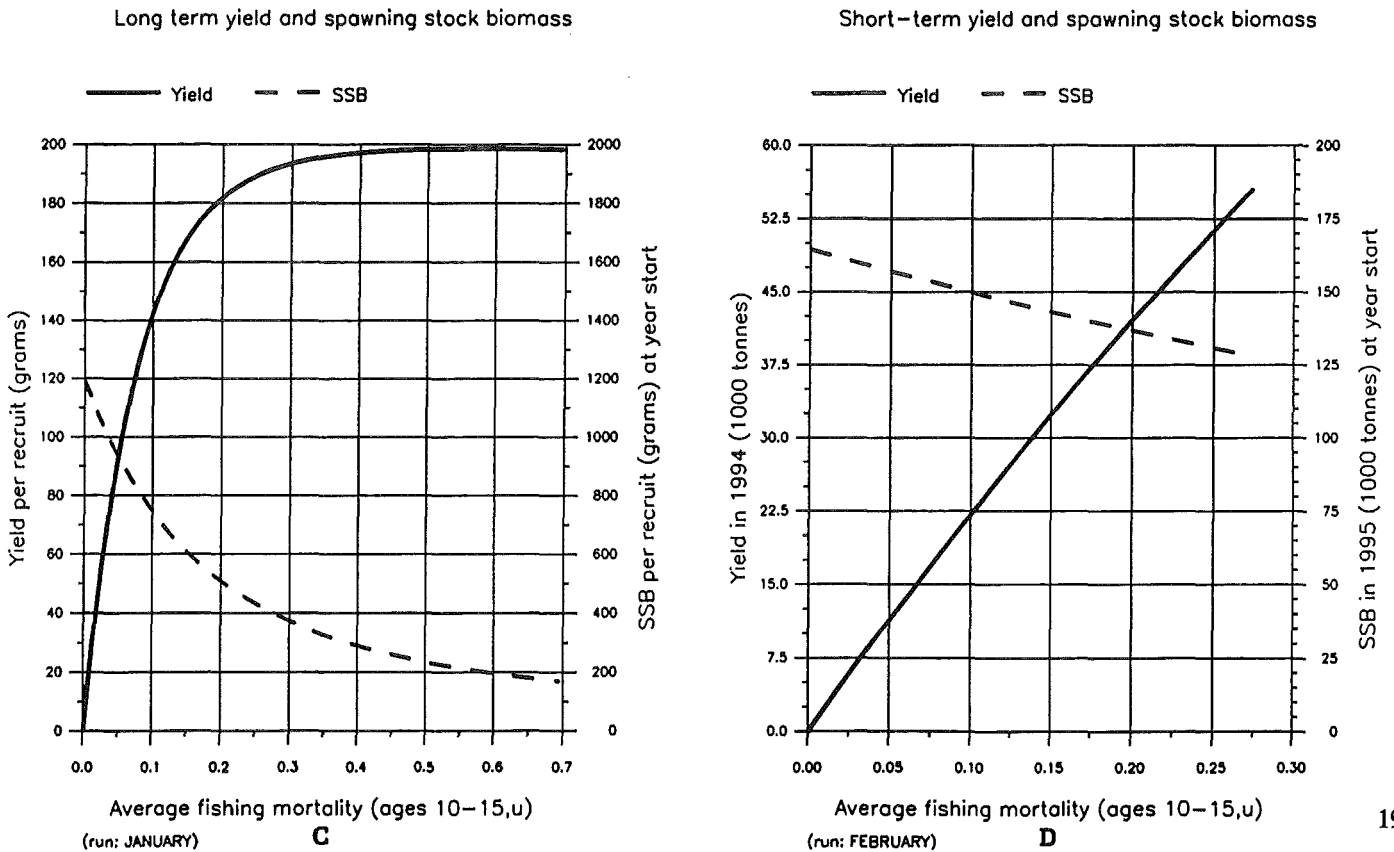


Figure 6.3

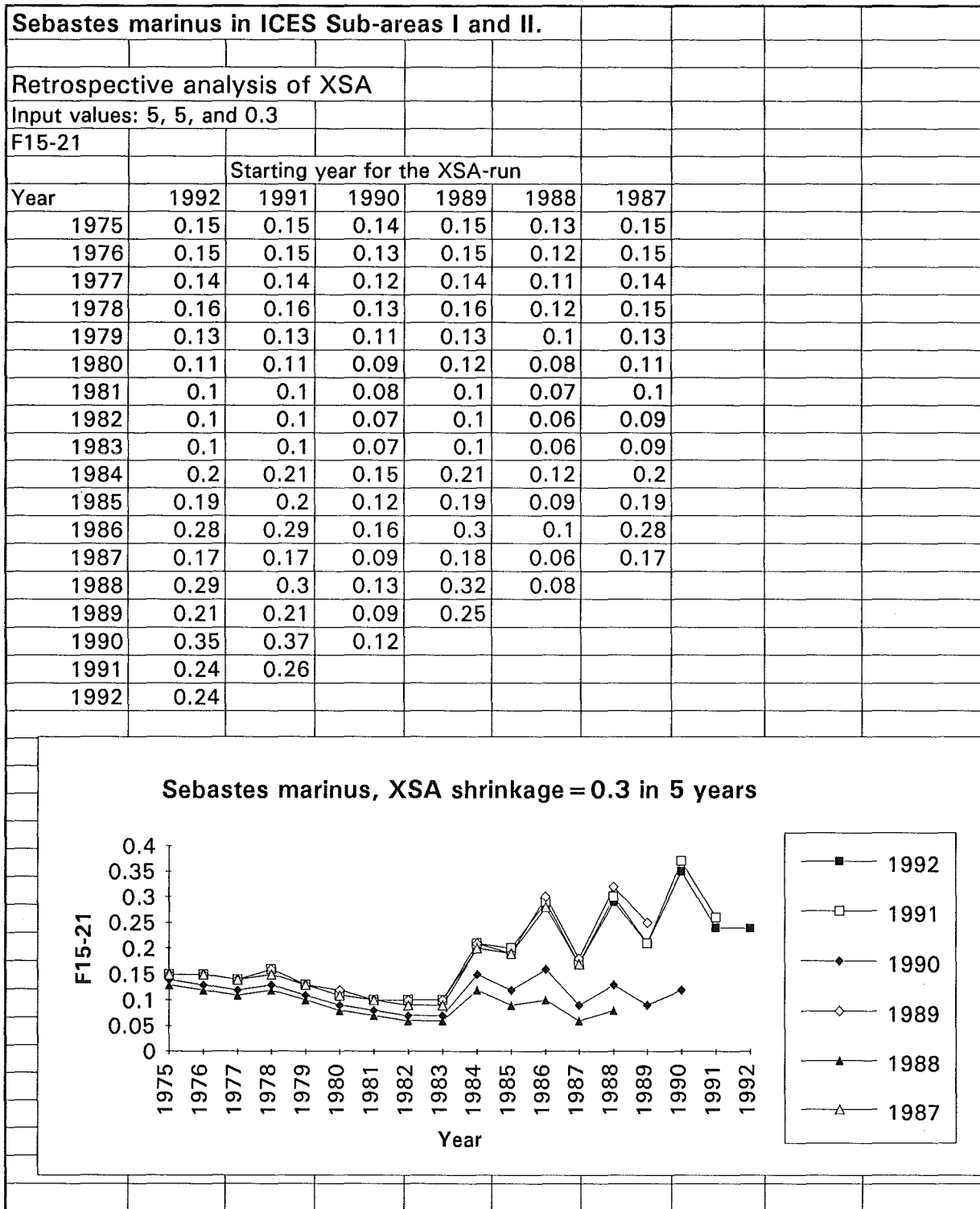


Figure 7.1

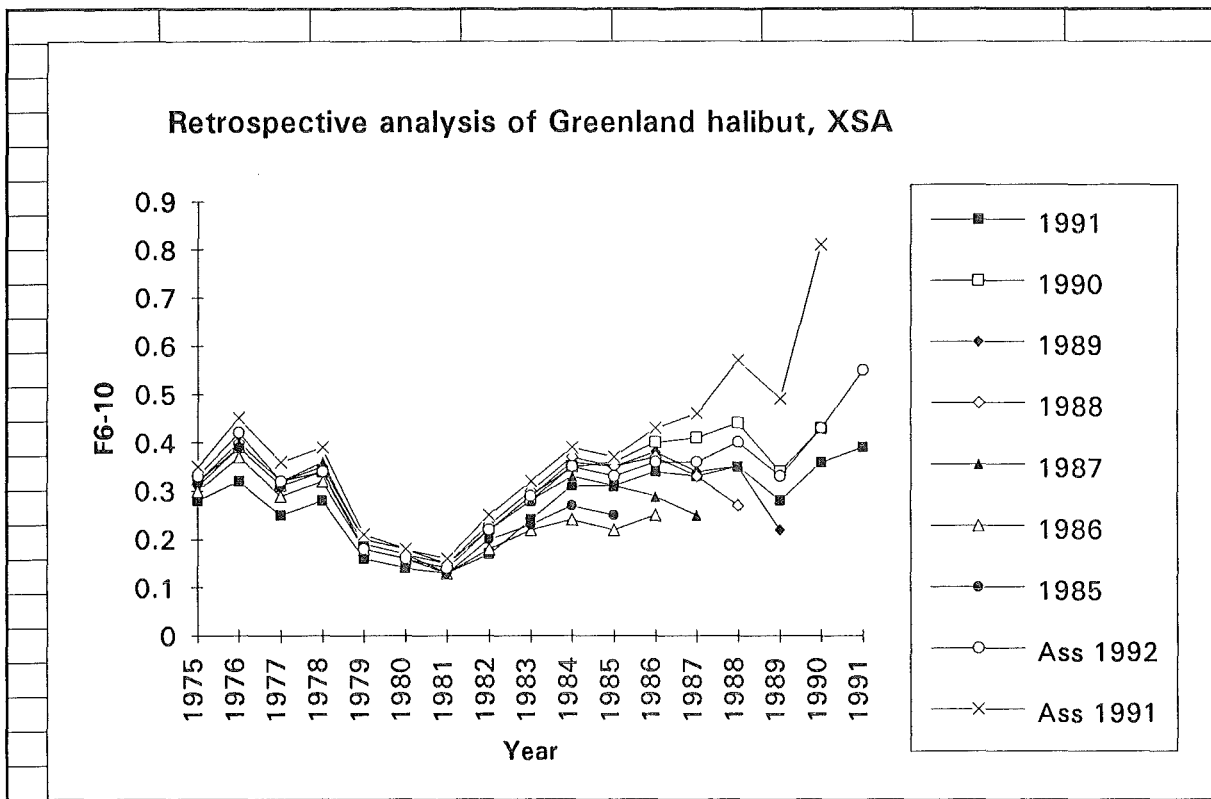
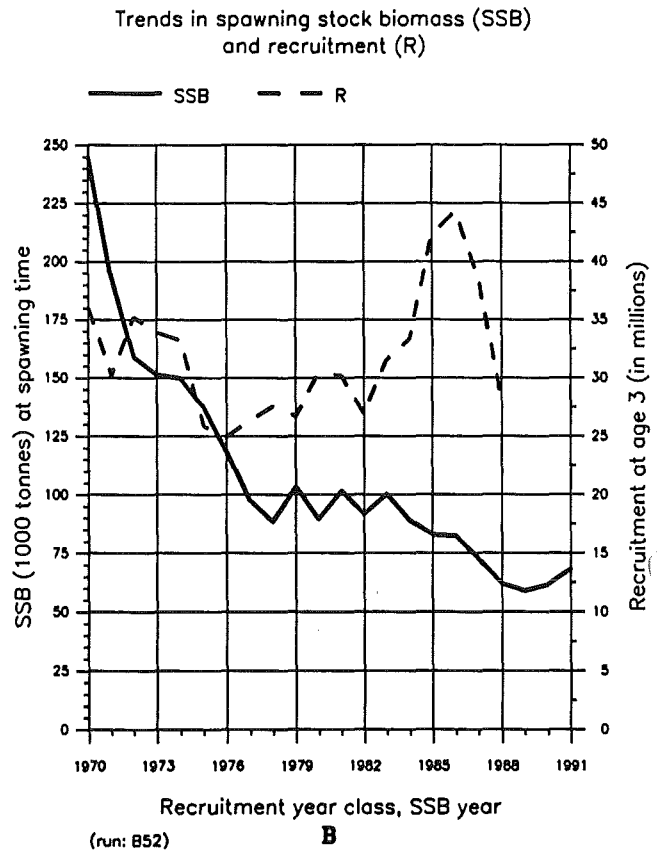
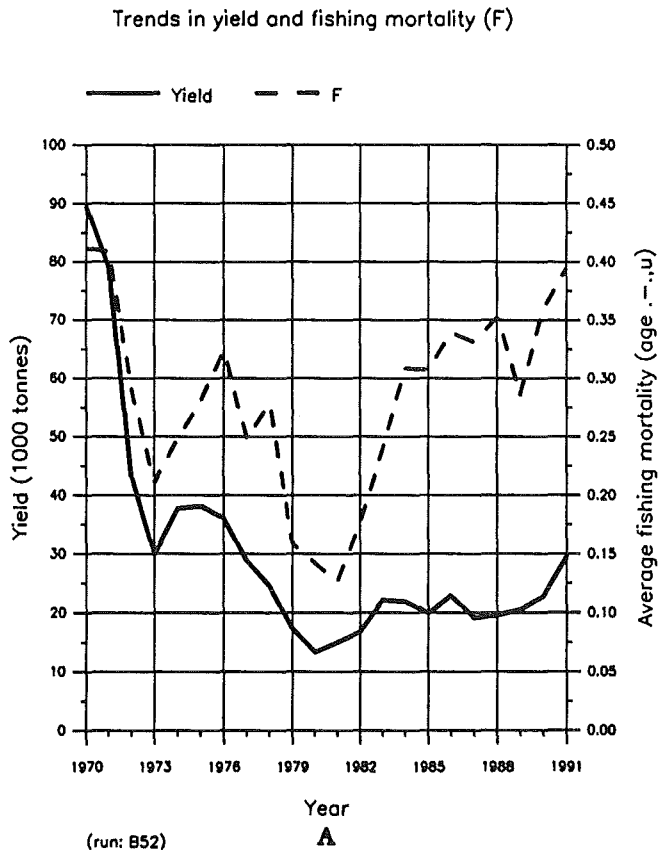


Figure 7.2

FISH STOCK SUMMARY
STOCK: Greenland Halibut in the North – East Arctic (Fishing Areas I and II)
3 – 9 – 1993



FISH STOCK SUMMARY
STOCK: Greenland Halibut in the North – East Arctic (Fishing Areas I and II)
16 – 9 – 1993

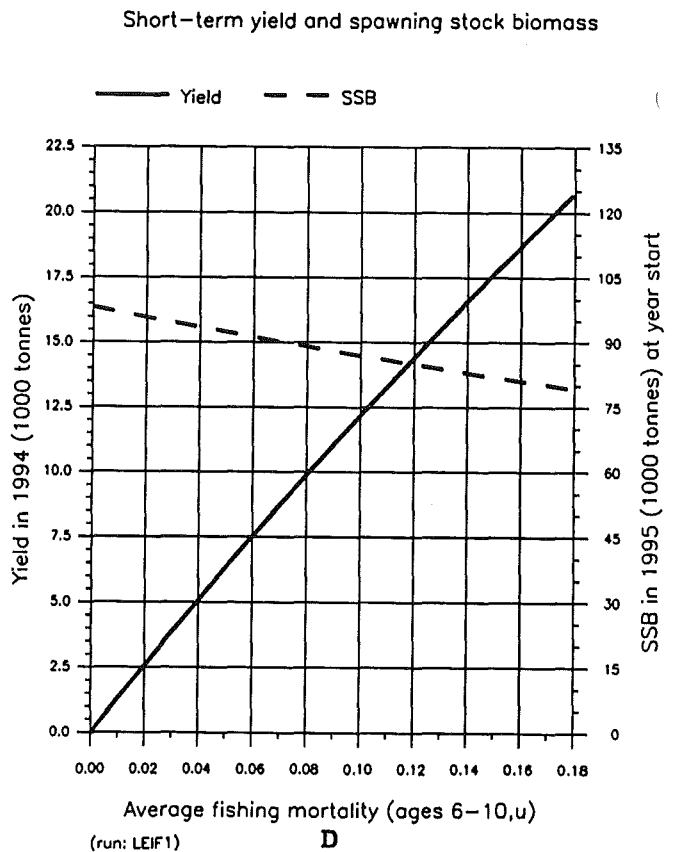
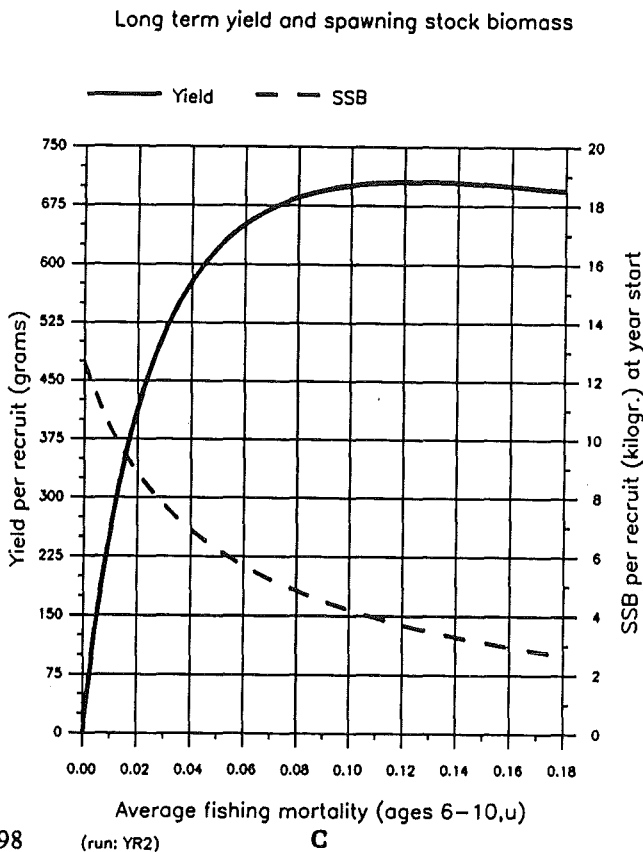
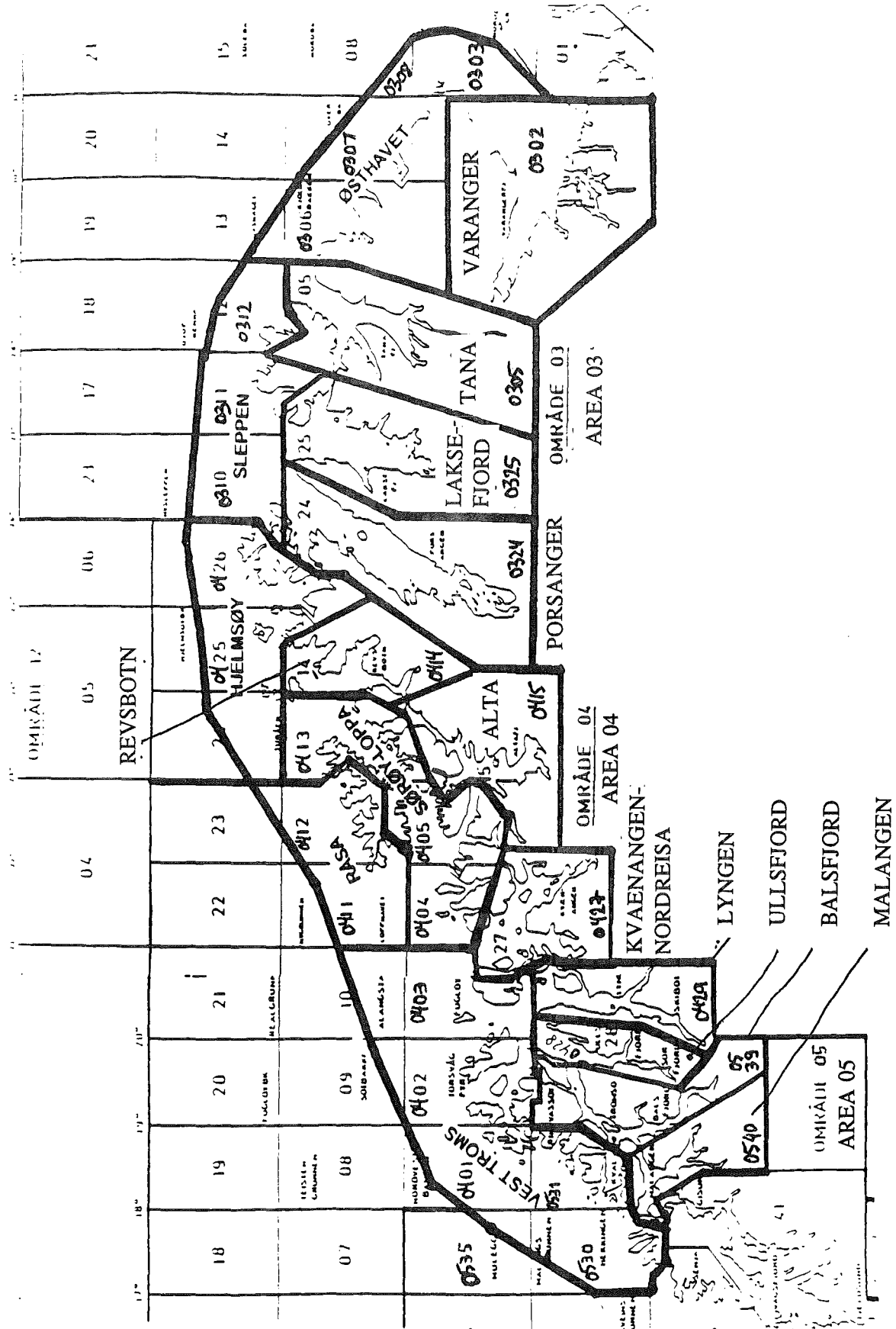


Figure 8.1 Area distribution in the coastal cod/North East Arctic cod investigations.



APPENDIX I

Table A1 North-East Arctic COD. Results from the Norwegian acoustic survey in the Barents Sea in January-March. Stock numbers in millions.

Old TS and bobbins gear (1989-1993 back-calculated from rock-hopper gear).

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1981	3	73	58	124	243	270	41	8	3	4	827
1982	1	4	71	86	93	73	74	5	1	-	408
1983	-	15	17	45	65	38	17	10	2	1	210
1984	2,382	506	174	80	63	46	16	1	+	+	3,269
1985	69	878	550	510	109	48	20	2	1	1	2,187
1986	625	578	1,246	424	225	27	9	-	-	-	3,136
1987	1	47	126	500	128	37	4	3	-	-	852
1988	1	23	79	74	179	26	6	+	+	-	389
1989	-	9	31	77	56	145	21	3	+	+	346
1990	145	58	32	61	81	73	138	10	2	+	599
1991	277	484	145	108	109	101	55	58	4	+	1,341
1992	250	1,004	490	205	67	46	28	15	11	+	2,117
1993	2,000	931	739	487	258	47	24	12	6	9	4,516

New TS and rock-hopper gear

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1991	140	227	62	40	37	33	18	20	1	+	578
1992	237	506	202	59	23	14	10	5	3	+	1,059
1993	927	354	302	195	101	18	9	4	1	2	1,916

Table A2 North-East Arctic COD. Results from the Norwegian acoustic survey in the Barents Sea and the Svalbard Region September-October. Stock numbers in millions.

Year	Age									Total
	1	2	3	4	5	6	7	8	9	
<u>Sub-area I and Division IIa¹</u>										
1986	42	96	290	99	45	12	1	-	-	587
1987	2	49	42	302	90	26	3	+	-	516
1988	5	4	23	14	43	15	9	+	+	114
1989	4	6	12	19	19	67	11	3	+	142
1990	45	16	28	18	23	20	38	5	+	195
1991	312	199	142	80	36	17	47	64	8	935
1992	57	168	116	132	37	23	15	10	17	575
<u>Division IIb</u>										
1986	10	68	125	42	19	5	12	-	-	281
1987	13	98	329	413	87	33	2	+	-	971
1988	+	16	22	24	50	18	6	+	+	138
1989	+	+	3	6	7	11	2	+	+	28
1990	5	+	1	1	1	1	4	1	+	15
1991	43	27	14	5	9	12	10	19	3	142
1992	45	102	104	67	20	24	29	13	39	445
<u>Total</u>										
1986	52	164	415	141	64	17	13	-	-	868
1987	15	147	371	715	177	59	5	+	-	1,487
1988	5	20	45	38	93	33	15	+	+	252
1989	4	6	15	25	26	78	13	3	+	170
1990	50	17	29	19	25	21	42	7	+	211
1991	355	226	156	85	45	59	57	83	11	1,077
1992	103	270	220	199	57	47	44	23	56	1,020

¹Northern part.

Table A3 North-East Arctic COD. Results from the Norwegian Bottom trawl survey in the Barents Sea in January-March. Index of number of fish at each age. Rock-hopper gear¹.

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1983	259.0	17.7	23.2	45.4	44.1	18.9	6.0	3.9	0.8	0.2	419.2
1984	2170.0	366.0	122.0	32.7	25.4	14.4	4.2	0.6	0.3	0.1	2735.7
1985	39.0	647.0	162.0	126.0	21.7	8.4	3.3	0.3	0.1	0.1	1007.9
1986	562.0	403.0	679.0	173.0	102.0	30.6	7.3	0.8	0.2	0.1	1958.0
1987	25.3	387.0	233.0	415.0	61.1	15.4	1.8	0.5	+	-	1139.1
1988	3.8	63.5	180.0	102.0	231.0	25.7	4.8	0.8	0.1	-	611.8
1989	7.1	12.7	37.9	73.2	43.3	104.0	11.7	1.0	0.2	0.2	291.3
1990	122.0	48.9	25.8	37.0	43.8	27.0	31.4	1.7	0.5	0.1	338.2
1991	356.7	212.7	37.0	24.6	23.9	21.7	12.2	12.7	0.7	0.1	702.3
1992	99.7	482.2	170.4	62.7	25.0	15.7	9.9	5.2	3.5	0.3	874.6
1993	90.6	75.5	196.5	148.3	79.7	16.1	8.3	4.4	2.6	2.8	624.8
1993+	423.0	304.8	313.8	195.3	91.1	20.4	9.2	5.7	2.9	2.9	1,369.1

¹1983-1988 back-calculated from bobbins gear.
1993+ Survey covered a larger area.

Table A4 North-East Arctic COD. Results from the Norwegian Bottom trawl survey in the Svalbard Area in September-October. Index of number of fish at each age. Rock-hopper gear¹.

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1983	145.0	26.8	10.7	9.5	2.4	1.9	1.0	1.3	0.3	-	210.4
1984	499.0	113.0	7.3	4.3	4.7	1.8	0.4	0.4	0.3	0.1	631.1
1985	239.0	452.0	99.1	28.4	13.6	5.4	1.0	0.4	0.1	0.2	839.2
1986	40.9	181.0	297.0	42.8	15.3	2.6	1.0	0.3	0.1	0.1	581.1
1987	41.5	108.0	141.0	125.0	17.1	5.4	0.5	0.1	0.1	+	438.7
1988	3.1	16.6	33.2	31.8	37.1	9.5	0.6	0.6	0.6	-	133.3
1989	3.6	2.7	15.4	12.8	11.9	19.2	3.2	0.4	0.2	-	69.4
1990	70.1	9.4	8.6	14.6	23.4	16.5	20.0	2.0	0.3	-	164.9
1991	116.0	101.0	25.3	8.5	13.9	16.0	13.5	19.0	1.5	-	314.7
1992	91.8	130.0	105.0	56.0	16.2	7.3	5.7	3.3	8.9	-	424.2

¹1983-1988 back-calculated from bobbins gear.

Table A5 North-East Arctic COD. Index from Norwegian trawler survey conducted in areas I, IIa and IIb during October - November.

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1989	17	27	433	1,575	2,105	6,648	1,624	195	25	2	12,695
1990	20	82	618	1,606	2,775	2,390	5,124	624	59	7	13,314
1991	20	899	2,662	2,534	3,183	3,528	2,360	4,468	391	19	20,104
1992	2	225	4,187	8,627	2,745	1,093	1,017	573	907	57	19,454

Table A6 North-East Arctic COD. Length at age (cm) from Norwegian surveys in January-March.

Year	1	2	3	4	5	6	7	8	9	10
1978	14.2	24.0	32.1	45.7	54.2	64.6	67.6	76.9	-	-
1979	12.8	22.9	33.1	42.0	53.3	64.4	74.7	83.0	-	-
1980	17.6	24.8	34.2	42.5	52.5	63.5	73.6	83.6	-	-
1981	17.0	26.1	35.5	44.7	52.0	61.3	69.6	77.9	-	-
1982	14.8	25.8	37.6	46.3	54.7	63.1	70.8	82.9	-	-
1983	-	26.1	34.8	46.8	56.0	64.5	73.3	80.4	-	-
1984	13.8	26.2	35.8	49.2	57.9	67.4	79.6	82.2	-	-
1985	14.5	23.5	40.3	50.8	62.2	71.1	81.8	88.7	-	-
1986	13.3	22.6	34.4	50.4	60.0	70.2	82.3	95.2	-	-
1987	14.5	21.0	31.8	41.1	55.7	67.2	81.8	94.5	-	-
1988	14.7	22.5	29.7	37.0	46.4	58.0	70.1	81.1	-	-
1989	12.7	25.7	34.7	40.6	47.5	57.1	68.5	84.0	-	-
1990	14.3	29.0	39.4	47.4	59.9	60.9	70.9	87.5	-	-
1991	13.8	27.6	41.6	52.6	60.2	68.2	73.8	79.0	94.2	-
1992	13.4	24.7	41.3	50.7	59.9	69.2	77.0	82.7	85.3	106.8
1993	11.4	20.7	35.9	50.9	59.2	68.8	76.2	84.5	-	-

Table A7 North-East Arctic COD. Weight (g) at age from Norwegian surveys in January-March.

Year	Age										
	1	2	3	4	5	6	7	8	9	10	11
1985	-	-	670	1,070	2,230	3,650	4,920	5,060	-	-	-
1986	-	-	390	1,090	1,850	3,110	4,320	5,509	-	-	-
1987	21	65	230	490	1,380	2,300	3,970	-	-	-	-
1988	20	80	203	410	793	1,473	2,706	4,613	-	-	-
1989	10	150	380	590	930	1,570	2,640	4,940	-	-	-
1990	28	229	570	1,030	1,460	1,930	2,890	4,370	-	-	-
1991	20	190	720	1,370	2,040	2,850	3,660	4,630	8,380	-	-
1992	20	130	640	1,120	1,850	2,830	3,980	4,990	6,040	11,200	-
1993	11	76	430	1,196	1,766	2,774	3,894	5,519	6,150	7,450	8,910

Table A8 North-East Arctic COD. Results from the Russian acoustic trawl survey in the Barents Sea and adjacent waters in the autumn. Stock numbers in millions.

Year	Age										Older	Total
	0	1	2	3	4	5	6	7	8	9		
1985 ¹	45	105	895	422	255	83	44	50	-	-	39	1,939
1986 ¹	60	53	141	980	444	183	56	62	19	-	2	2,000
1987 ²	8	15	170	170	738	99	67	42	20	9	5	1,344
1988 ²	+	+	43	161	106	245	34	10	2	+	+	602
1989 ¹	2	1	4	17	44	56	99	82	20	6	4	335
1990 ³	29	22	57	29	35	52	46	89	14	2	1	376
1991 ¹	33	29	53	101	43	50	58	70	51	6	+	494
1992 ¹	228	61	333	317	110	45	37	38	29	22	3	1,223

¹October-December.

²September-October.

³Revised.

Table A9 North-East Arctic COD. Results from the Russian Bottom trawl survey in the Barents Sea and adjacent waters in November-December (numbers per hour trawling).

Year	Age										Older	Total	
	0	1	2	3	4	5	6	7	8	9			
<u>Sub-area I</u>													
1982	1.4	0.2	6.9	13.2	7.4	-	-	-	-	-	-	5.1	34.2
1983	4.3	8.0	5.1	4.6	5.4	5.9	-	-	-	-	-	4.7	38.0
1984	0.7	12.3	11.6	25.5	13.7	6.5	4.0	-	-	-	-	2.5	76.8
1985	3.3	2.9	51.3	35.2	53.1	25.2	4.4	1.8	-	-	-	1.0	178.2
1986	0.3	2.2	7.0	60.4	15.8	8.2	1.8	0.6	0.1	-	-	0.1	96.5
1987	+	0.1	3.6	4.0	35.9	6.3	3.6	0.6	0.1	0.1	-	+	54.4
1988	0.2	0.1	1.7	5.7	5.2	17.2	2.6	0.6	0.2	0.1	-	+	33.4
1989	0.4	0.1	1.0	3.5	11.2	15.4	20.8	16.1	3.7	0.7	-	0.3	73.4
1990 ¹	6.8	4.8	12.7	5.3	6.0	9.4	8.2	14.6	2.2	0.2	-	+	70.2
1991	3.1	4.1	6.6	16.4	6.6	7.0	8.7	9.0	5.2	0.5	-	0.1	67.3
1992	10.3	2.9	26.4	42.3	22.4	8.5	4.6	5.6	3.3	2.7	-	0.6	129.6
<u>Division IIa</u>													
1982	0.1	+	11.7	10.6	4.7	-	-	-	-	-	-	7.9	35.0
1983	0.7	0.4	0.3	1.5	6.4	5.0	-	-	-	-	-	4.9	19.2
1984	0.4	0.7	0.6	3.7	4.0	6.7	4.7	-	-	-	-	1.7	22.5
1985	0.2	0.2	1.4	3.7	9.5	12.6	6.4	2.5	-	-	-	0.8	37.6
1986	-	+	0.1	2.5	2.9	3.2	1.5	0.5	0.4	-	-	0.2	11.3
1987	-	-	-	-	3.0	1.7	2.3	0.9	0.1	-	-	0.1	8.1
1988	0.2	+	0.1	0.2	1.2	10.0	2.4	0.7	0.2	0.1	-	+	15.1
1989	-	+	0.1	0.3	0.9	1.3	3.9	3.9	1.2	0.5	-	0.2	12.3
1990 ¹	-	+	0.3	1.1	1.6	2.2	1.9	4.4	0.9	0.1	-	+	12.5
1991	1.0	0.1	0.3	1.0	1.0	2.4	2.1	2.8	2.2	0.3	-	0.1	13.3
1992	0.4	0.3	0.3	2.7	3.8	3.0	2.2	2.1	1.8	1.3	-	0.1	18.0
<u>Division IIb</u>													
1982	9.9	1.7	42.5	17.8	1.1	-	-	-	-	-	-	2.2	75.2
1983	9.7	14.9	5.0	9.4	11.0	2.6	-	-	-	-	-	2.4	55.0
1984	1.4	7.7	22.7	7.4	2.7	2.4	1.3	-	-	-	-	0.8	46.4
1985	9.1	9.4	45.2	32.3	32.8	11.5	5.3	1.8	-	-	-	0.4	147.8
1986	1.6	2.9	14.8	67.2	19.9	16.4	5.4	1.3	0.6	-	-	0.1	127.1
1987	-	0.2	5.6	11.0	64.4	4.0	2.2	0.5	0.1	-	-	-	88.0
1988	0.1	0.4	4.8	13.7	15.1	25.0	2.5	0.6	0.1	0.2	-	-	62.8
1989	0.6	0.1	0.3	3.8	6.4	6.1	9.2	5.4	0.2	0.4	-	0.2	33.7
1990 ¹	0.1	0.7	1.3	2.3	2.9	3.7	3.9	8.6	1.6	0.3	-	+	25.4
1991	6.4	4.3	9.7	9.6	3.5	5.5	6.8	9.9	8.0	0.8	-	0.2	64.7
1992	60.5	15.1	60.5	60.8	13.8	5.2	6.5	5.0	5.1	3.4	-	0.5	236.4
<u>Total (Sub-area I and Divisions IIa and IIb)</u>													
1982	3.7	0.6	18.1	14.1	5.1	-	-	-	-	-	-	4.7	46.3
1983	5.4	8.9	4.3	5.6	7.3	4.7	-	-	-	-	-	4.0	40.2
1984	0.9	9.2	14.2	16.2	8.6	5.0	3.1	-	-	-	-	1.9	59.1
1985	5.0	4.9	43.0	30.3	40.5	18.8	4.9	1.9	-	-	-	0.6	150.0
1986	0.7	2.2	9.1	56.5	16.1	10.6	3.0	0.8	0.3	-	-	0.1	99.4
1987	-	0.2	4.0	5.9	42.6	5.4	3.1	0.6	0.1	+	-	-	61.9
1988	0.1	0.2	2.5	7.7	7.8	19.0	2.5	0.6	0.1	0.2	-	-	40.8
1989	0.4	0.1	0.6	3.4	8.8	11.8	15.5	11.4	2.6	0.5	-	0.3	54.8
1990 ¹	4.0	3.1	7.8	3.8	4.4	6.6	6.0	11.3	1.8	0.2	-	+	49.0
1991	4.2	3.9	7.3	12.7	5.0	6.1	7.5	8.9	6.0	0.6	-	0.1	62.3
1992	30.6	7.8	39.5	48.5	18.2	6.9	5.3	5.2	4.0	2.9	-	0.5	169.4

¹Revised.

Table A10 North-East Arctic COD. Length at age (cm) from Russian surveys in November-December.

Year	Age									
	0	1	2	3	4	5	6	7	8	9
1984	15.7	22.3	30.7	44.3	51.7	63.6	73.4	82.5	88.4	97.0
1985	15.0	21.1	30.6	43.2	53.7	61.2	72.8	83.0	92.8	101.3
1986	15.2	19.7	28.3	39.0	51.8	62.2	70.9	83.0	91.3	104.0
1987	-	19.2	27.9	33.4	41.4	59.1	69.2	80.1	95.7	102.6
1988	11.3	21.3	28.7	36.2	43.9	53.3	65.3	79.5	85.0	-
1989	-	20.8	28.8	34.8	46.0	53.9	61.8	69.8	78.7	88.6
1990 ¹	16.0	24.0	30.4	46.5	54.9	62.5	69.7	77.6	87.8	102.0
1991	11.5	21.9	29.5	39.2	52.1	62.8	71.7	79.4	88.9	99.5
1992	11.3	21.3	31.9	50.1	59.8	69.1	78.6	84.0	90.8	97.5

¹Revised.

Table A11 North-East Arctic COD. Weight (g) at age from Russian surveys in November-December.

Year	Age										
	0	1	2	3	4	5	6	7	8	9	10
1984	26	90	250	746	1,187	2,234	3,422	5,027	6,479	9,503	-
1985	26	80	245	762	1,296	1,924	3,346	5,094	7,360	6,833	11,167
1986	25	63	191	506	1,117	1,940	2,949	4,942	7,406	9,300	-
1987	-	54	182	316	672	1,691	2,688	3,959	8,353	10,583	13,107
1988	15	78	223	435	789	1,373	2,609	4,465	5,816	-	-
1989	-	73	216	401	928	1,427	2,200	3,133	4,649	6,801	8,956
1990 ¹	28	106	230	908	1,418	2,092	2,897	4,131	6,359	10,078	13,540
1991	26	87	241	557	1,320	2,351	3,588	5,040	7,452	10,507	12,843
1992	10	76	273	1165	1,895	2,971	4,377	5,596	7,319	9,452	12,414

¹Revised.

Table A12 Abundance indices of 0-group fish in the Barents Sea and adjacent waters in 1965-1992

Year	Cod	Haddock	Polar cod		Redfish	Greenland halibut	Long rough dab
			West	East			
1965	6	7		0	159		66
1966	1	1		129	236		97
1967	34	42		165	44		73
1968	25	8		60	21		17
1969	93	82		208	295		26
1970	606	115		197	247	1	12
1971	157	73		181	172	1	81
1972	140	46		140	177	8	65
1973	684	54		(26)	385	3	67
1974	51	147		227	468	13	83
1975	343	170		75	315	21	113
1976	43	112		131	447	16	96
1977	173	116	157	70	472	9	72
1978	106	61	107	144	460	35	76
1979	94	69	23	302	980	22	69
1980	49	54	79	247	651	12	108
1981	65	30	149	73	861	38	95
1982	114	90	14	50	694	17	150
1983	386	184	48	39	851	16	80
1984	486	255	115	16	732	40	70
1985	742	156	60	334	795	36	86
1986	434	160	111	366	702	55	755
1987	102	72	17	155	631	41	174
1988	133	86	144	120	849	8	72
1989	202	112	206	41	698	5	92
1990	465	227	144	48	670	2	35
1991	766	472	90	239	200	1	28
1992	1,159	313	195	118	150	3	32

Table A13 Estimated logarithmic indices with 90% confidence limits of year class abundance for 0-group herring, cod and haddock in the Barents Sea and adjacent waters 1965-1992.

Year	Herring ¹			Cod			Haddock		
	Index	Confidence limits		Index	Confidence limits		Index	Confidence limits	
1965				+					
1966	0.14	0.04	0.31	0.02	0.01	0.04	0.01	0.00	0.03
1967	0.00	-	-	0.04	0.02	0.08	0.08	0.03	0.13
1968	0.00	-	-	0.02	0.01	0.04	0.00	0.00	0.02
1969	0.01	0.00	0.04	0.25	0.17	0.34	0.29	0.20	0.41
1970	0.00	-	-	2.15	2.02	3.05	0.64	0.42	0.91
1971	0.00	-	-	0.77	0.57	1.01	0.26	0.18	0.36
1972	0.00	-	-	0.52	0.35	0.72	0.16	0.09	0.27
1973	0.05	0.03	0.08	1.48	1.18	1.82	0.26	0.15	0.40
1974	0.01	0.01	0.01	0.29	0.18	0.42	0.51	0.39	0.68
1975	0.00	-	-	0.90	0.66	1.17	0.60	0.40	0.85
1976	0.00	-	-	0.13	0.06	0.22	0.38	0.24	0.51
1977	0.01	0.00	0.03	0.49	0.36	0.65	0.33	0.21	0.48
1978	0.02	0.01	0.05	0.22	0.14	0.32	0.12	0.07	0.19
1979	0.09	0.01	0.20	0.40	0.25	0.59	0.20	0.12	0.28
1980	-	-	-	0.13	0.08	0.18	0.15	0.10	0.20
1981	0.00	-	-	0.10	0.06	0.18	0.03	0.00	0.05
1982	0.00	-	-	0.59	0.43	0.77	0.38	0.30	0.52
1983	1.77	1.29	2.33	1.69	1.34	2.08	0.62	0.48	0.77
1984	0.34	0.20	0.52	1.55	1.18	1.98	0.78	0.60	0.99
1985	0.23	0.18	0.28	2.46	2.22	2.71	0.27	0.23	0.31
1986	0.00	-	-	1.37	1.06	1.70	0.39	0.28	0.52
1987	0.00	0.00	0.03	0.17	0.01	0.40	0.10	0.00	0.25
1988	0.32	0.16	0.53	0.33	0.22	0.47	0.13	0.05	0.34
1989	0.59	0.49	0.76	0.38	0.30	0.48	0.14	0.10	0.20
1990	0.31	0.16	0.50	1.23	1.04	1.34	0.61	0.48	0.75
1991	1.19	0.90	1.52	2.30	1.97	2.65	1.17	0.98	1.37
1992	1.06	0.69	1.50	2.94	2.53	3.39	0.87	0.71	1.06

¹Assessment for 1965-1984 made by Toresen (1985).

Table B1 North-East Arctic HADDOCK. Results from the Norwegian bottom trawl survey in the Barents Sea in January-March. Index of number of fish at age.

Year	Age								Total
	1	2	3	4	5	6	7	8	
1983	1,780.0	5.7	3.1	3.5	1.9	1.9	4.2	1.9	1,801.8
1984	3,450.0	592.0	16.9	2.1	1.0	0.3	0.4	0.4	4,063.1
1985	911.0	1,180.0	436.0	8.2	0.6	0.3	0.4	0.4	2,536.9
1986	416.0	312.0	385.0	166.0	6.7	0.7	0.2	0.2	1,286.8
1987	86.1	78.2	187.0	355.0	75.3	0.2	0.3	+	782.1
1988	28.6	15.0	30.3	83.0	155.0	23.8	0.3	-	336.0
1989	51.8	6.0	10.1	19.2	37.9	40.9	4.4	-	170.2
1990	356.0	49.2	4.8	4.9	7.7	14.3	18.4	2.6	457.9
1991	978.2	404.7	90.5	17.6	4.7	3.6	4.6	8.5	1,512.4
1992	821.9	1,168.8	351.1	89.9	6.2	1.3	2.0	7.8	2,449.0
1993	387.1	351.4	402.1	130.3	14.2	0.6	0.8	0.4	1,286.9
1993+	431.9	468.0	526.6	148.2	14.9	0.6	0.8	0.4	1,591.4

1983-1988 back-calculated from bobbins gear to rockhopper gear.
+ Extended survey area.

Table B2 North east-Arctic HADDOCK. Results from the Norwegian bottom trawl survey in the Svalbard area in September-October. Index of number of fish at age.

Year	Age									Total
	1	2	3	4	5	6	7	8	9	
1985	21.8	33.0	1.1	+	0	0	0	0	0	55.9
1986	0.4	2.3	19.6	2.3	+	0	0	0	0	24.6
1987	0.1	+	0.1	0.1	+	+	0	0	0	0.3
1988	0.5	+	+	0.1	0.2	0.1	+	0	0	0.9
1989	0.0	0.5	0.6	+	+	0.4	0.8	0.1	0	2.4
1990	40.9	0.7	+	0.1	0.2	0.3	0.7	+	0	42.9
1991	138.1	20.0	2.8	0.8	2.0	0.7	0.7	0.1	0	165.2
1992	27.1	83.9	15.5	0.4	+	0.1	0.1	0	0	127.1

1985-1988 back calculated from bobbins gear to rockhopper gear.

Table B3 North-East Arctic HADDOCK. Results from the Russian trawl survey in the Barents Sea and adjacent waters in November-December (numbers per hour trawling).

Year	Age										Older	Total	
	0	1	2	3	4	5	6	7	8	9			
<u>Sub-area 1</u>													
1983	39.9	97.3	16.5	0.8	0.7	+						1.1	156.3
1984	9.7	100.2	110.6	2.8	0.4	0.2	+					0.7	224.6
1985	3.9	19.1	213.4	168.8	0.8	0.2	0.1	-				0.3	406.6
1986	0.2	2.3	16.6	58.1	27.6	0.1	+	+	+			-	105.0
1987	0.4	1.4	2.5	12.5	34.2	8.6	+	+	-	+		-	59.8
1988	1.9	0.4	1.1	2.8	6.2	11.6	1.1	+	+	+		-	25.2
1989	3.3	3.0	3.6	0.7	2.5	7.1	13.9	1.8	0.1	+		-	36.0
1990	71.7	22.2	18.6	13.2	7.5	13.2	13.3	10.3	0.6	0.1		-	170.7
1991	15.9	61.5	27.5	10.8	1.6	0.6	1.0	3.3	2.6	0.3		-	125.1
1992	19.6	44.2	180.6	52.1	8.4	0.7	1.0	1.6	1.3	0.2		-	309.7
<u>Division IIa</u>													
1983	5.4	5.5	0.1	0.2	0.3	0.1						1.0	12.6
1984	4.9	14.4	5.6	0.1	0.1	0.1	-					0.2	25.4
1985	3.8	7.0	11.7	4.1	0.1	-	+	-				0.1	26.8
1986	0.4	0.3	3.5	10.4	2.9	0.1	+	+	-			-	17.6
1987	-	-	-	-	0.3	0.3	-	-	-	-		-	0.6
1988	1.0	0.1	-	+	0.2	0.5	0.2	-	-	-		-	2.1
1989	0.1	0.7	2.7	+	0.1	0.1	0.1	-	-	-		-	3.8
1990	6.1	0.9	0.9	0.1	0.1	0.1	0.1	0.1	-	-		-	8.4
1991	5.7	3.8	0.6	0.1	+	-	-	-	-	-		-	10.2
1992	1.2	2.3	5.6	2.3	3.0	0.3	0.3	0.4	0.4	-		-	15.9
<u>Division IIb</u>													
1983	22.1	9.9	0.2	0.1	+	+						0.1	32.4
1984	2.2	14.3	1.8	-	-	-	-					+	18.3
1985	1.4	10.2	61.4	5.1	+	+	+	-				+	78.1
1986	+	0.2	3.1	7.2	1.4	-	-	+	+			-	12.0
1987	-	-	0.1	0.7	1.4	0.5	+	-	-	-		-	2.8
1988	0.2	-	-	+	0.3	1.1	0.2	-	+	-		-	1.9
1989	0.7	0.1	0.2	+	0.1	0.3	0.6	0.1	+	-		-	2.1
1990	12.9	5.4	0.8	+	+	0.2	0.1	0.1	+	-		-	19.5
1991	20.0	22.9	6.2	0.4	0.1	0.1	0.1	+	+	-		-	49.8
1992	13.3	9.1	69.8	13.9	0.5	+	+	0	+	+		-	106.6
<u>Total - Sub-area I and Divisions IIa and IIb</u>													
1983	29.8	59.2	9.5	0.5	0.4	+						0.8	100.2
1984	6.4	58.6	58.4	1.5	0.2	0.1	+					0.3	125.5
1985	3.0	14.4	134.3	90.0	0.4	0.1	0.1	-				0.2	242.7
1986	0.2	1.4	10.7	36.3	16.4	0.1	+	+	+			+	65.1
1987	0.3	0.9	1.7	8.3	22.5	5.7	+	+	-	+		-	39.4
1988	1.3	0.3	0.7	1.7	4.0	7.6	0.8	+	+	+		-	16.4
1989	2.2	1.8	2.4	0.4	1.4	4.1	8.1	1.1	0.1	+		-	21.6
1990	44.8	14.3	10.6	7.3	4.2	7.3	7.4	5.7	0.3	0.1		-	102.0
1991	16.7	42.9	17.6	6.2	0.9	0.3	0.6	1.8	1.5	0.2		-	88.7
1992	16.4	28.2	128.6	34.6	5.0	0.4	0.6	0.9	0.8	0.1		-	215.6

Table B4 North-East Arctic HADDOCK. Results from the Norwegian acoustic survey in the Barents Sea in January-March. Index of number of fish at age.

Old TS and bobbins gear (1989-1993 back-calculated from rockhopper gear)

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1981	2	25	14	66	160	50	2	1	+	+	320
1982	3	4	7	10	12	29	14	1	+	+	80
1983	-	10	7	9	5	4	10	5	+	+	50
1984	2,148	1,002	53	15	7	2	2	2	+	+	3,321
1985	1,034	1,972	1,187	33	2	1	1	1	1	1	4,233
1986	346	502	1,720	751	2	1	1	+	+	+	3,323
1987	37	29	175	640	166	+	+	+	-	+	1,049
1988	8	7	20	70	150	23	+	-	-	+	279
1989	20	8	19	34	61	64	6	-	-	+	213
1990	201	86	12	11	15	27	36	5	+	+	394
1991	1,662	914	217	36	9	9	11	20	+	-	2,876
1992	717	2,145	600	101	9	2	2	5	8	+	3,588
1993	1,212	1,244	1,852	381	38	+	+	2	+	10	4,739

New TS and rockhopper gear

Year	Age										Total
	1	2	3	4	5	6	7	8	9	10	
1991	1,344	247	61	10	3	3	3	6	+	0	1,679
1992	580	652	129	27	3	+	+	1	3	+	1,396
1993	832	537	614	134	14	+	+	1	+	+	2,137

Table B5 North-East Arctic HADDOCK. Results from the Russian trawl acoustic survey in the Barents Sea and adjacent waters in the autumn 1985-1991. Index of number of fish at age.

Year	Age											Total
	0	1	2	3	4	5	6	7	8	9	Older	
1985 ¹	194	434	1,468	636	3	1	+	-	-	-	1	2,737
1986 ¹	34	37	208	917	910	2	+	+	+	-	+	2,109
1987 ²	6	16	29	62	197	61	+	-	-	+	12	383
1988 ²	2	1	3	18	83	301	46	-	-	-	+	454
1989 ¹	41	32	94	2	14	35	67	9	1	+	-	295
1990 ¹	594	176	75	28	17	23	43	44	4	1	-	1,004
1991 ^{1,2}	240	368	143	65	11	4	7	21	17	2	+	878
1992 ^{1,2}	199	245	758	218	35	3	4	7	6	+	+	1,475

¹October-December.

²September-October.

Table B6 North-East Arctic HADDOCK. Results from the Norwegian acoustic survey in the Barents Sea and the Svalbard region in September-October. Index of number of fish at age.

Year	Age									Total	
	1	2	3	4	5	6	7	8	Older		
1986	89	197	267	95	-	-				1	650
1987	5	25	89	276	69	+	+			+	463
1988	171	19	5	17	35	4	-	-	-	-	252
1989	38	5	+	2	6	5	+	-	-	-	58
1990	225	48	4	2	3	6	10	+	-	-	300
1991	890	317	30	4	7	5	9	11	+	+	1,273
1992	236	458	153	32	3	2	1	2	7	7	894

Table B7 North-East Arctic HADDOCK. Length data (cm) from Norwegian surveys in January-March and Russian surveys in November-December.

Year	Age									
	1	2	3	4	5	6	7	8	9	10
<u>Norway</u>										
1987	13.9	21.6	30.2	39.2	47.0	62.5	-	-	-	-
1988	13.5	24.3	29.3	36.2	42.7	50.1	56.6	-	-	-
1989	16.3	22.5	32.0	36.8	43.0	47.3	53.6	-	-	-
1990	16.3	24.9	33.8	44.2	46.9	50.7	53.0	-	-	-
1991	16.9	25.0	37.0	42.7	54.3	55.2	53.8	56.8	63.7	-
1992	15.6	25.4	36.5	45.9	53.9	61.6	62.9	59.8	66.9	77.5
1993	14.4	21.8	32.2	42.6	50.6	58.4	57.9	-	-	-
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+
<u>Russia</u>										
1984	-	24.1	35.8	44.4	56.4	62.8	64.8	-	-	-
1985	16.5	22.4	30.9	44.1	53.8	61.3	64.7	-	-	-
1986	16.1	20.7	28.1	35.4	46.7	62.0	-	-	-	-
1987	17.0	21.5	27.8	32.3	37.3	48.6	-	-	-	-
1988	17.3	23.2	29.7	33.7	39.3	46.2	51.2	-	-	-
1989	17.7	22.2	26.5	38.5	44.5	49.3	53.0	57.7	-	-
1990	18.8	24.5	30.9	40.4	50.6	53.2	55.7	59.7	63.8	-
1991	17.4	24.2	30.5	39.7	53.4	55.4	58.3	60.5	62.7	70.2
1992	15.3	22.8	31.1	44.6	53.8	63.8	61.2	66.4	69.0	69.6

Table B8 North-East Arctic HADDOCK. Weight data (g) from Norwegian surveys in January-March and Russian surveys in November-December.

Year	Age									
	1	2	3	4	5	6	7	8	9	10
<u>Norway</u>										
1987	24	91	273	542	934	2,197	-	-	-	-
1988	25	120	350	450	730	1,140	1,560	-	-	-
1989	40	100	320	490	780	1,040	1,440	-	-	-
1990	42	148	370	827	988	1,247	1,425	-	-	-
1991	40	140	490	840	1,630	1,710	1,600	1,860	2,480	-
1992	30	150	450	940	1,510	2,280	2,810	2,170	2,980	4,870
1993	27	98	329	788	1,331	2,030	2,324	-	-	-
	0+	1+	2+	3+	4+	5+	6+	7+	8+	9+
<u>Russia</u>										
1984	36	127	438	815	1,777	2,395	2,688	-	-	-
1985	37	105	282	817	1,530	2,262	2,263	-	-	-
1986	38	88	209	419	919	2,240	-	-	-	-
1987	-	95	196	330	497	1,055	-	-	-	-
1988	35	106	248	398	627	997	1,431	-	-	-
1989	52	105	181	606	903	1,287	1,587	2,004	-	-
1990	62	143	288	667	1,337	1,533	1,778	2,233	2,731	-
1991	57	133	292	690	1,570	1,863	2,206	2,320	2,568	3,525
1992	40	108	279	850	1,542	2,199	2,363	3,045	3,391	3,400

Table C1 North-East Arctic SAITHE. Results from the Norwegian acoustic survey in October-November. Numbers in millions.

Year	Ages					Total
	2	3	4	5	6+	
1985 ¹	7.8	12.3	6.1	1.2	+	27.4
1986	49.5	108.5	9.0	4.5	6.5	178.0
1987	4.5	54.0	118.5	4.4	4.5	185.9
1988	40.0	54.0	26.5	7.9	0.5	128.9
1989	60.9	68.6	37.0	21.6	21.0	209.1
1990	248.0	43.1	19.4	8.9	16.4	335.8
1991	218.4	219.4	10.8	8.1	15.9	472.6
1992	357.6	557.8	73.6	8.1	13.9	1,011.0

¹ Only northern part of area covered, the year excluded from VPA tuning. Abundance estimates from the Halten Bank area covered only in 1988-1992 are not included in the Table.

Table E1 Greenland HALIBUT in Sub-areas I and II. Norwegian bottom-trawl survey indices (numbers in thousands) in the Svalbard area (Division IIb).

Year	Fish ² <20 cm	Age										Total			
		1	2	3	4	5	6	7	8	9	10+				
1981	2.1														20,100
1982	0.7					No age data									26,000
1983	5.9														26,690
1984	3.2	550	3,042	2,924	8,573	6,847	5,657	4,345	2,796	1,709	187				36,630
1985	1.6	884	3,921	4,294	6,674	8,793	8,622	3,920	1,817	508	17				39,450
1986	0.1	49	1,005	1,967	7,314	4,671	1,754	2,301	372	11	26				19,470
1987	1.0	630	1,014	3,076	4,409	4,786	3,141	964	364	108	8				18,500
1988	2.5	818	4,298	6,191	6,696	12,289	2,396	6,015	338	257	20				39,300
1989 ¹	1.4	1,010	3,510	7,200	8,500	6,590	2,660	1,670	500	224	+				31,900
1990 ¹	0.4	115	336	5,050	7,130	7,730	4,490	2,330	918	544	+				28,700
1991 ¹	0.1	71	877	3,080	6,720	9,270	5,450	2,800	1,660	483	41				30,452
1992 ¹		33	30	338	1,190	3,520	4,420	2,280	1,280	437	37				13,565

¹ New standard trawl equipment (rockhopper gear and 40 meter sweep length).

² In millions.

Table E2 Greenland HALIBUT in Sub-areas I and II. Results from the Norwegian bottom trawl survey in the Barents Sea in January-March. Numbers in thousands.

Year	Length group (cm)													Total		
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74		75-79	80+
1990	21	199	777	785	1,205	1,657	1,829	2,043	1,349	479	159	160	40	82	0	10,800
1991	0	42	262	618	655	868	954	1,320	1,875	1,577	847	165	34	51	0	9,270
1992	14	35	64	149	509	843	1,096	1,072	1,029	827	633	108	31	27	26	6,500
1993	0	0	17	67	117	484	1,415	1,255	1,418	846	589	358	89	31	34	6,720

Table E3 Greenland HALIBUT in Sub-areas I and II. Results of the Russian bottom-trawl survey in the Svalbard and Barent Sea regions in October-December (numbers in millions).

Year	Survey area	Age								Total
		to 3	4	5	6	7	8	9	10+	
1990	I-III	1.2	8.3	18.9	17.2	8.3	2.9	1.2	1.2	59.2
1991	I-III	No age data								16.7
	I-IV									63.0
1992	I-III	0.5	6.9	24.6	12.2	3.4	1.6	0.9	1.1	51.2
	I-IV	0.7	7.0	30.3	18.7	7.2	4.3	1.5	1.5	72.1

Sub-areas I-III: Along the continental slope to the west of Bear Island and Svalbard from 71°40'N-80°N.

Sub-area IV: From the Bear Island and Svalbard east to 33°E and from 73°N-77°N.

Table E4 Proportion of mature GREENLAND HALIBUT by age. Data from Russia for the years 1983-1992.

Age years	1984 ¹	1985 ¹	1986 ²	1987 ²	1988 ¹	1989 ²	1990 ²	1992 ³	Average 1983-1987
3	-	-	-	-	-	-	-	-	-
4	-	-	0.04	0.06	-	0.01	0.09	0.03	0.05
5	0.28	0.18	0.23	1.20	0.04	0.10	0.29	0.14	0.23
6	0.68	0.43	0.49	0.46	0.40	0.66	0.52	0.22	0.49
7	0.70	0.64	0.52	0.70	0.57	0.74	0.66	0.26	0.66
8	0.76	0.77	0.62	0.74	0.63	0.68	0.75	0.34	0.78
9	0.80	0.92	0.80	0.91	0.67	0.81	0.71	0.55	0.89
10	0.89	0.97	0.88	0.96	0.89	0.92	0.77	0.95	0.95
11	0.96	0.99	1.00	1.00	1.00	0.94	0.93	0.83	0.99
12	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
13	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
14	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	1.00
15	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	1.00

¹ The specimens analyzed were sampled through the whole year.

² The specimens analyzed were sampled in August-February.

³ The specimens analyzed were sampled in October-December.

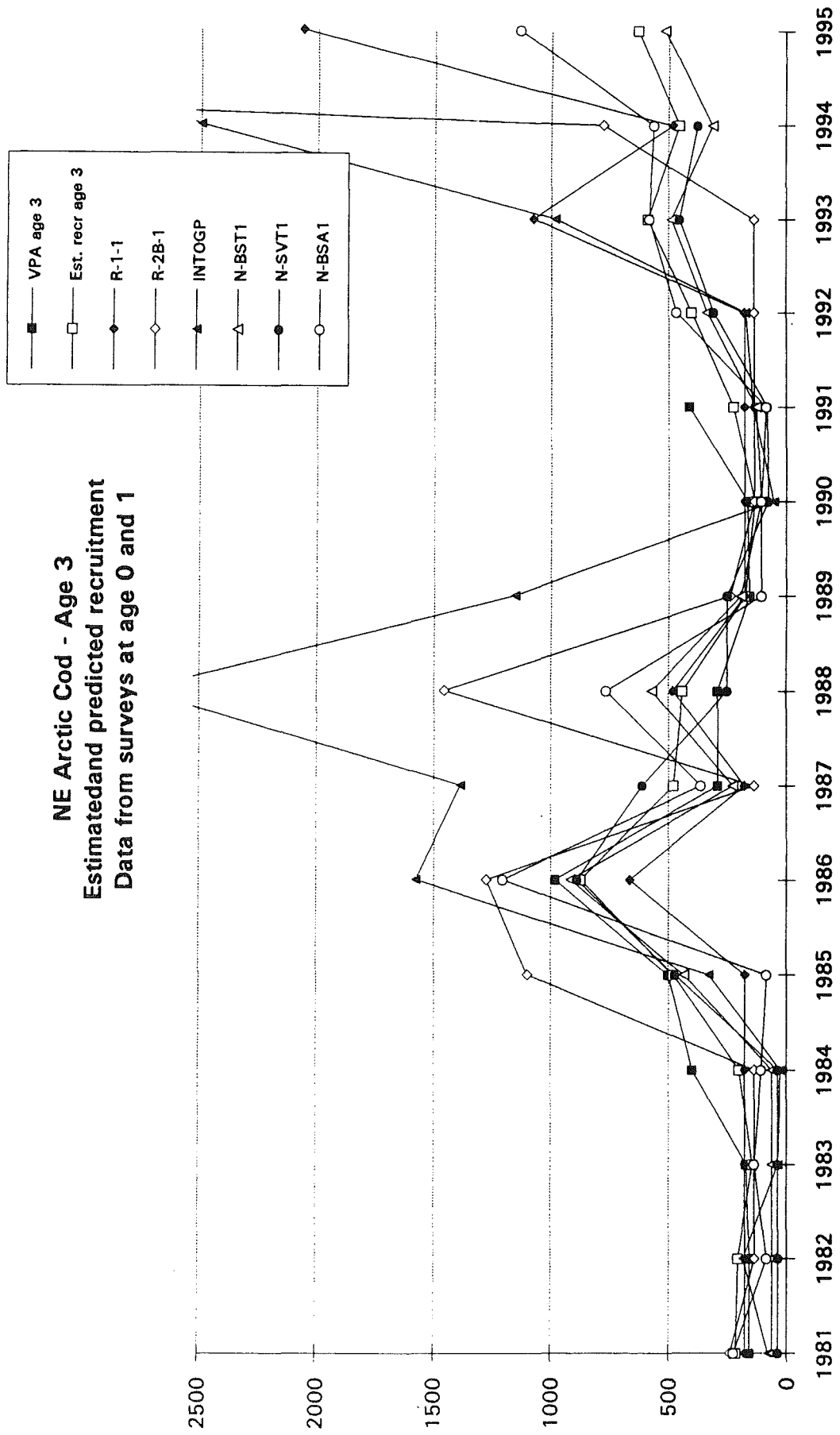


Chart6

NE Arctic Cod - Age 3
Estimated and predicted recruitment
Data from surveys at age 2

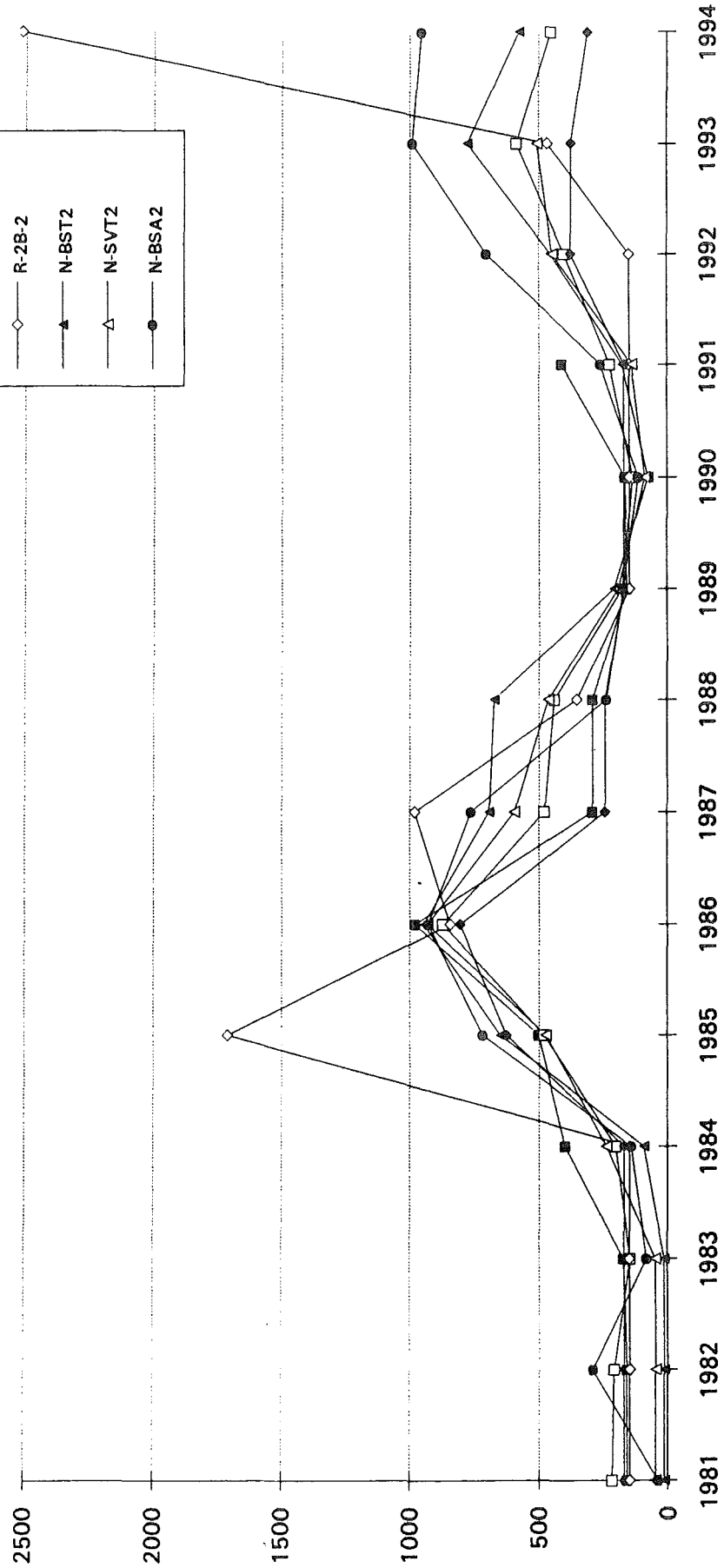


Figure A2

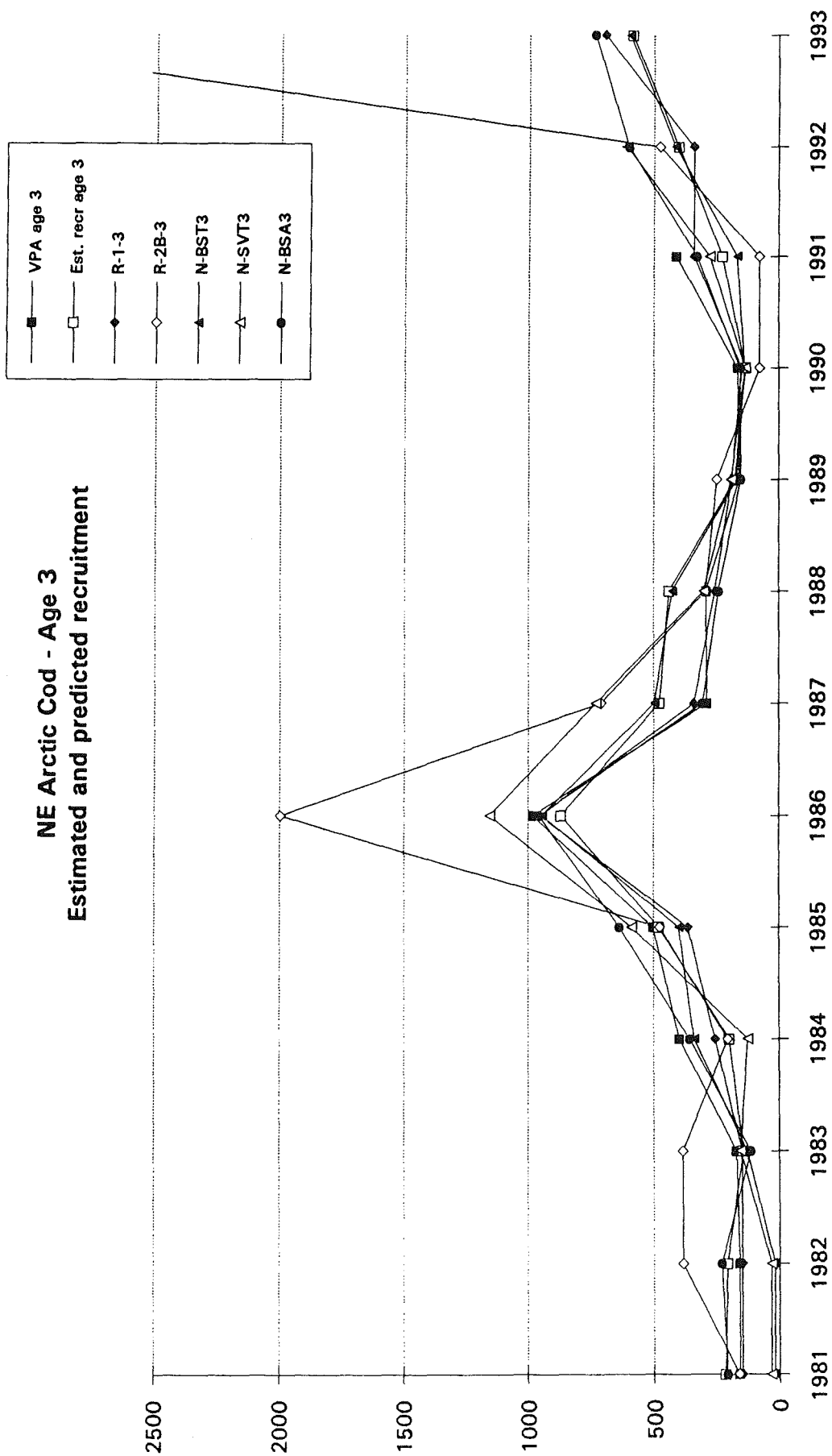


Figure A4

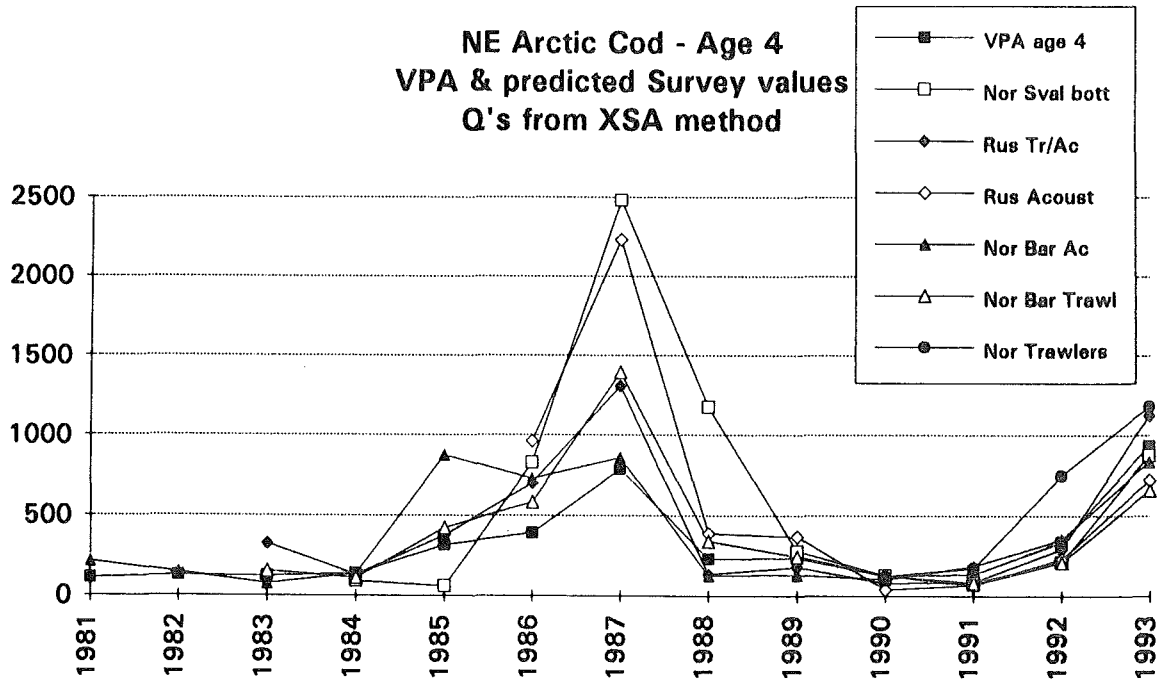


Figure A5

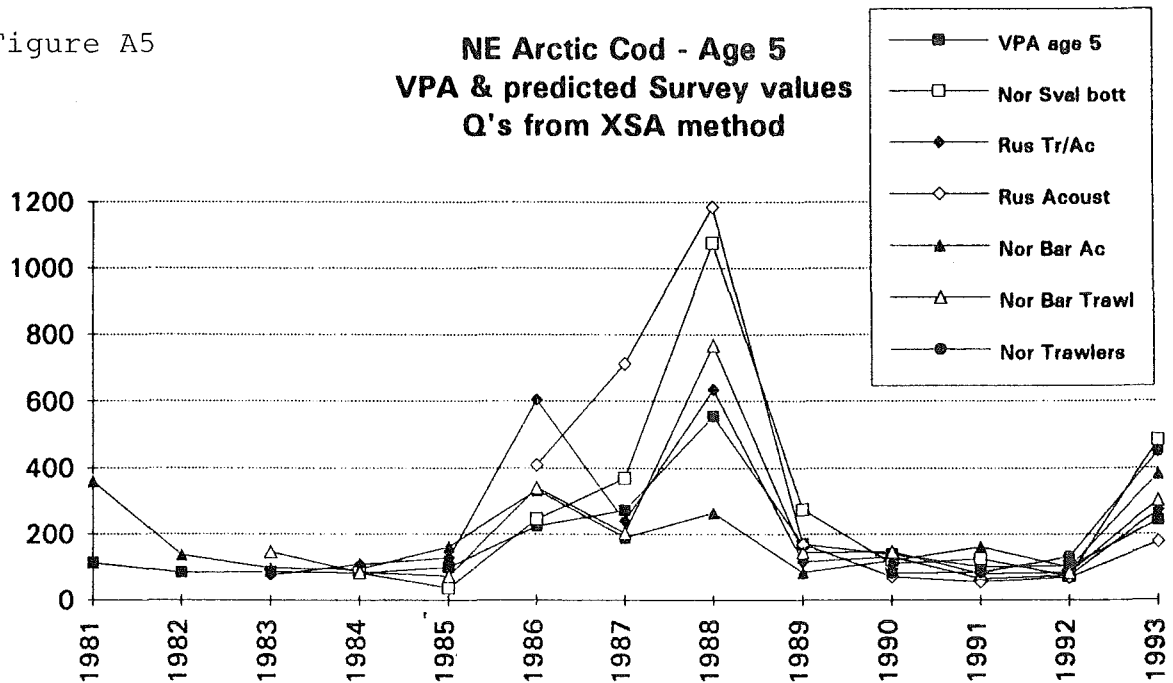


Figure A6

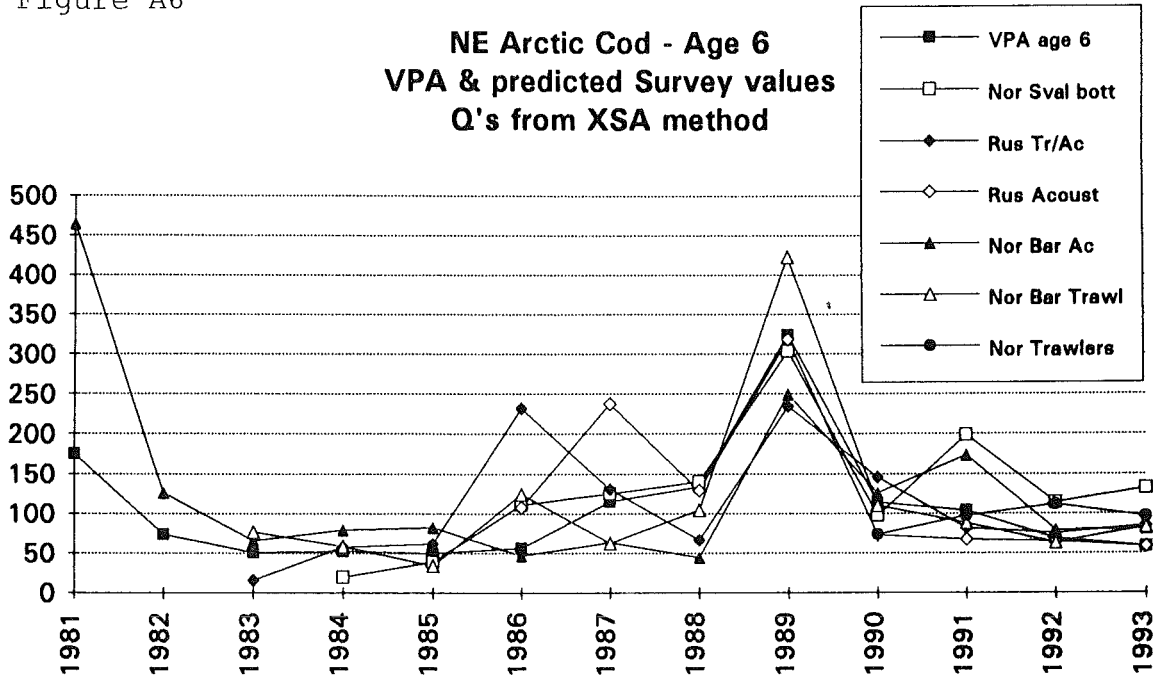


Figure A7

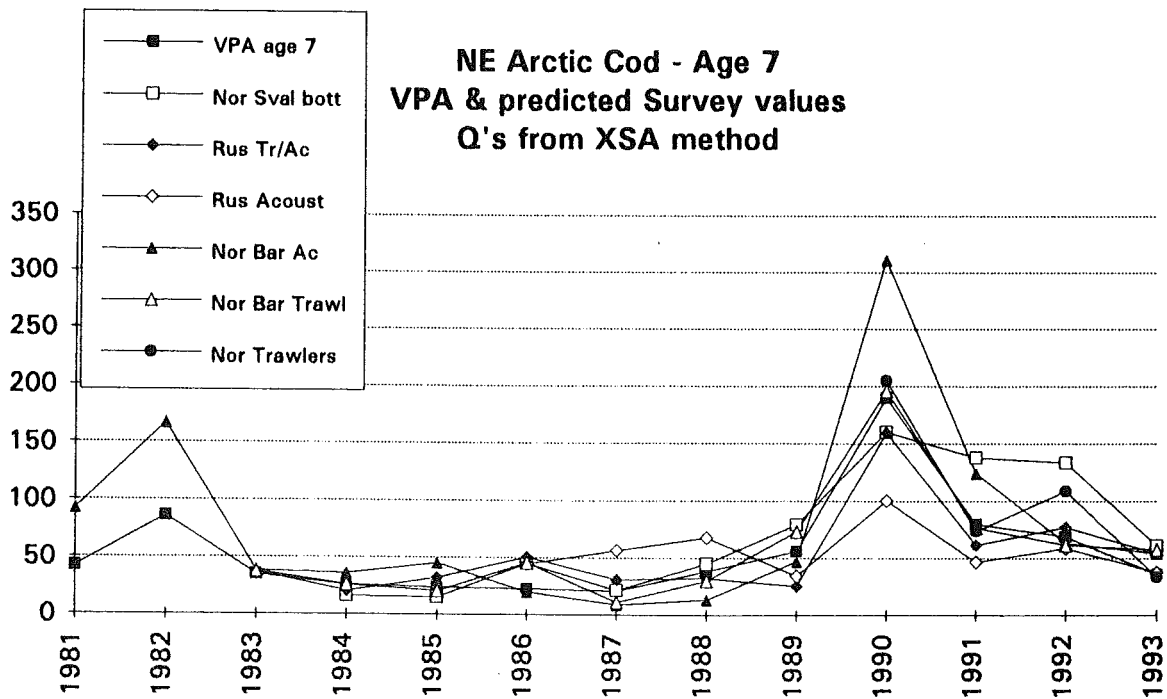


Figure A8

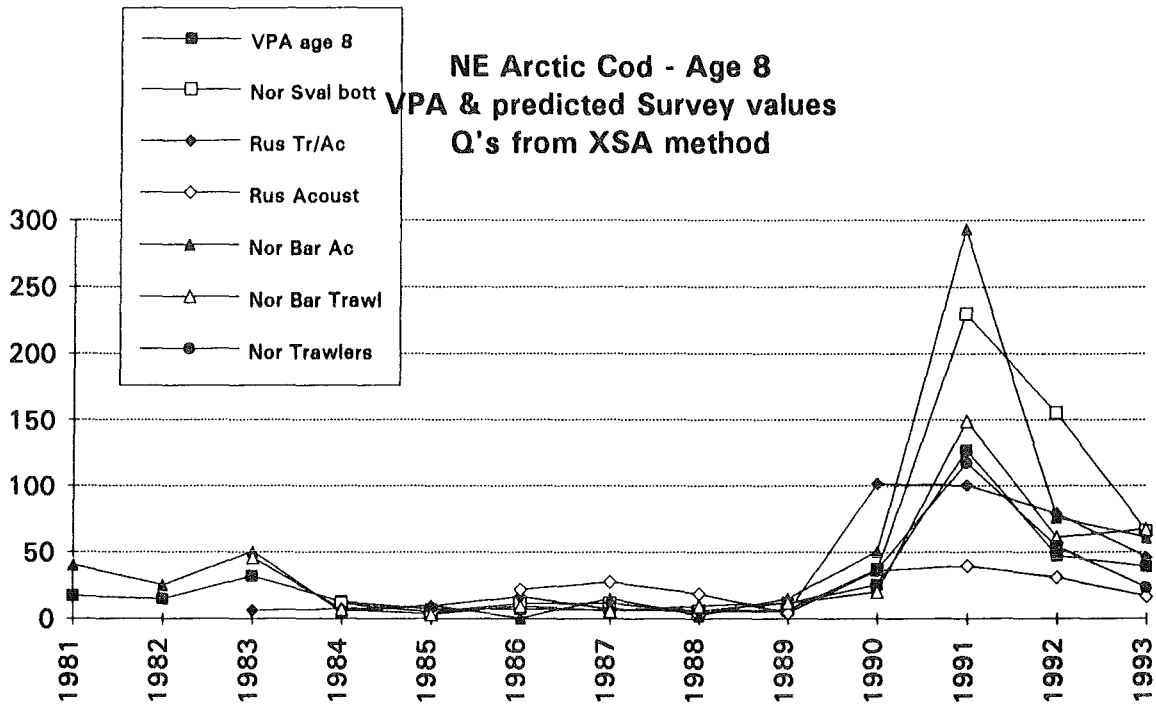


Figure A9

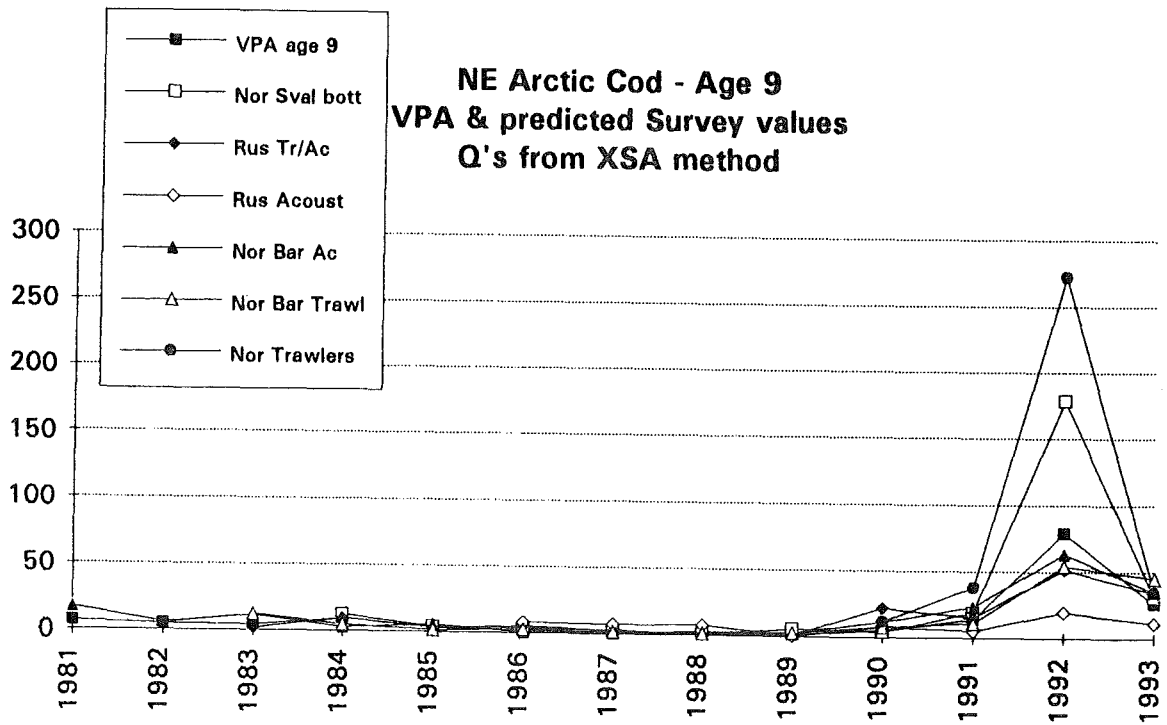


Figure B1

**NE Arctic Haddock
numbers at 3 year old
VPA & predicted survey values Q's from XSA**

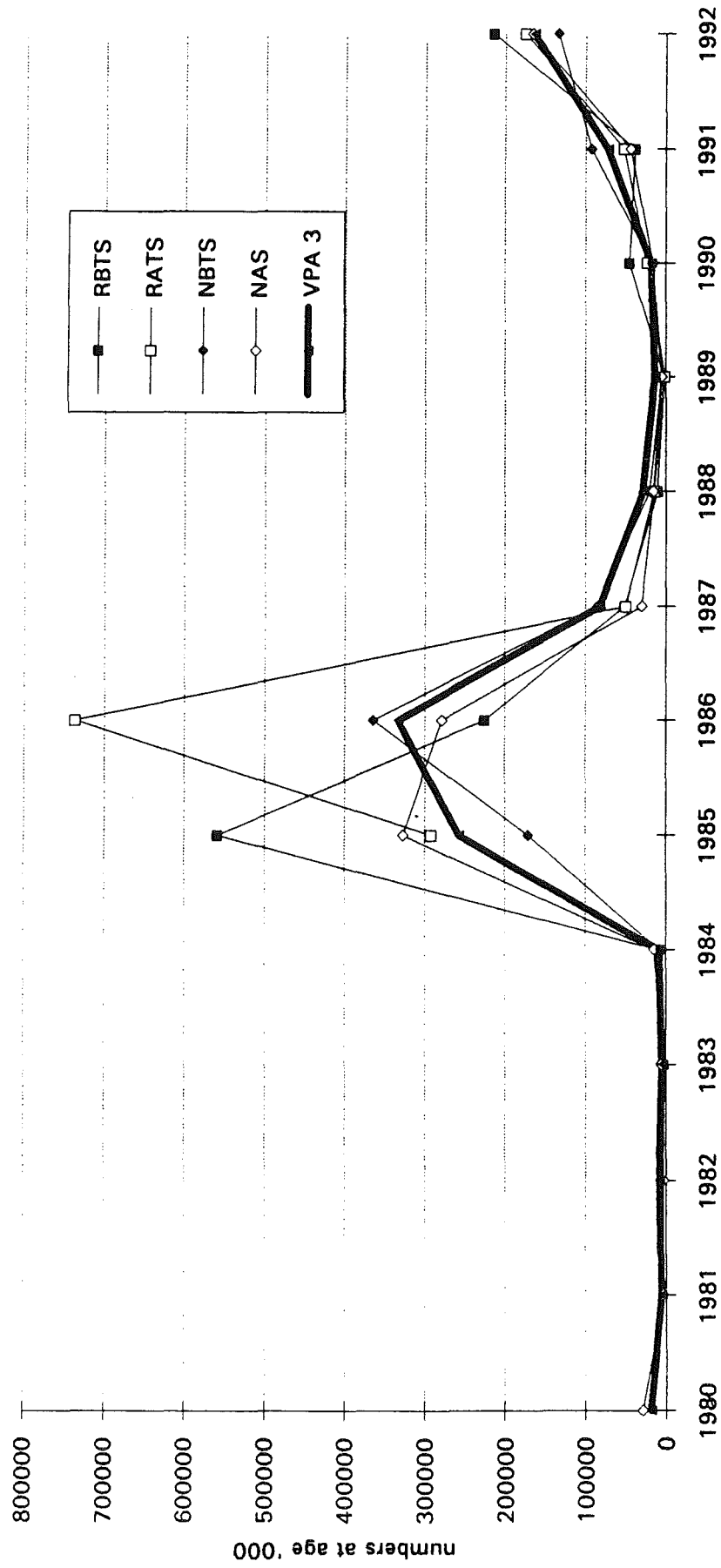


Figure B2

**NE Arctic Haddock
numbers at 4 year old
VPA & predicted survey values Q's from XSA**

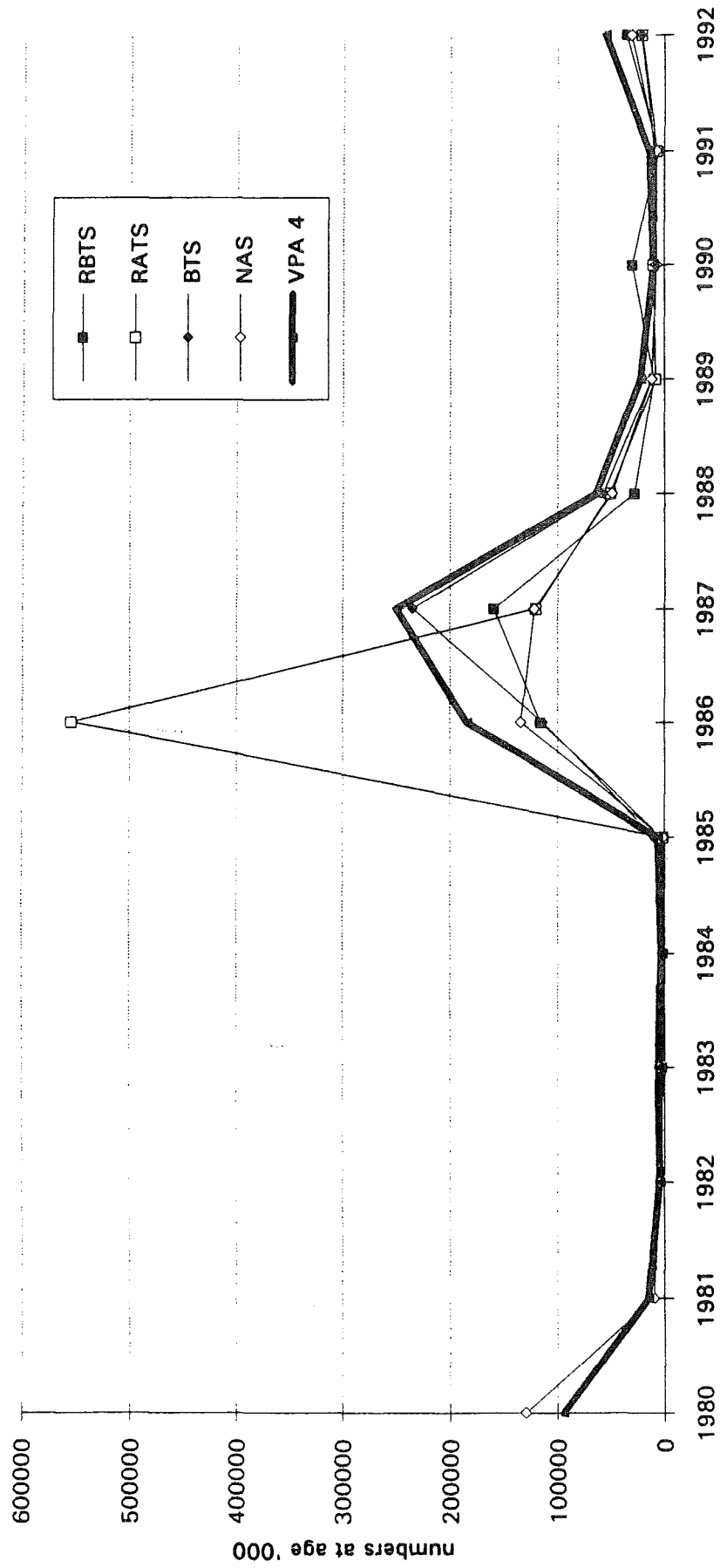


Figure B3

**NE Arctic Haddock
numbers at 5 year old
VPA & predicted survey values Q's from XSA**

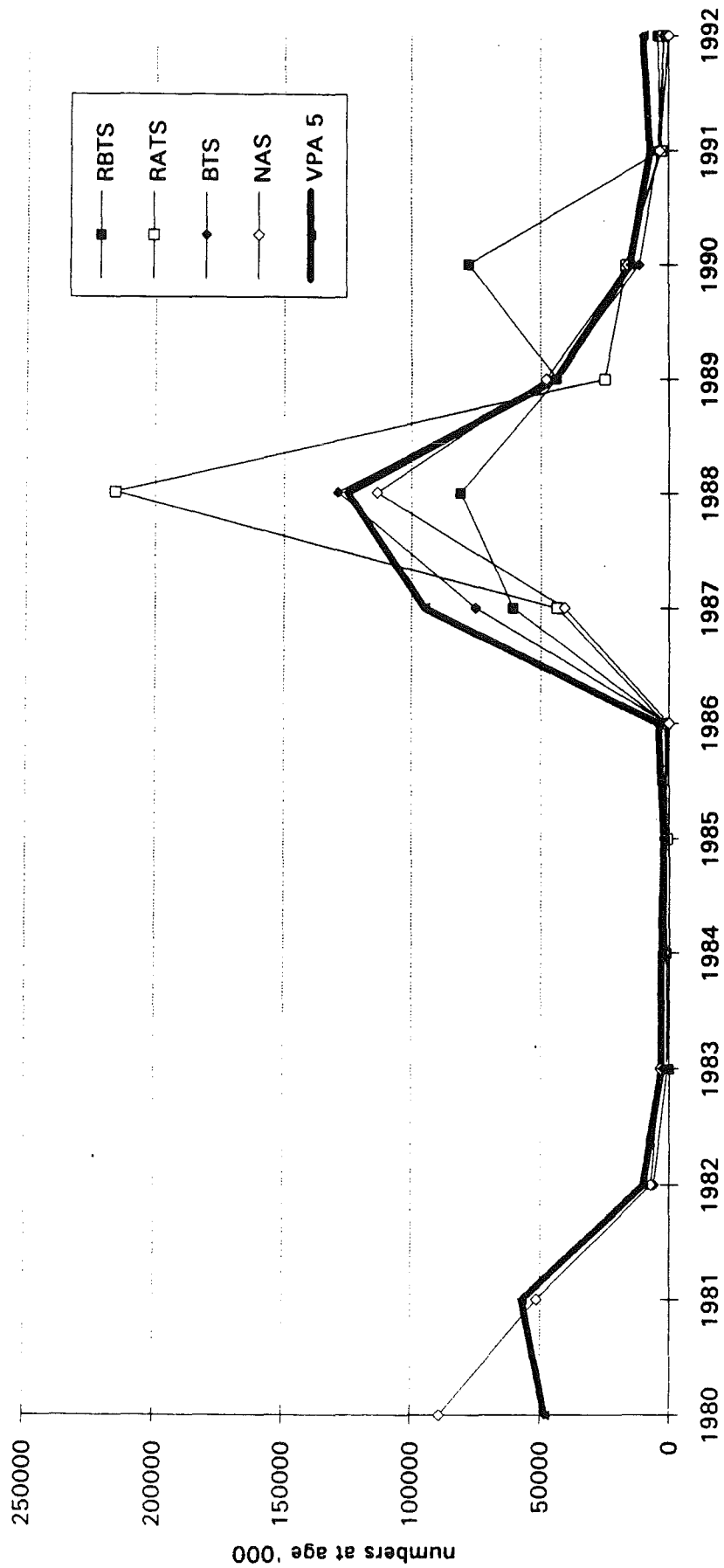


Figure B4

**NE Arctic Haddock
numbers at 6 year old
VPA & predicted survey values Q's from XSA**

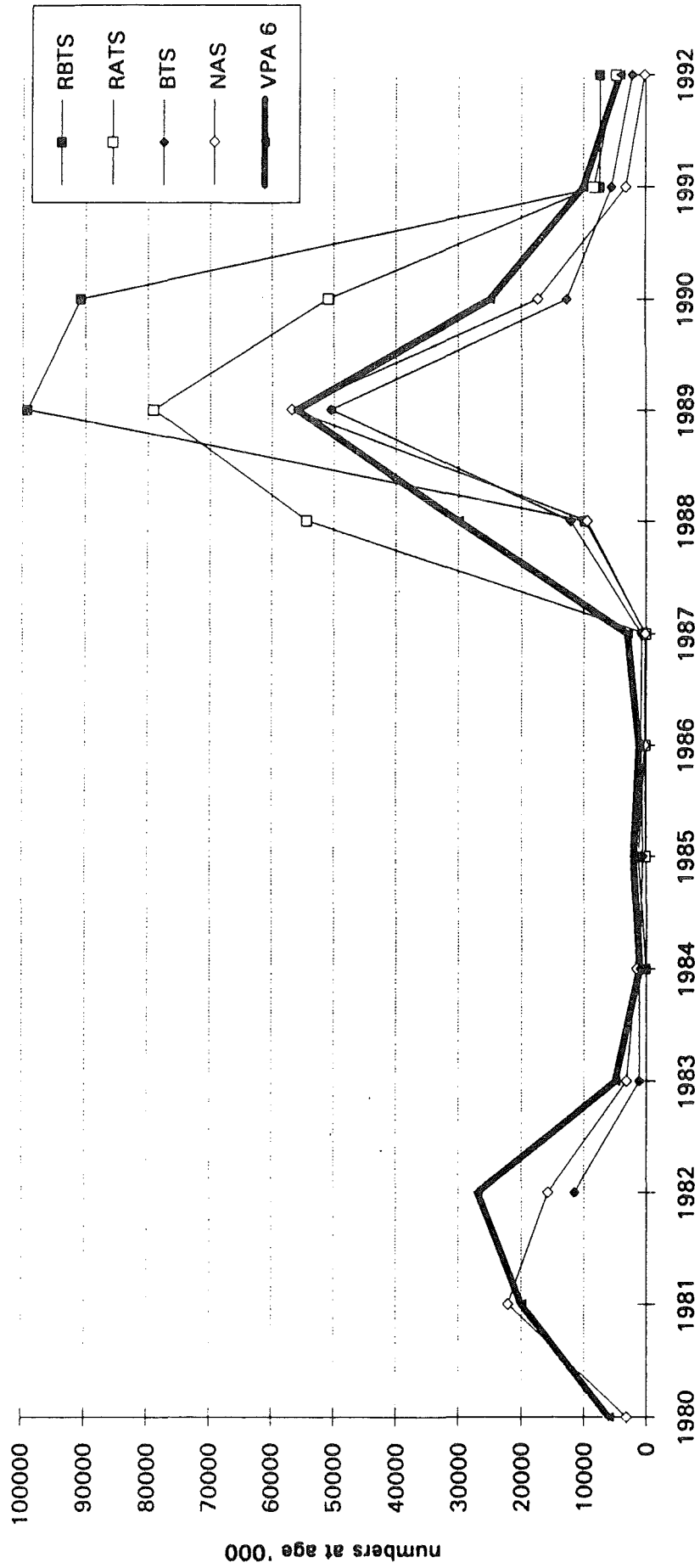
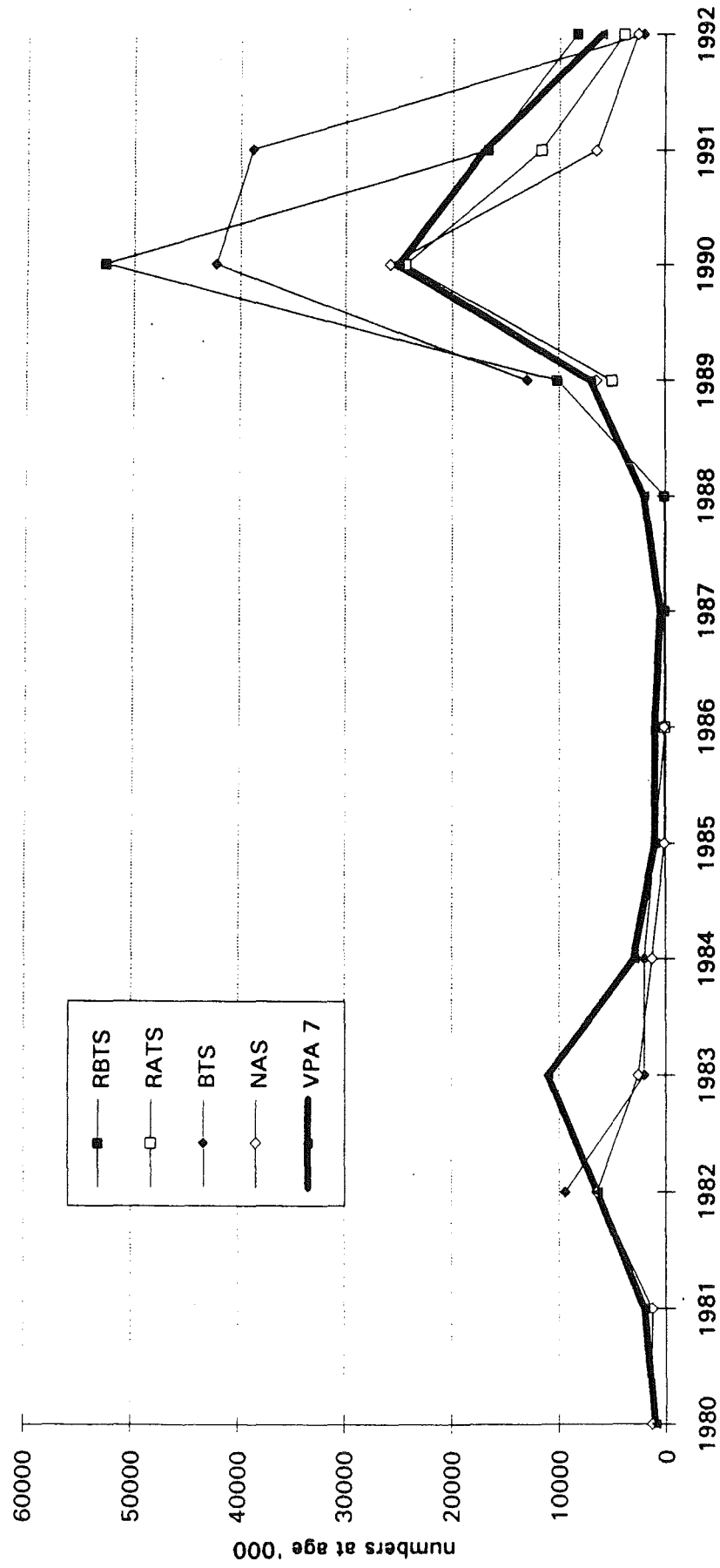


Figure B5

**NE Arctic Haddock
numbers at 7 year old
VPA & predicted survey values Q's from XSA**



APPENDIX III

ADAPT Tuning Analysis for North-East Arctic Cod

The ADAPT tuning analysis was used in addition to XSA to determine population sizes and fishing mortalities for North-East Arctic cod. Five surveys were used in this tuning and are described, along with their ADAPT designations, as follows:

- RV1 - Norwegian Barents Sea Bottom Trawl Survey
- RV2 - Norwegian Barents Sea Acoustic Survey
- RV3 - Norwegian Svalbard Area Trawl Survey
- RV4 - Russian Trawl/Acoustic Survey
- RV5 - Russian Acoustic Survey

The Norwegian Barents Sea bottom trawl and acoustic surveys were conducted during winter so they were shifted one age and allocated to the end of the year before they were conducted so that the 1993 survey data could be included in the tuning. For each survey only ages 3 to 8 were included in the analysis. The fishing mortalities on ages 9 and older in the terminal year were assumed to be the same as that estimated on age 8 and the fishing mortalities on the oldest age for each year were assigned the average F of ages 8-9.

The estimated population numbers for ages 3-8 in 1993 along with the catchabilities by survey and age and their standard errors are presented in Table 1. Coefficients of variation (CVs) on the estimated populations ranged from 0.13 to 0.29 while the CVs on the catchabilities ranged from 0.18 to 0.23. The estimated abundance of age 3 in 1992 was associated with the highest CV (0.29).

Residuals (OBSinRV-PREDinRV) are presented in Table 2. Throughout the survey time series year effects are evident, that is to say residuals for a particular survey and year are either all negative or all positive. This is a common observation from research survey data. The residuals also indicate, in general, that the surveys overestimate the size of the population in the terminal year.

Population numbers and fishing mortalities for the period of the tuning (1981-1992) are presented in Table 3. The estimates of abundance and F are very similar to those derived from the accepted XSA analysis. The total population for 1992 is estimated to be about the size of the population in 1986 when the strong 1983 year class was first observed in the VPA. Fishing mortalities for the 1990-1992 period are generally lower than those from the earlier period (1981-1989). In 1990 management measures were introduced to lower the level of fishing effort on this stock.

Table 4 with an associated figure describe the retrospective patterns for this ADAPT analysis. ADAPT seems to give consistent results for successive assessment periods. The large drop in fishing mortality from 1989 to 1990 is observed in each retrospective assessment when data for these years are available.

Appendix 3 - Table 1

North-East Arctic Cod: ADAPT tuning including estimates of overfishing.
 Parameter estimates with standard errors.

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000393
 MEAN SQUARE RESIDUALS 0.382371

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.
-----	---	-----	-----	-----	-----
NUMBERS					
	3	934602	267018	3.500	0.286
	4	307945	59582	5.168	0.193
	5	93923	13791	6.810	0.147
	6	68178	9242	7.377	0.136
	7	66794	9216	7.247	0.138
	8	46949	5945	7.897	0.127
INDEX 1: RV1					
	3	3.28E ⁻⁴	6.29E ⁻⁵	5.223	0.191
	4	3.20E ⁻⁴	6.07E ⁻⁵	5.273	0.190
	5	2.63E ⁻⁴	4.98E ⁻⁵	5.279	0.189
	6	1.70E ⁻⁴	3.23E ⁻⁵	5.277	0.190
	7	9.25E ⁻⁵	1.76E ⁻⁵	5.264	0.190
	8	6.99E ⁻⁵	1.34E ⁻⁵	5.217	0.192
INDEX 2: RV2					
	3	6.34E ⁻⁴	1.16E ⁻⁴	5.467	0.183
	4	7.27E ⁻⁴	1.32E ⁻⁴	5.515	0.181
	5	6.28E ⁻⁴	1.14E ⁻⁴	5.521	0.181
	6	4.87E ⁻⁴	8.82E ⁻⁵	5.519	0.181
	7	2.45E ⁻⁴	4.45E ⁻⁵	5.506	0.182
	8	2.56E ⁻⁴	4.69E ⁻⁵	5.461	0.183
INDEX 3: RV3					
	3	1.30E ⁻⁴	2.61E ⁻⁵	4.969	0.201
	4	1.24E ⁻⁴	2.47E ⁻⁵	5.022	0.199
	5	1.31E ⁻⁴	2.61E ⁻⁵	5.033	0.199
	6	1.31E ⁻⁴	2.61E ⁻⁵	5.032	0.199
	7	1.01E ⁻⁴	2.01E ⁻⁵	5.020	0.199
	8	1.32E ⁻⁴	2.65E ⁻⁵	4.978	0.201
INDEX 4: RV4					
	3	4.83E ⁻⁵	9.25E ⁻⁶	5.223	0.191
	4	7.14E ⁻⁵	1.35E ⁻⁵	5.273	0.190
	5	8.40E ⁻⁵	1.59E ⁻⁵	5.279	0.189
	6	1.04E ⁻⁴	1.97E ⁻⁵	5.277	0.190
	7	1.18E ⁻⁴	2.23E ⁻⁵	5.264	0.190
	8	1.31E ⁻⁴	2.52E ⁻⁵	5.217	0.192
INDEX 5: RV5					
	3	4.92E ⁻⁴	1.11E ⁻⁴	4.413	0.227
	4	6.61E ⁻⁴	1.48E ⁻⁴	4.471	0.224
	5	8.02E ⁻⁴	1.79E ⁻⁴	4.480	0.223
	6	1.02E ⁻³	2.28E ⁻⁴	4.478	0.223
	7	2.43E ⁻³	5.45E ⁻⁴	4.464	0.224
	8	2.92E ⁻³	6.61E ⁻⁴	4.415	0.227

Appendix 3 - Table 2

North-East Arctic Cod: ADAPT tuning including estimates of overfishing.
Residuals.

LOG RESIDUALS FROM RV1

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.1	-0.3	0.2	0.3	0.5	0.3	0.2	-0.1	-0.5	-0.5	-0.2
4	0.5	0.0	-0.4	0.4	-0.4	0.3	-0.2	0.0	-0.3	-0.2	0.3
5	0.3	0.1	-0.5	0.7	-0.6	-0.3	0.3	-0.1	-0.2	-0.1	0.4
6	0.0	0.0	-0.2	0.6	-0.7	-0.2	0.2	0.1	-0.1	-0.1	0.4
7	0.3	-0.7	-0.8	0.2	-0.2	0.4	0.2	-0.3	0.2	0.2	0.5
8	0.9	-0.8	-0.8	0.4	-0.9	-0.3	0.5	1.1	-0.3	-0.3	0.5

SUM OF RV RESIDUALS : 2.912335024E-7 MEAN RESIDUAL : 4.412628828E-9

LOG RESIDUALS FROM RV2

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.1	-0.5	-0.1	1.0	0.5	0.1	-0.7	-0.4	-0.3	0.3	0.1	0.0
4	0.4	0.0	0.1	0.4	0.3	-0.4	-0.8	-0.8	-0.2	0.4	0.0	0.5
5	0.5	0.2	0.4	0.4	-0.3	-0.6	-1.2	-0.3	0.0	0.5	0.1	0.4
6	0.6	0.0	0.2	0.5	-0.2	-1.0	-1.0	-0.3	0.5	0.4	-0.1	0.3
7	0.3	0.2	-1.2	0.1	-1.3	0.6	-1.1	0.4	0.5	0.8	0.3	0.3
8	-0.2	0.6	-1.6	0.2	0.0	0.1	0.0	0.1	1.2	0.1	-0.4	-0.1

SUM OF RV RESIDUALS : 2.797362006E-7 MEAN RESIDUAL : 3.885225016E-9

LOG RESIDUALS FROM RV3

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	-0.5	-1.7	0.6	1.1	1.5	0.3	-0.1	-0.7	-0.5	0.0
4	-0.1	-1.1	0.0	0.2	0.6	0.4	-0.3	0.1	-0.4	0.7
5	-1.1	-0.4	0.5	-0.1	-0.1	-0.2	-0.3	0.5	0.4	0.8
6	-0.7	-0.7	0.5	-0.2	0.0	0.1	-0.2	0.4	0.5	0.4
7	-0.5	-0.8	0.1	0.2	-0.4	-0.6	0.1	0.5	1.0	0.3
8	-0.2	-0.3	0.2	0.0	-1.1	0.8	0.0	0.0	0.7	-0.1

SUM OF RV RESIDUALS : 2.817475928E-7 MEAN RESIDUAL : 4.695793204E-9

LOG RESIDUALS FROM RV4

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.9	-0.2	0.1	0.5	0.4	-0.6	-0.2	-0.6	-0.4	-0.2	0.3
4	-0.2	0.2	0.2	1.0	-0.2	0.1	-0.4	-0.1	-0.5	-0.3	0.2
5	-1.2	0.1	0.2	1.4	0.1	-0.7	-0.3	0.2	-0.3	0.1	0.5
6	0.0	-0.3	0.2	0.7	0.3	-0.1	-0.8	-0.1	-0.3	0.1	0.4
7	-1.7	-0.7	0.3	0.8	0.0	-0.1	-0.5	1.4	-0.1	0.5	0.2
8	-1.1	-0.1	-0.1	0.9	0.3	-0.9	-0.8	2.1	0.0	-0.4	0.1

SUM OF RV RESIDUALS : 2.665914622E-7 MEAN RESIDUAL : 4.039264565E-9

LOG RESIDUALS FROM RV5

	1985	1986	1987	1988	1989	1990	1991	1992
3	0.8	1.0	0.4	0.5	-1.3	-0.8	-0.4	-0.2
4	0.5	0.9	0.7	-0.1	-0.7	-0.6	-0.4	-0.3
5	0.6	0.7	-0.1	0.0	-0.5	-0.5	-0.1	0.0
6	0.6	0.9	0.6	-0.6	-0.6	-0.6	-0.2	0.0
7	0.9	1.2	1.0	-0.8	0.2	-1.1	-0.5	-0.9
8	1.2	1.2	1.2	-1.0	0.9	-1.1	-1.4	-1.0

SUM OF RV RESIDUALS : -5.072721816E-7 MEAN RESIDUAL : -1.056817045E-8

Appendix 3 - Table 3

North-East Arctic Cod: ADAPT tuning including estimates of overfishing.
Population numbers and fishing mortality.

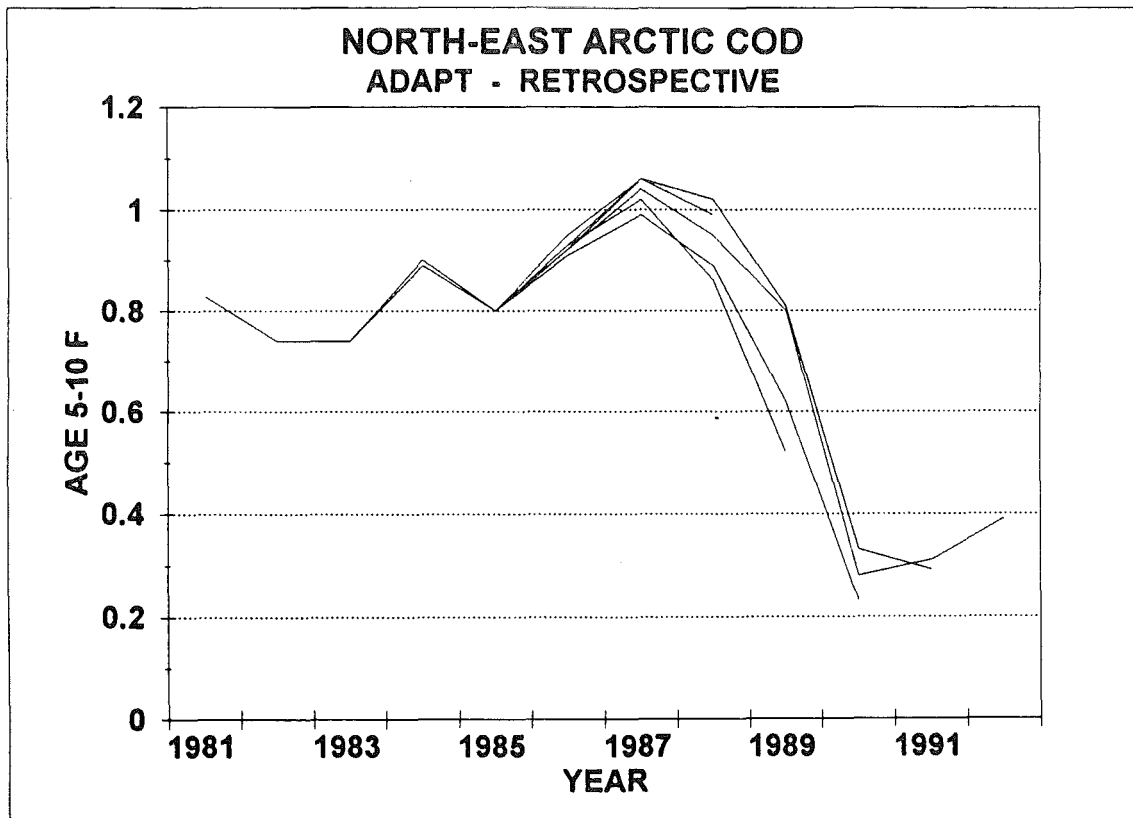
POPULATION NUMBERS (000S)												
	1981	1982	1983	1984	1985	1986	1987	1988				
3	159745	159206	170935	384968	501358	936659	287817	232683				
4	112790	127706	122250	137137	308827	393030	751541	230604				
5	113017	83780	85616	82361	99461	218171	271242	524473				
6	175019	73707	51089	51571	50385	56806	110321	134017				
7	42027	85897	34935	25852	23810	22846	21380	33887				
8	16721	14694	31874	13216	7218	7199	6637	5831				
9	6625	4702	4435	9512	3257	1942	1743	1867				
10	2214	1563	1246	1328	2310	944	611	504				
11	1455	627	639	435	396	930	267	106				
12	208	393	268	316	156	177	350	92				
13	51	72	87	152	120	75	32	75				
14	5	8	34	19	74	52	35	11				
3+	629877	552354	503407	706868	997372	1638829	1451976	1164150				
	1989	1990	1991	1992								
3	159219	151780	379835	932612								
4	186896	126852	122873	306696								
5	169590	135072	99179	93145								
6	298911	113399	100983	67548								
7	55980	168900	78848	66270								
8	8470	24568	110088	46582								
9	1684	2462	14084	66010								
10	443	549	1265	7843								
11	123	72	302	669								
12	27	59	22	218								
13	21	15	36	11								
14	16	16	4	28								
3+	881377	723743	907516	1587632								
FISHING MORTALITY												
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3	0.02	0.06	0.02	0.02	0.04	0.02	0.02	0.02	0.03	0.01	0.01	0.03
4	0.10	0.20	0.19	0.12	0.15	0.17	0.16	0.11	0.12	0.05	0.08	0.14
5	0.23	0.29	0.31	0.29	0.36	0.48	0.51	0.36	0.20	0.09	0.18	0.40
6	0.51	0.55	0.48	0.57	0.59	0.78	0.98	0.67	0.37	0.16	0.22	0.46
7	0.85	0.79	0.77	1.08	1.00	1.04	1.10	1.19	0.62	0.23	0.33	0.37
8	1.07	1.00	1.01	1.20	1.11	1.22	1.07	1.04	1.04	0.36	0.31	0.37
9	1.24	1.13	1.01	1.22	1.04	0.96	1.04	1.24	0.92	0.47	0.39	0.37
10	1.06	0.69	0.85	1.01	0.71	1.06	1.55	1.21	1.62	0.40	0.44	0.37
11	1.11	0.65	0.50	0.82	0.61	0.78	0.87	1.19	0.53	1.00	0.12	0.37
12	0.87	1.31	0.36	0.77	0.54	1.50	1.33	1.28	0.40	0.31	0.52	0.37
13	1.62	0.54	1.34	0.52	0.63	0.56	0.87	1.37	0.05	1.16	0.03	0.37
14	1.16	1.06	1.01	1.21	1.08	1.09	1.06	1.14	0.98	0.41	0.35	0.37

Appendix 3 - Table 4

Retrospective analysis using the ADAPT tuning for North - East Arctic Cod.

Year	Terminal year of assessment					
	1992	1991	1990	1989	1988	1987
1981	0.83	0.83	0.83	0.83	0.83	0.83
1982	0.74	0.74	0.74	0.74	0.74	0.74
1983	0.74	0.74	0.74	0.74	0.74	0.74
1984	0.89	0.89	0.89	0.89	0.89	0.90
1985	0.80	0.80	0.80	0.80	0.80	0.80
1986	0.92	0.93	0.91	0.93	0.92	0.95
1987	1.04	1.06	0.99	1.02	1.06	1.06
1988	0.95	1.02	0.89	0.86	0.99	
1989	0.80	0.81	0.62	0.52		
1990	0.28	0.33	0.23			
1991	0.31	0.29				
1992	0.39					

Note: Estimates of overfishing included for 1990-1992.



Appendix 3 - Table 5

NE ARCTIC HADDOCK ADAPT TUNING
BARENTS SEA TRAWL AND ACOUSTIC RV BY NORWAY SHIFTED TO DECEMBER

	POPULATION NUMBERS (000S)								28/ 8/93			
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990		
3 |	5653	8022	4565	8247	258290	342392	81894	34265				
4 |	15097	4189	5769	3101	6339	184734	257166	63495				
5 |	56992	10043	2615	2977	1778	4147	95627	130656				
6 |	19711	26643	5171	1341	1681	961	2479	30688				
7 |	2098	6470	10771	2991	820	729	447	1499				
8 |	422	782	2922	5849	1756	386	284	179				
9 |	413	199	329	1572	2753	864	185	121				
10 |	565	191	95	223	836	1067	441	85				
11 |	906	398	84	45	119	308	436	253				
12 |	1192	443	243	43	14	52	151	198				
13 |	51	466	73	180	2	7	11	45				
3+ |	103101	57846	32639	26568	274389	535647	439120	261484				
|	1989	1990	1991	1992								
3 |	15336	11707	61944	225056								
4 |	27336	11606	9116	47125								
5 |	43813	18805	8440	5684								
6 |	60945	24737	13704	5203								
7 |	7513	29057	16509	8617								
8 |	882	3054	17679	9497								
9 |	87	498	1730	10473								
10 |	68	62	56	1056								
11 |	30	23	5	27								
12 |	79	13	16	3								
13 |	40	45	8	7								
3+ |	156127	99607	129207	312748								
	FISHING MORTALITY										28/ 8/93	
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3 |	0.10	0.13	0.19	0.06	0.14	0.09	0.05	0.03	0.08	0.05	0.07	0.06
4 |	0.21	0.27	0.46	0.36	0.22	0.46	0.48	0.17	0.17	0.12	0.27	0.32
5 |	0.56	0.46	0.47	0.37	0.41	0.31	0.94	0.56	0.37	0.12	0.28	0.66
6 |	0.91	0.71	0.35	0.29	0.63	0.57	0.30	1.21	0.54	0.20	0.26	0.47
7 |	0.79	0.59	0.41	0.33	0.55	0.74	0.72	0.33	0.70	0.30	0.35	0.32
8 |	0.55	0.67	0.42	0.55	0.51	0.53	0.65	0.51	0.37	0.37	0.32	0.39
9 |	0.57	0.54	0.19	0.43	0.75	0.47	0.58	0.38	0.15	1.98	0.29	0.39
10 |	0.15	0.62	0.56	0.43	0.80	0.70	0.35	0.85	0.89	2.27	0.53	0.39
11 |	0.52	0.29	0.48	0.97	0.63	0.51	0.59	0.97	0.59	0.16	0.24	0.39
12 |	0.74	1.60	0.10	2.67	0.51	1.36	1.02	1.40	0.37	0.28	0.66	0.39
13 |	0.85	0.65	0.38	0.31	0.59	0.65	0.51	0.77	0.62	0.25	0.31	0.39

Appendix 3 - Table 6

NE ARCTIC HADDOCK ADAPT TUNING
 BARENTS SEA TRAWL AND ACOUSTIC RV BY NORWAY SHIFTED TO DECEMBER

LOG RESIDUALS FROM RV1											28/ 8/93
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
3 |	-0.47	-0.36	0.29	-0.08	0.35	0.30	-0.32	-0.83	0.69	0.68	-0.25
4 |	0.07	-0.70	-0.70	0.87	0.15	0.56	0.25	-0.50	-0.19	0.48	-0.29
5 |	0.12	-0.38	-0.60	0.80	-1.40	0.87	0.72	0.57	-0.19	-0.26	-0.27
6 |	0.14	-0.93	0.36	-0.21	0.68	-0.53	0.55	0.62	-0.18	-0.38	-0.12
7 |	1.20	-1.05	0.16	0.98	-0.10	-1.25	-2.84	1.47	0.90	1.44	-0.91

SUM OF RV RESIDUALS : 0.0003334363909 MEAN RESIDUAL : 0.000006062479835

LOG RESIDUALS FROM RV2											28/ 8/9
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
3 |	0.03	-0.39	0.74	0.81	0.57	0.08	-0.74	-0.62	-0.89	0.54	-0.07
4 |	-0.05	0.42	0.63	-0.11	-0.95	0.33	-0.09	0.11	-0.45	-0.16	0.24
5 |	0.77	0.42	1.08	0.16	0.72	-2.53	0.39	0.73	0.77	0.26	-0.28
6 |	1.48	0.64	0.31	0.91	1.03	-0.78	-1.99	0.49	0.93	0.31	-0.75
7 |	0.56	0.85	-0.76	-0.25	0.57	0.88	-0.27	-1.86	0.81	0.44	-0.33
	1992										
3 |	-0.05										
4 |	0.08										
5 |	-2.50										
6 |	-2.57										
7 |	-0.63										

SUM OF RV RESIDUALS : 0.000333309183 MEAN RESIDUAL : 0.00000555515305

LOG RESIDUALS FROM RV3										28/ 8/93
	1984	1985	1986	1987	1988	1989	1990	1991	1992	
3 |	0.35	1.08	-0.16	-0.24	-0.98	-1.57	1.57	-0.23	0.18	
4 |	-0.26	-0.42	0.16	0.16	-0.47	-0.68	1.22	0.08	0.20	
5 |	-0.79	-0.23	-1.17	0.35	-0.05	0.24	1.41	-0.82	1.05	
6 |	-0.70	0.11	-0.10	-1.31	-0.15	0.82	1.29	-0.57	0.60	
7 |	-1.67	-0.15	0.16	0.62	-0.98	0.87	0.76	0.23	0.15	

SUM OF RV RESIDUALS : 0.000333120758 MEAN RESIDUAL : 0.000007402683511

LOG RESIDUALS FROM RV4								28/ 8/93
	1986	1987	1988	1989	1990	1991	1992	
3 |	1.16	-0.13	-0.52	-1.87	1.02	0.21	0.12	
4 |	1.57	-0.28	0.00	-0.93	0.07	0.01	-0.44	
5 |	-0.60	0.19	1.17	-0.05	0.16	-0.65	-0.22	
6 |	-1.45	-2.62	1.75	0.89	1.07	-0.11	0.47	
7 |	-0.79	-1.01	-2.54	1.35	1.24	1.12	0.64	

SUM OF RV RESIDUALS : 0.0003091157027 MEAN RESIDUAL : 0.00000883187722

Appendix 3 - Table 7

NE ARCTIC HADDOCK ADAPT TUNING
 BARENTS SEA TRAWL AND ACOUSTIC RV BY NORWAY SHIFTED TO DECEMBER
 APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.009918
 MEAN SQUARE RESIDUALS 0.854748

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.
-----	---	-----	-----	-----	-----
NUMBERS					
	3	225657	104875	2.152	0.465
	4	47457	13853	3.426	0.292
	5	5756	1249	4.609	0.217
	6	5253	1187	4.423	0.226
	7	8678	2147	4.042	0.247
INDEX 1: RV1					
	3	9.69E ⁻⁴	2.78E ⁻⁴	3.484	0.287
	4	6.77E ⁻⁴	1.93E ⁻⁴	3.507	0.285
	5	3.26E ⁻⁴	9.32E ⁻⁵	3.494	0.286
	6	3.39E ⁻⁴	9.75E ⁻⁵	3.481	0.287
	7	1.95E ⁻⁴	5.58E ⁻⁵	3.493	0.286
INDEX 2: RV2					
	3	2.31E ⁻³	6.33E ⁻⁴	3.647	0.274
	4	1.25E ⁻³	3.41E ⁻⁴	3.669	0.273
	5	5.06E ⁻⁴	1.38E ⁻⁴	3.657	0.273
	6	4.90E ⁻⁴	1.34E ⁻⁴	3.645	0.274
	7	7.32E ⁻⁴	2.00E ⁻⁴	3.656	0.274
INDEX 3: RV3					
	3	1.66E ⁻⁴	5.30E ⁻⁵	3.132	0.319
	4	1.46E ⁻⁴	4.63E ⁻⁵	3.157	0.317
	5	1.31E ⁻⁴	4.15E ⁻⁵	3.144	0.318
	6	1.23E ⁻⁴	3.93E ⁻⁵	3.130	0.319
	7	1.51E ⁻⁴	4.79E ⁻⁵	3.141	0.318
INDEX 4: RV4					
	3	1.06E ⁻³	3.89E ⁻⁴	2.739	0.365
	4	1.78E ⁻³	6.41E ⁻⁴	2.771	0.361
	5	1.35E ⁻³	4.90E ⁻⁴	2.762	0.362
	6	8.39E ⁻⁴	3.05E ⁻⁴	2.750	0.364
	7	6.61E ⁻⁴	2.39E ⁻⁴	2.761	0.362

NE ARCTIC SAITHE ADAPT TUNING

		POPULATION NUMBERS (000S)						28/ 8/93
		1976	1977	1978	1979	1980	1981	1982
2	|	305640	178547	283254	167043	356303	152504	139767
3	|	232290	201239	117533	190505	111125	275225	115389
4	|	67813	77051	75138	51919	99906	54068	149370
5	|	18419	27854	32033	36467	21400	48639	24522
6	|	25489	7890	13630	14938	17079	9186	20343
7	|	9529	12986	4594	7057	8249	8211	4246
8	|	10141	4694	6712	2433	3153	3858	4415
9	|	6861	5397	2525	3823	1120	1371	1342
10	|	4839	3193	2965	1219	1903	784	788
2+	|	681023	518851	538384	475403	620238	553846	460182
		1983	1984	1985	1986	1987	1988	1989
2	|	118831	138128	266774	200928	104807	84847	91501
3	|	98846	86760	99858	216411	161510	82310	64927
4	|	63045	65325	33513	37495	157172	116065	60037
5	|	63433	30110	23413	16604	19030	83594	62590
6	|	8259	22346	13736	12664	8109	11654	38738
7	|	9225	3843	8158	6470	6274	3818	5416
8	|	2523	4831	2120	3295	2759	1979	1019
9	|	2483	1001	2352	1034	1432	1576	517
10	|	681	1345	312	1131	529	611	416
2+	|	367326	353690	450236	496032	461623	386454	325162
		1990	1991	1992	1993			
2	|	312643	477890	175995	131954			
3	|	64819	245526	385712	270181			
4	|	41958	34066	134172	81217			
5	|	31134	22170	17378	7405			
6	|	21708	17351	13270	5655			
7	|	14750	9492	9622	4938			
8	|	2680	5077	5068	2300			
9	|	493	1175	2339	1062			
10	|	251	265	716	416			
2+	|	490435	813012	744271				

Appendix 3 - Table 9

NE ARCTIC SAITHE ADAPT TUNING

FISHING MORTALITY

28/ 8/93

	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	0.218	0.218	0.197	0.208	0.058	0.079	0.146	0.115	0.124
3	0.904	0.785	0.617	0.445	0.520	0.411	0.404	0.214	0.751
4	0.690	0.678	0.523	0.686	0.520	0.591	0.656	0.539	0.826
5	0.648	0.515	0.563	0.559	0.646	0.672	0.888	0.843	0.585
6	0.474	0.341	0.458	0.394	0.532	0.572	0.591	0.565	0.808
7	0.508	0.460	0.436	0.606	0.560	0.420	0.321	0.447	0.395
8	0.431	0.420	0.363	0.575	0.633	0.856	0.376	0.725	0.520
9	0.565	0.399	0.528	0.498	0.157	0.353	0.478	0.413	0.964
10	0.494	0.401	0.447	0.500	0.544	0.493	0.455	0.505	0.602

	1985	1986	1987	1988	1989	1990	1991	1992	90-92
2	0.009	0.018	0.042	0.068	0.145	0.042	0.014	0.088	0.048
3	0.780	0.120	0.130	0.116	0.237	0.443	0.404	0.156	0.334
4	0.502	0.478	0.431	0.418	0.457	0.438	0.473	0.302	0.404
5	0.415	0.517	0.290	0.569	0.859	0.385	0.313	0.653	0.450
6	0.553	0.502	0.553	0.566	0.766	0.627	0.390	0.713	0.577
7	0.707	0.652	0.954	1.121	0.504	0.866	0.428	0.467	0.577
8	0.518	0.634	0.360	1.142	0.526	0.624	0.575	0.590	0.596
9	0.532	0.470	0.651	1.132	0.524	0.423	0.295	0.590	0.426
10	0.632	0.577	0.754	0.843	0.635	0.747	0.409	0.590	0.582

Appendix 3 - Table 10

NE ARCTIC SAITHE ADAPT TUNING

LOG RESIDUALS FROM CE1

28/ 8/93

	1977	1978	1979	1980	1981	1982	1983	1984	1985
3 |	0.78	0.43	0.04	-0.04	0.13	0.06	-0.42	0.80	1.19
4 |	-0.31	-0.39	-0.14	-0.13	1.91	0.60	0.18	-0.38	0.00
5 |	-0.04	-0.20	0.87	0.67	-0.47	-1.91	1.28	0.42	0.15
6 |	-0.70	0.00	1.04	1.11	-0.58	-1.51	0.86	1.32	0.53
7 |	-2.58	0.69	1.84	2.21	-0.74	-3.76	1.00	-0.04	1.11

	1986	1987	1988	1989	1990	1991	1992
3 |	-0.97	-0.42	-1.18	-0.65	0.09	0.42	-0.26
4 |	-1.61	0.95	0.98	0.26	-0.02	-0.46	-1.43
5 |	-1.23	-0.70	1.39	1.91	0.73	-0.81	-2.04
6 |	-0.54	-1.79	-0.90	1.44	1.82	-0.62	-1.49
7 |	0.71	-2.32	-0.73	-0.25	2.58	0.73	-0.46

SUM OF RV RESIDUALS : 3.846110248E-7 MEAN RESIDUAL : 4.807637812E-9

LOG RESIDUALS FROM CE2

28/ 8/93

	1976	1977	1978	1979	1980	1981	1982	1983	1984
3 |	0.99	-0.19	-1.94	0.39	1.00	-0.76	-0.89	-0.16	1.34
4 |	-2.03	0.22	-0.88	0.50	-0.07	0.53	-0.42	0.36	1.02
5 |	-0.55	-0.28	-0.32	-0.65	-0.67	0.15	1.05	0.49	-0.04
6 |	-0.91	-1.90	-0.42	-0.97	0.00	0.01	0.49	0.46	0.38
7 |	-0.24	-1.21	-0.88	-0.07	-0.05	-0.60	-0.71	-0.01	-0.52

	1985	1986	1987	1988	1989	1990	1991	1992
3 |	1.12	-0.48	-2.00	-0.67	0.40	1.31	0.96	-0.41
4 |	0.39	0.89	-0.20	-1.67	0.23	0.44	0.71	-0.04
5 |	-0.18	0.61	0.26	0.15	-0.01	-0.41	-0.33	0.70
6 |	0.42	0.62	0.50	0.58	0.36	0.01	-0.14	0.49
7 |	0.50	0.87	1.08	1.17	0.12	0.52	-0.06	0.10

SUM OF RV RESIDUALS : 3.75188463E-7 MEAN RESIDUAL : 4.413981939E-9

LOG RESIDUALS FROM RV1

28/ 8/93

	1986	1987	1988	1989	1990	1991	1992
3 |	-0.45	-0.85	-0.19	0.39	0.10	0.36	0.64
4 |	-0.50	0.60	-0.60	0.42	0.12	-0.23	0.18
5 |	0.01	-0.33	-1.00	0.54	-0.04	0.14	0.67

SUM OF RV RESIDUALS : -4.964702089E-7 MEAN RESIDUAL : -2.364143853E-8

Appendix 3 - Table 11

NE ARCTIC SAITHE ADAPT TUNING

APPROXIMATE STATISTICS ASSUMING LINEARITY NEAR SOLUTION

ORTHOGONALITY OFFSET..... 0.000314
 MEAN SQUARE RESIDUALS 0.935591

PARAMETER	AGE	ESTIMATE	STD. ERR.	T-STAT	C.V.
-----	---	-----	-----	-----	-----
NUMBERS					
	3	387361	205622	1.884	0.531
	4	135072	52950	2.551	0.392
	5	17595	5527	3.183	0.314
	6	13449	4406	3.052	0.328
	7	9713	3823	2.541	0.394
INDEX 1: CE1					
	3	1.46E ⁻³	3.61E ⁻⁴	4.055	0.247
	4	1.16E ⁻³	2.85E ⁻⁴	4.074	0.245
	5	5.57E ⁻⁴	1.37E ⁻⁴	4.063	0.246
	6	2.17E ⁻⁴	5.38E ⁻⁵	4.032	0.248
	7	6.15E ⁻⁵	1.53E ⁻⁵	4.025	0.248
INDEX 2: CE2					
	3	8.47E ⁻⁴	2.02E ⁻⁴	4.185	0.239
	4	2.77E ⁻³	6.60E ⁻⁴	4.203	0.238
	5	4.21E ⁻³	1.00E ⁻³	4.192	0.239
	6	4.24E ⁻³	1.02E ⁻³	4.161	0.240
	7	4.50E ⁻³	1.08E ⁻³	4.155	0.241
INDEX 3: RV1					
	3	1.03E ⁻³	3.95E ⁻⁴	2.603	0.384
	4	6.97E ⁻⁴	2.66E ⁻⁴	2.624	0.381
	5	4.85E ⁻⁴	1.87E ⁻⁴	2.595	0.385