International Council for the
Exploration of the Sea

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# REPORT OF THE ARCTIC FISHERIES WORKING GROUP

ICES Headquarters, 23 August–1 September 1994



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# 2 INTRODUCTION

## 2.1 Terms of Reference

At the 81st Statutory Meeting of ICES in 1993 it was decided (C.Res.1993/2:6:1) that:

"The Arctic Fisheries Working Group (Chairman: Mr K. Sunnanå, Norway) will meet at ICES Headquarters from 23 August–1 September 1994 to:

a) assess the status of and provide catch options for 1995 for the stocks of cod, haddock, saithe, redfish and Greenland halibut in Sub-areas I and II;

b) provide estimates of the stock size of North-East Arctic cod using a range of natural mortalities;

c) assess, as far as possible, the impact of predators on the stocks under item a), including cannibalism, and provide support to other Working Groups with regard to the predatory impact of the stocks in item a), in particular on Barents Sea capelin and Norwegian spring-spawning herring.

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

## 3.1 Status of the fisheries

### 3.1.1 Landings prior to 1994 (Tables 3.1–3.3 and 8.1, Figure 3.1A)

The final reported landings of 1992 amounts to 383,494 t (Table 3.1), excluding 35,321 t of Norwegian coastal cod (Table 8.1). The provisional figures for 1993 are 532,480 t excluding 43,377 t of Norwegian coastal cod. The agreed TAC on North-East Arctic cod was exceeded by 32,480 t, and the total quota including 40,000 t Norwegian coastal cod was exceeded by 35,857 t. Last year, the Working Group gave two sets of prediction tables, with 1993 catches of 0 and 130,000 t in excess of the TAC, respectively. Table 3.1 shows that the landings increased in Sub-area I and Division IIa, while the landings in Division IIb decreased.

The catch by area split into trawl and other gears is given in Table 3.2 and the nominal catch by country is given in Table 3.3. In 1993 11,395 t were taken by countries with no quota (listed under 'others' in Table 3.3).

The estimates of unreported landings in excess of the quota set in 1990–1992 made by the Working Group last year (Table 3.1) were not changed. The unreported landings in 1993 was estimated to be 50,000 t, based on information provided by Working Group members.

### 3.1.2 Expected landings in 1994

The final agreed TAC of North-East Arctic cod for 1994 is 700,000 t. According to the agreement between Norway and Russia, Norway is allowed to take an additional 40,000 t Norwegian coastal cod. From earlier experience and provisional reports it is expected that the total reported landings of cod will be about 785,000 t including about 40,000 t of Norwegian coastal cod. This includes 45,000 t taken by countries with no quota. In addition, the unreported landings are expected to be about 25,000 t, giving a total landings of North-East Arctic cod of 770,000 t.

## 3.2 Status of research

### 3.2.1 Fishing effort and CPUE

The management measures which limited the amount of fishing effort during the early 1990s, causing trends in catchability, render the data on catch per unit effort ineffectual as indices of stock abundance.

### 3.2.2 Survey results (Appendix I - Tables A1–A14)

Table A1 shows the results of the Norwegian acoustic survey in the Barents Sea in January–March. This time series has now been recalculated with the new target strength 20 log L -68.0 and bobbins to rock-hopper conversion for the years prior to 1989. The methodology for the conversions is described by Aglen and Nakken (1994). For this survey and the bottom trawl survey at the same time of the year (Table A3), it should be noted that the survey in 1993 and 1994 covered a larger area than in previous years. In 1991 and 1992, the number of young cod (particularly 1-and 2-year old fish) was probably underestimated, as cod of these ages were distributed at the edge of the old survey area.

The tables with survey results were updated with data

from the last year. The number and length/weight at age data from the Russian surveys in autumn 1991 (Tables A8–A11) have been revised due to re-reading of otoliths from these surveys. The number at age from the Norwegian trawler survey (Table A5) have also been somewhat revised. Data from the Norwegian acoustic survey in the Barents Sea and the Svalbard area (Table A2) in September–October in 1993 were not available to the Working Group.

The number at age and weight at age from the Norwegian acoustic survey on the spawning population in the Lofoten area in March/April in 1992–1994 is given in Table A14. This survey covers the main part of the spawning stock, and has been carried out for many years. In order to make a longer time series available, the abundance indices from 1991 and earlier years have to be recalculated using the new target strength value.

All the survey indices show that the year classes 1988-1991 are stronger than the average in the time period when the surveys have been conducted. The year classes 1992 and 1993 are also strong according to the Norwegian surveys and the 0-group survey, but not according to the Russian surveys. The year classes 1984–1987 currently seem about or below average, while the 1983 year class still is strong.

The weight at age has declined both in the Norwegian and Russian surveys compared to last year.

## 3.3 Data used in the assessment

### 3.3.1 Catch at age (Table 3.14)

For 1992, revised age compositions in the Norwegian fishery together with final total landings for all countries were used to revise the number at age in the 1992 landings. For 1993, age compositions for all areas were available from Norway (all gears) and Russia (trawl only). The Russian long-line catches (a new fishery started in 1993) in all areas were age distributed using the age distributions from the Norwegian long-line catches. From the UK and Germany, the age composition from Divisions IIa and IIb were available. Spain provided age compositions from Division IIb, while Iceland provided age compositions from Sub-area I. Age compositions of the total landings were calculated separately in Sub-area I and Divisions IIa and IIb by using the age compositions provided and raising the landings from other countries (Belgium, Denmark, Faroe Islands, France, Greenland, Lithuania, Portugal) by Norwegian trawl in Sub-area I, by UK trawl in Division IIa and by Spanish trawl in Division IIb.

A SOP check gave a deviation of 2% and 1% for 1992 and 1993, respectively. The number at age was adjusted to make the SOP fit to the nominal catch for these years.

The unreported catches were assumed to have the same age distribution as the total reported catch. Data to determine the age composition of the catch in excess of that reported are currently not available, however, implications of using the most appropriate age compositions should be investigated. This could be very important if most of the unreported catches are taken in areas that traditionally contained large numbers of small cod.

The age composition of cod in 1993 is made up of several year classes (mainly 1983–1990) with those of 1989 (age 4) and 1988 (age 5) together contributing more than 50% of the catch in numbers. It should, however, be noted that the numbers caught of fish at age 11, 12 and 13 are the highest since the 1970s.

### 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 at age in the catch from Norway and Russia for 1992, and from Norway, Russia, Germany, Spain and Iceland for 1993. The weight at age in the catch from Norway and Russia is given in Table 3.4.

The weight at age in the catch in 1993 was generally lower than what was assumed by the Working Group last year, especially for ages 3–6 and 10.

Stock weights (Table 3.6) used from 1985 to 1994 for ages 3 to 8 are averages of values derived from Norwegian surveys in January-February for the years 1985-1994 (Table A7) and Russian surveys in autumn during 1984-1993 (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 the survey weights have been derived in the same way for ages 9 and older as was the case for the younger ages. For age 12 in 1994 only weights from the Norwegian survey were available. The stock weight at age in 1994 is approximately equal to the 'low growth' prognosis given by the Working Group last year.

The 1992 weight at age in the stock have been changed due to the revision of the Russian weight at age data from the autumn 1991 survey. There was good correspondence between the weight at age in Norwegian and Russian surveys for the last year, indicating that the earlier problems with discrepancies in age readings have been solved.

### 3.3.3 Maturity at age (Table 3.7)

As in 1993, only Russia provided a maturity ogive. The ogive for 1994 is very similar to the ogive for 1993.

### 3.3.4 Data for tuning (Table 3.8)

Only survey data were used in the tuning. The following surveys were used (Table 3.8):

1) Norwegian Barents Sea trawl survey , January–March
2) Norwegian Acoustic survey, January–March
3) Russian trawl survey, Autumn
4) Russian Acoustic survey, Autumn
5) Norwegian Svalbard Trawl survey, Autumn
6) Norwegian Trawler survey, October–November

Surveys that were conducted during winter were allocated to the end of the previous year. This was done so that data from the 1994 surveys could be included in the assessment. For the Russian surveys ages 1–8 were included in the tuning. For the Norwegian Barents Sea Trawl and Acoustic surveys ages 2–9 were included shifted one year earlier and one year younger. For the Norwegian Trawler survey ages 3–11 were included, compared to ages 3–10 last year.

The Norwegian Lofoten acoustic survey was not included in the tuning. The time series is short, and the survey covers only part of the mature stock. Assuming that a constant proportion of the mature stock is found in this area each year, the survey could be included in the tuning if the abundance at age is multiplied by the inverse of the maturity ogive to account for variations in maturity.

Some of the survey indices have been multiplied by a factor 10 or 100. This is done to keep the dynamics in the survey even for very low indices, because 1.0 is added to the indices before the logarithm is taken.

### 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 an index of recruitment from the International 0-group survey.

## 3.4 Methods used in the assessment

### 3.4.1 VPA and tuning (Table 3.11-3.13)

Tuning of the VPA was carried out using Extended Survivors Analysis (XSA). It was decided to run the XSA in the same way as last year, with shrinking to 2 ages and 5 years, using a SE of 2.0 for the mean. The XSA was first run up to 1992 using the same surveys, age ranges and input parameters as last year. This gave a fishing mortality ($F_{5\text{-}10}$) in 1992 of 0.37, compared to 0.39 last year. The difference is probably due to the revision of the data from some of the surveys.

It was decided to include ages down to 1 in the XSA, assuming a natural mortality of 0.2 also for ages 1 and 2. When running the VPA up to 1992, this gave a lower fishing mortality ($F_{5\text{-}10}$ in 1992=0.32).

Including ages down to age 1 and running the XSA up to 1993 gave a $F_{5\text{-}10}$ of 0.26 and very low Fs on ages 11 and older. This is probably due to a shift in the fishery with increased catch of older fish in 1993. It was thus decided to run the XSA on ages 1–11, with age 12 and older as a plus group. The tuning diagnostics are given in Table 3.11, and the fishing mortalities and population numbers in Tables 3.12 and 3.13.

The final VPA was then run as an ordinary VPA on ages 3–15, with the input F on the oldest age taken from last year's report for the years 1983 and earlier. For the years 1984 and later, the input F on the oldest age groups was adjusted to give the same population numbers at age 11 in the final VPA as in the XSA. The F in the last year was taken directly from the XSA for ages 3–11, while for ages 12 and older the input F was adjusted in the same way as the input F on the oldest ages in the years 1984 and later. In some cases it was not possible to get the same F as in the XSA at age 11. An arbitrary F value of 1.5 was adopted as input in order to get as close as possible to the XSA value.

### 3.4.2 Recruitment (Table 3.10)

The strength of the 1991 and 1992 year classes was estimated from the XSA analysis, applying a natural mortality of 0.2 at age 1 and 2. The only year class which need to be estimated by the RCT3 program is thus the 1993 year class. Only the age 1 survey indices and the index from the international 0-group survey were includeded in the estimation.

## 3.5 Results of the Assessment

### 3.5.1 Fishing Mortality and VPA (Tables 3.15–3.19, Figure 3.1A and B)

The average age 5–10 fishing mortalities for the years 1981–1989 were in the range 0.60 to 1.00. The lowest of these Fs occurred during 1989 and the highest in 1987. In 1990 fishing mortality dropped to 0.25 as a result of management measures brought into effect to control the amount of fishing effort. Age 5–10 F remained at 0.25 in 1991 before increasing to 0.33 in 1992 and 0.43 in 1993 as catches increased. Full recruitment to the commercial fishery for this stock normally occurred at age 7 or 8. However, the current assessment indicates that full recruitment occurs at a much younger age (5), giving a shift in the fishing pattern. The fishing mortalities and stock numbers are given in Tables 3.15–3.16, while the stock biomass at age and spawning stock biomass at age are given in Tables 3.17–3.18. A

summary of landings, fishing mortality, biomass and recruitment since 1946 is given in Table 3.19 and Figures 3.1A and 3.1B.

### 3.5.2 Recruitment (Table 3.10)

The XSA estimates of the 1991 and 1992 year classes are 695 and 616 million at age 3, respectively, while the RCT3 estimate of the 1993 year class is 632 million at age 3. These values are all close to the long-term arithmetic mean of 600 million individuals at age 3.

### 3.5.3 State of stock (Tables 3.19–3.20)

From an average level of about 1 million t in the 1980s, the total stock biomass has increased rapidly to above 2 million tonnes in 1992–1993, and now seems to stabilize around that level. Total biomass is currently similar to that of the mid-1970s, which is close to the long-term average of the stock. However, the high stock size in the late 1940s are most probably overestimates, as indicated by large SOP discrepancies (Table 3.20). Due to this, the Working Group would evaluate the stock using the SOP corrected values.

The spawning stock biomass in 1994 is 830 thousand tonnes, a decrease from last year, but still higher than any values in the period 1959–1989 (Table 3.19).

Individual growth has decreased to the rate experienced during the capelin stock collapse in 1986–1988, with the weight at age in 1994 being similar to that in 1987. The low condition factor observed in 1987–1989 has not yet been observed, however.

## 3.6 Prediction of Catch and Stock Biomass

### 3.6.1 Data used in the prediction (Tables 3.21 and 3.22)

The input data to the short-term prediction (1994–1996) are given in Table 3.21 and the input data to the medium-term prediction (1994–1999) are given in Table 3.22.

The stock number at age is taken from the final VPA (Table 3.16) and the recruitment of the 1993 year class from the RCT3 analysis (Table 3.10). The fishing pattern is the average of the last 3 years from the final VPA, scaled to the 1993 level. The maturity ogive is the average of the years 1992–1994 and is used for 1995 onwards. The recruitment of the 1994 and later year classes is set at the long-term geometric mean of 466 million individuals at age 3.

The reason for assuming low growth is the low abundance of capelin, the most important prey species for cod (Table A15) and also the declining stock size of other important prey like shrimp and small redfish. The abundance of young herring in the Barents Sea is high, however, and this may partly compensate for the lack of capelin. A decrease of the temperature in the Barents Sea is also expected. These and related matters are discussed further in Section 9 on ecological considerations.

The weight at age in the catch in 1994 for ages 3–8 was calculated assuming the same ratio between weight at age in the catch and in the stock as the average of this ratio in 1991–1993. For 1995 the weight at age in the catch was assumed to be equal to the average of the years 1987–1990, i.e., at a low level. The weight at ages 3–7 in the stock in 1995 was calculated using a bioenergetics model (Ajiad *et al.* 1994) , assuming that the stomach content of cod in 1994 is the same as in 1993 and using the temperature prognosis described in Section 9 of the Working Group report. The weight at age 8 in the stock in 1995 and the weight at ages 3–8 in the stock in 1996 was assumed to be equal to the low 1987–1990 average. For ages 9–11 the weight at age in the catch was assumed to be equal to the weight at age in the catch in 1993, while for age 12 and older the old time series weights were used. For 1995 onwards the weight at age in the stock was assumed to be equal to the weight at age in the catch for ages 9 and older.

For the medium-term projection two 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. Given the ecological situation in the Barents Sea with depleted prey stocks and a decrease in the temperature, the Working Group decided that using low and medium growth would give an appropriate range of variation. The low growth scenario is described above, while in the medium growth scenario weight at age is set equal to the average for the years 1983–1994 (stock) and 1983–1993 (catch) for ages 3–11, using the time series weights for ages 12 and older in both cases. The input data for medium growth and $F_{med}$ are given in Table 3.22.

### 3.6.2 Biological reference points (Figure 3.1C)

The yield per recruit analysis using the 1994 fishing pattern and stock parameters from the management option table gave estimates of $F_{0.1}=0.14$ and $F_{max}=0.26$, which are slightly higher than the values obtained last year. Jakobsen (1992) gives the values of $F_{low}=0.32$, $F_{med}=0.46$ and $F_{high}=0.78$. The present exploitation level is $F_{93}=0.43$ *(status quo)*.

### 3.6.3 Projections of catch and biomass (Tables 3.23–3.24 and Figure 3.1D)

The management option table (Table 3.23) shows that the expected catches in 1994 will give an increase of the $F_{5\text{-}10}$ from 0.43 in 1993 to 0.55 in 1994. The *status quo* F in 1995 ($F_{95}=F_{93}$) gives a catch of 680,000 t, which is less than the expected catch in 1994 of 770,000 t. The same catch in weight in 1995 as in 1994 will give an F of 0.50, which is above $F_{med}$. F *status quo* in 1995 will stabilize the spawning stock biomass around 750,000 t, which is a high level.

In Figure 3.1D the catch level in 1995 and spawning stock biomass level in 1996 are plotted against the fishing mortality, F, in 1995.

In Table 3.24, the results of the two growth scenarios for the medium-term predictions are given, for the biological reference points $F_{low}$ and $F_{med}$. 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 values in the table must therefore not be taken as options for long-term strategies.

In the medium term the stock will increase slightly from the 1995 level of 2.1 million tonnes to 2.2 million tonnes in 1999 with medium growth and decrease to 1.8 million tonnes in 1999 with low growth when fishing at $F_{med}$ (Table 3.25). Fishing at $F_{low}$ will give an increase to 2.4 and 2.9 million tonnes with low and medium growth, respectively. For both growth options, the spawning stock size shows a large increase when fishing at $F_{low}$ and stabilizes when fishing at $F_{med}$. The small difference between the growth options in this case is due to the small difference between the options at the older ages. When considering the development of the spawning stock size it is also important to take into account that low growth in these calculations is not assumed to affect the maturation.

## 3.7 Comments to the assessment and the predictions

The stock situation from last year's assessment is confirmed in this assessment. The recruitment is still good, while the individual growth has declined significantly from 1993 to 1994. The ecological situation in the Barents Sea, which may affect the individual growth of cod strongly, is discussed in Section 9.

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 data used in the assessment. Updating of the time series on weight at age in the catch and in the stock and the maturation ogive, is in process.

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

## 4.1 Status of the Fisheries

### 4.1.1 Landings prior to 1994 (Tables 4.1–4.3 and Figure 4.1A)

The final reported landings of 1992 amount to 53,887 t (Table 4.1) which is close to the figure used in last year's assessment. The provisional landings for 1993 are 75,916 t which is slightly above the agreed TAC of 72,000 t. The catch increased in all areas compared to last year. The catch by area split into trawl and other gears is given in Table 4.2 and the nominal catch by country is given in Table 4.3.

### 4.1.2 Expected landings in 1994

The Working Group expects the TAC of 120,000 t to be taken.

## 4.2 Status of research

### 4.2.1 Fishing effort and CPUE

There is at present very little directed trawl fishery for haddock and no commercial CPUE data are included in the assessment.

### 4.2.2 Survey results (Appendix II - Tables B1–B8)

Norway provided indices from the 1994 Barents Sea bottom trawl and acoustic survey in January–March (Tables B1 and B4). Russia provided indices from the 1993 trawl and acoustic survey (autumn) in the Barents Sea (Tables B3 and B5). Data from the 1993 Svalbard bottom trawl survey (autumn) and the 1993 Svalbard - Barents Sea acoustic survey in autumn were not available to the Working Group (Tables B2 and B6).

The time series for the Norwegian acoustic survey (Table B4) have been updated by a new target strength and bobbins to rock-hopper conversion, in the same way as for cod (see Section 3.2.2).

All the surveys show the 1990 year class to be very strong and also the 1991 and 1989 year classes are strong.

The weight at age in the stock has declined somewhat from last year both according to the Norwegian and Russian survey (Table B8). The weights at age from these two surveys are in good agreement with each other.

## 4.3 Data used in the assessment

### 4.3.1 Catch in numbers at age (Table 4.14)

A revised age composition in the Norwegian landings together with final total landings from all countries were used to revise the number at age in the 1992 landings.

Age compositions of the catches for 1993 were available from Norway and Russia in Sub-area I, from Norway, Russia, Germany and the UK (England and Wales) in Division IIa and from Norway, Germany and the UK (England and Wales) in Division IIb. The catches of other countries were distributed on ages using the combined 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.

A SOP check gave a deviation of 1% from the nominal catch both for 1992 and 1993. The number at age was adjusted to make the SOP fit to the nominal catch for these years.

### 4.3.2 Weight at age (Tables 4.4–4.6)

The mean weights at age in the catch (Table 4.6) were calculated as weighted averages of the weights in the catch from Norway and Russia (Table 4.4). The weight at age in the catch has generally declined from 1992 to 1993, with a strong decline observed for ages 3 and 4. The weight at age in the catch in 1993 is, however, close to the values used by the Working Group last year.

Stock weights used from 1987 to 1994 for ages 3 to 7 (Table 4.5) are averages of values derived from Norwegian surveys in January–February for the years 1987–1994 and Russian surveys in the autumn during 1986–1993 (Table B8). For the older age groups the time series weights have been used, except for the year classes of 1982 and later, where the survey weights have been derived in the same way for ages 8 and older as was the case for the younger ages. For some of the older ages in some of the years only Russian data were available. The stock weight at age in 1994 is approximately equal to the average of the 'low' and 'medium' growth prognosis given by the Working Group last year.

### 4.3.3 Maturity at age (Table 4.7)

A maturity ogive was available from Russia for 1994 and is given in Table 4.7. This ogive indicates a somewhat later maturation than in 1993, with a clearly lower proportion of mature fish at age 4–6 compared to 1993. The proportion of 5 and 6 year old fish which is mature is the lowest in the time series which goes back to 1981.

### 4.3.4 Data 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 | 1–7 | 1983-93 |
| Russian acoustic | Total area | Autumn | 1–7 | 1985-93 |
| Norwegian bottom trawl | Barents Sea | Winter | 2–8 | 1981-94 |
| Norwegian acoustic | Barents Sea | Winter | 2–8 | 1981-94 |

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.

Some of the survey indices have been multiplied by a factor 10 or 100.

### 4.3.5 Recruitment indices (Table 4.9)

10 indices of recruitment were updated with data from the last year and are given in Table 4.9. These are from the autumn Russian bottom trawl survey (ages 0+, 1+ and 2+), International 0-group survey (age 0), and the winter Norwegian bottom trawl and acoustic surveys (ages 1–3 for both).

## 4.4 Methods used in the assessment

### 4.4.1 VPA and tuning (Tables 4.11–4.13)

Tuning of the VPA was carried out using Extended Survivors Analysis (XSA). The XSA was run in the same way as last year, with shrinking to 2 ages and 5 years, using a SE of 0.7 for the mean. Repeating the XSA of last year with the revised data gave very similar results, with a fishing mortality ($F_{4-7}$) in 1992 of 0.47, compared to 0.45 last year.

It was decided to run the XSA down to age 1, assuming a natural mortality of 0.2 also for ages 1 and 2. When running the tuning in the VPA up to 1992, this gave a $F_{4-7} = 0.46$, thus having little effect on the results for the age groups older than 2 years.

Including ages down to age 1 and running the XSA up to 1993 gave an $F_{4-7}$ of 0.27 in 1992 and very low Fs in the older age groups, resulting in a dome-shaped fishing pattern. As for cod, this is probably due to a shift in the fishery with increased catch of older fish in 1993. It was therefore decided to run the XSA on ages 1–10, with age 11 and older as a plus group. The tuning diagnostics are given in Table 4.11, and the fishing mortalities and population numbers in Tables 4.12 and 4.13.

The final VPA was then run as an ordinary VPA on ages 3–14+, with the input F on the oldest age taken from last years report for the years 1983 and earlier. For the years 1984 and later, the input F on the oldest age groups was adjusted to give the same population numbers at age 11 in the final VPA as in the XSA. The F in the last year was taken directly from the XSA for ages 3–10, while for ages 11 and older the input F was adjusted in the same way as the input F on the oldest ages in the years 1984 and later. In some cases it was not possible to get the same F as in the XSA at age 10. An arbitrary F value of 1.5 was adopted as input in order to get as close as possible to the XSA value.

### 4.4.2 Recruitment (Table 4.10)

The strength of the 1991 and 1992 year classes was estimated from the XSA analysis, applying a natural mortality of 0.2 at age 1 and 2. The only year class estimated by the RCT3 program was thus the 1993 year class. Only the age 1 survey indices and the indices from the International 0-group survey were included in the estimation, together with estimates of year class strength at age 3 from the VPA.

## 4.5 Results of the Assessment

### 4.5.1 Fishing mortality and VPA (Tables 4.15–4.19 and Figures 4.1A and 4.1B)

The highest level of average fishing mortality for ages 4–7 since 1980 occurred in 1981 (0.59) and decreased to half this level in 1984, increasing again to the 1981 level in 1987–1988 and dropping in 1990 to 0.18. Subsequently fishing mortality increased and reached 0.56 in 1993. There appear to have been no trends in the exploitation pattern since 1985.The fishing mortalities and stock numbers are given in Tables 4.15–4.16, while the stock biomass at age and spawning stock biomass at age are given in Tables 4.17 and 4.18. A summary of landings, fishing mortality, biomass and recruitment since 1950 is given in Table 4.19 and Figures 4.1A and 4.1B.

### 4.5.2 Recruitment (Table 4.10)

The XSA estimates of the 1991 and 1992 year classes are 153 and 69 million at age 3, respectively (Table 4.10). The RCT3 estimate of the 1993 year class is 80 million at age 3, which is close to the long-term geometric mean of 88 million. The long term arithmetic mean is 177 millions.

### 4.5.3 State of the stock

The spawning stock biomass has increased from 1984 to 1993 but remained below the long-term average. A sharp decrease is seen from 1993 to 1994, due to delayed maturation and revision of the weight at age on the oldest age groups from 1994 onwards. The total stock biomass is, however, about the same in 1994 as in 1993. Fishing mortality steadily increased from 1989 to 1993 to 0.56, which is well above $F_{med}$ (0.35). The estimated catches indicate that F will probably be even higher in 1994.

## 4.6 Prediction

### 4.6.1 Input data to the prediction (Tables 4.20–4.21)

The input data to the short-term prediction (1994–1996) are given in Table 4.20 and the input data to the medium-term prediction (1997–1999) are given in Table 4.21.

The stock numbers at age are taken from the final VPA (Table 4.16) and the recruitment at age 3 of the 1993 year class from the RCT3 analysis (Table 4.10). From the 1994 year class onwards the recruitment is set at the long-term geometric mean of 88 million. The exploitation pattern used is the mean pattern of the last 3 years from the VPA, scaled to the 1993 level. The maturity at age is set to be the average of the 1987–1991 values, when we had strong year classes maturing.

In the mid- and late 1980s, it was observed that the variations in weight at age for haddock were correlated to those for cod. Thus, we treat the prediction of weight at age for haddock in the same way as for cod.

The weight at age in the catch in 1994 for ages 3–10 was set equal to the weight at age in the stock in 1994 multiplied by the average catch weight/stock weight at age ratio in the period 1991–1993. For 1995 and 1996 the weight at age in the catch and the stock was assumed to be equal to the average of the years 1987-1990, i.e., at a low level. Given the unreliability of the high weights of the older ages in the historic data series, the weight at age 11 and older both in the stock and in the catch were set to the 1992–1993 average for all the prediction years. Remaining inconsistencies in the weight at age matrix were subjectively corrected in order to get a continuous growth through ages.

For the medium-term prediction 1997–1999, predictions were given for low and medium (1983–1993 average)

weights in the stock and in the catch, and for $F_{93}$ and $F_{med}$.

### 4.6.2 Biological reference points (Figure 4.1C)

The yield per recruit analysis using the same fishing pattern and stock parameters for 1994 as in the management option table resulted in estimates of $F_{0.1}$ = 0.26 and $F_{max}$ = 0.50. These values are quite different from last year, with a higher value for $F_{0.1}$ and a lower value for $F_{max}$. The change is due to the use of recent weights at age for the older age groups instead of the time series weights. Jakobsen (1992) gives the values of $F_{low}$ = 0.02, $F_{med}$ = 0.35 and $F_{high}$ = 1.11. The present exploitation level is $F_{93}$ = 0.56 *(status quo)*.

### 4.6.3 Projections of catch and biomass (Tables 4.22–4.24 and Figure 4.1D)

The management options are given in Table 4.22 and the catch levels in 1995 and spawning stock biomass in 1996 are plotted against the fishing mortality in 1995 (Figure 4.1D). The expected catches in 1994 increase the $F_{4-7}$ from 0.56 in 1993 to 0.62 in 1994. The *status quo* catch in 1995 ($F_{95}$=$F_{93}$) is 128,000 t, very close to that expected in 1994. At this F level in 1995 the spawning stock will increase from 1995 to 1996, but will remain at a low level. The total stock biomass is expected to decrease during 1995 with fishing at the current level of F, in spite of the recent recruitment of the relatively good 1989–1991 year classes.

In Table 4.23 the results of the medium-term predictions are given for low and medium growth and the reference points $F_{med}$ and $F_{93}$. Detailed prediction tables for low growth and $F_{93}$ are given in Table 4.24.

The medium-term predictions given low growth indicate that the catches will decrease to around 65,000 t in 1999 both for $F_{med}$ and $F_{93}$. The medium growth scenario shows that the catches will decrease to around 80,000 t in 1999 for both F values. In both cases, the spawning stock biomass will remain at a low level when fishing at $F_{93}$, but will approach the long-term mean when fishing at $F_{med}$.

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

### 5.1 Status of the Fishery

### 5.1.1 Landings prior to 1994 (Tables 5.1 and 5.2, Figure 5.2A)

Revised landings as reported to ICES for 1992 were 124,562 t, an increase of 17,236 t from 1991 (Table 5.1). A further increase of about 20,000 t is indicated by provisional reports of landings in 1993. These give a total of 144,056 t compared to 138,000 t expected by last year's Working Group and are about 12,000 t higher than the target TAC of 132,000 t set by the Norwegian authorities. An increase from 1992 to 1993 is seen for all gears except gill-net (Table 5.2).

### 5.1.2 Expected Landings in 1994

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 145,000 t. So far there is no basis for assuming another catch level than this in 1994.

### 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. The effort of this category is raised by the catches to represent the total purse seine effort. A decreasing trend in the purse seine effort is indicated after 1991, giving a reduction of about 29% from 1991 to 1993 (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. The effort used in the directed fishery is raised by the catches to represent total effort of Norwegian trawlers (Table 5.5). The index has increased by about 26% from 1991 to 1993.

Catches from the two gear categories have historically 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). The decline in purse seine effort is balanced by the increase in trawl effort and only a slight increase (3%) is indicated from 1992 to 1993. The level has been fairly stable since 1988.

### 5.2.2 Survey results (Table C1)

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 III - Table C1) and are used in the VPA tuning. Because the survey before 1988 covered a smaller area than in the more recent years, and having a series of 6 years with consistent area coverage after that, it was decided to leave those early years out of the 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), but the 1990 year class appears to be less abundant than the survey indicates.

The area of investigations for coastal cod (see Section 8) has been expanded and in August-September 1993 also covered a large part of the saithe stock. An acoustic estimate of 336,000 t indicates that about half of the stock was within the survey area. The age composition covers a much wider range than the October–November survey, but the results are not inconsistent. However, having results from one year only, it is difficult to draw conclusions regarding the saithe stock from this survey.

Considering that the coastal cod survey covers a large part of the area covered only a couple of months later by the saithe survey, it would seem rational to combine them in one survey. The surveys are conducted by two different institutes, but there have been preliminary discussions about a joint survey in 1995.

## 5.3 Data Used in the Assessment

### 5.3.1 Catch at Age (Table 5.8)

The age composition of Norwegian landings in 1992 was revised, resulting in about 50% increase in number caught of 7–9 year old fish and a decrease of about 20% of 4–6 year old fish. The main reason for the change is that some samples had been given a wrong code and were therefore not included in the data used by last year's working group. Data for 1993 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. However, data collected during the coastal cod survey indicate that maturity for saithe at present occurs somewhat earlier, possibly as much as one year. A re-evaluation of the historical data on maturity is therefore desirable.

### 5.3.4 Tuning data (Table 5.6)

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 2-5 (Table 5.6). Survey data for age 2 were not used last year.

### 5.3.5 Recruitment indices

Reliable recruitment indices are crucial for the predictions, but attempts to establish such indices have so far failed. At present no solution to this problem is apparent.

## 5.4 Methods Used in the Assessment

### 5.4.1 VPA tuning (Table 5.7)

The saithe assessment has previously used age 1 as the youngest age. However, catches of 1-year-old saithe are rare and cannot be reliably sampled. Furthermore, there are no tuning data for this age group. To bring the saithe assessment more in line with the other assessments of the Working Group it was decided to exclude age 1. The only noteworthy difference this makes is that the recruitment values will refer to age 2 and the level will be reduced by about 18% (M=0.2).

Extended Survivors Analysis (XSA) was used for the assessment with the same settings as last year. The tuning diagnostics are given in Table 5.7.

Trial runs showed that the changes in the survey time series (see Section 5.2.2) had virtually no effect on the tuning results. However, the survey now emerges as the best indicator of the youngest age groups and seems to have improved the quality of the assessment.

## 5.5 Results of the Assessment

### 5.5.1 Fishing mortalities and VPA (Tables 5.10–5.13, Figures 5.2A and B)

The fishing mortality ($F_{3-6}$) in 1993 is 0.43 and there is a reasonably good agreement with last year's assessment. The assessment confirmed that the 1989 year class is the strongest in the VPA series. The 1990 year class

is clearly weaker, but survey and catch data are to some extent conflicting. The 1991 year class seems to be less abundant than the 1990 year class. However, the retrospective analysis carried out last year showed that abundance estimates at age 2 and 3 have not been reliable, although the introduction of survey data may have improved this.

### 5.6 Prediction of Catch and Biomass

#### 5.6.1 Data used in the predictions (Table 5.14)

For weight at age in the catch and stock and for the exploitation pattern, the average for 1991–1993 is used. The exploitation pattern is scaled to the 1993 level so that this level corresponds to an F-factor of 1.

The estimates of recruiting year classes up to the 1989 year class from the VPA were acccepted. The long-term geometric mean recruitment of 209 million was used for the 1990 and subsequent year classes. It should be noted that increasing the size of the 1990 year class from the level estimated by XSA implies a slightly lower estimate (0.41 compared to 0.43) of $F_{3-6}$ in 1993.

#### 5.6.2 Biological reference points (Figure 5.2C)

Yield and SSB per recruit were based on the parameters in Table 5.14. The calculations gave $F_{0.1}=0.13$ and $F_{max}=0.24$ (Figure 5.2C). $F_{low}=0.20$, $F_{med}=0.34$ and $F_{high}=0.50$ were not recalculated.

#### 5.6.3 Projection of catch and biomass (Tables 5.15–5.17)

The management option table (Table 5.15) shows that the expected catches in 1994 will give a decrease in fishing mortality to 0.30. The *status quo* catch in 1995 ($F_{95}=F_{93}$) is 221,000 t compared to a catch at $F_{med}$ of 185,000 t. SSB will increase from a historical low of 56,000 t in 1993 to 139,000 t in 1994 and further to 271,000 t in 1995. At $F_{med}$ and *status quo* F SSB in 1996 will decrease to 255,000 t and 228,000 t, respectively (Table 5.16). Detailed prediction for *Status quo* F is given in Table 5.17. The catch in 1995 and SSB in 1996 for various levels of F in 1995 are shown in Figure 5.2D.

### 5.7 MBAL (Minimum Biological Axcceptable Level) (Figure 5.1)

A stock and recruitment plot was made in order to investigate MBAL. No clear recruitment dependency on SSB is seen in the plot, but 6 of the 8 year classes less than 150 million have been produced by low spawning stocks in the range 70,000 t to 130,000 t. Thus, keeping the SSB in excess of this range might reduce the frequency of poor year classes and 150,000 t could then be a suitable MBAL.

### 5.8 Comments on the Stock Assessment

As stated in previous reports, the data from the commercial fleets have limitations and the reliability of the survey is not yet established. However, this year's assessment indicates that the survey has improved the quality of the assessment. Uncertainty about recruitment will, however, affect the predictions also in the future and severe overestimation of the 1990 and 1991 year classes cannot be ruled out.

### 5.9 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 1994 (Tables 6.1–6.6, D1–D3, and Figure 6.3A)

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 1993 was 28,604 t, which is a 14% decrease compared to 1992, and the smallest catch since the 1960s.

The landings of 2,038 t from Sub-area I in 1993 were somewhat less than the average level of the years since 1980. Landings in Division IIa in 1992 showed a sudden decrease to only 50% of the year before, reflected in both the Norwegian and the Russian landings. A further but smaller decrease was observed in 1993. Landings in Division IIb have been very variable the last decade, but were in 1993 close to the lowest level during these years.

The national landings statistics of redfish for Russia and Norway are split into species by the respective national laboratories (Appendix IV, Tables D1–D3). For other countries, the Working Group has split the landings into *Sebastes mentella* and *Sebastes marinus* based on 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 48,735 t in 1991 (Table 6.5). In 1992 the landings decreased again to only 16,249 t. The provisional figure for the *S.mentella* landings in 1993 is 13,300 t which is close to what was expected by last year's Working Group.

Revised landings of *S. marinus* showed a decrease in 1991 from a level of 23,000–30,000 t in 1984–1990 to less than 20,000 t in 1991–1993. Also for this species the provisional figure of 15,274 tonnes in 1993 is close to that expected.

The redfish population in Sub-area IV (North Sea) is believed to belong to the North-East Arctic stock. Since this area is outside the traditional areas handled by this Working Group, the catches have not been included in the assessment. The landings from Sub-area IV have been about 1,000–2,000 t per year (Table 6.6). In 1992, however, the landings increased to 2,599 t due to an increase in the French fishery. Historically these landings have been *S. marinus*, but since the mid-1980s trawlers have also caught *S. mentella* along the northern slope of this Sub-area.

### 6.1.2 Expected landings in 1994

On the basis of reports of landings from the first seven months of the year, landings expected for the whole 1994 are estimated to be at nearly the same level as in 1993 for both *S. mentella* and *S. marinus*, i.e., 13,000 t and 16,000 t, respectively. This will be in accordance with the recommendations.

## 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 were available for the Russian PST vessels fishing in ICES Divisions IIa and IIb in 1993 and 1994, which in 1993 accounted for 33% 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. The fishery in 1993 is, however, not comparable with the years before since it was conducted by a low effort limited to the historically best fishing area and season. The decrease in 1994 to 0.5 tonnes/hour should, however, be comparable to 1993 since the fishery has been conducted in a similar way these two years.

Estimates of total effort are based on Russian PST units raised to total international catch, showing an increase from 1987 to 1991, but a strong decline since then.

Catch-per-hour-trawling data from the Norwegian trawl fishery were presented as a short series restricted to only one trawler that has long experience in the Norwegian fishery for *S. mentella* (Table 6.8). The average catch-rates show a decreasing trend since 1989, and was in 1993 about 68% of the 1989-level.

Data for *S. marinus* were available for Norwegian freshfish trawlers since 1981 (Table 6.9) from which the total international effort was estimated. This series is based on GLIM analysis on data from each month from five Norwegian statistical areas 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. A somewhat lower effort is observed since 1991, and except for a few years with high catch-rates and a low catch-rate in 1989 (very high effort), the CPUE has been rather stable. The provisional figures for 1992 and 1993 are close to the 1981-1993 average of 0.42 t/hour.

### 6.2.2 Survey results (Tables D5–D6)

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 (Table D5). The survey design has improved, and the indices earlier than 1979 should, therefore, not be directly compared with the years after. The great reduction in the abundance of 0-group redfish that was observed during the survey in 1991 was followed by even lower indices in 1992 and 1993.

Since 1981, a stratified random bottom trawl survey, aimed at cod and haddock, has been carried out by Norway in February in the Barents Sea. This has been combined with an acoustic survey. The results for redfish are presented on length. The abundance of each of the redfish species (larger than 10 cm) was about 20% less in 1994 than the average value for 1990–1993. Regarding *S. mentella*, and based on length frequencies, yearclasses from 1987–1990 still dominate, and more recent yearclasses appears to be weak.

Since 1981, a stratified random bottom trawl survey has also been carried out by Norway in September in the Svalbard and Bear Island areas. The abundance of *S. mentella* larger than 7–8 cm, was in 1993 less than 40% of the average value for 1990–1992. This was mainly due to a great reduction of smaller fish, indicating weak 1991–1992 yearclasses. The abundance index for *S. marinus* for the area covered was similar to the 1990–1992 average.

In 1992 Russia conducted a redfish trawl/acoustic survey in March–April. The area investigated was larger than in 1986–1990. 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 was the strongest in the fishable stock at that time. A similar survey was conducted in 1993. Total biomass was estimated to be 150,000 t (373 million specimens). The spawning biomass was, however, not estimated due to lack of maturity ogives. Nevertheless, the survey showed a decrease in the extension of the spawning area as well as in the abundance of 9–23 years old fish compared with the 1992 survey. Using the same maturity ogive as that used for 1993 in the assessment, will give a spawning biomass of approx. 90,000 t in this survey.

The only available age disaggregated survey data are from the coverage of young redfish during a Russian bottom trawl groundfish survey in the Barents Sea and Svalbard regions in October–November. The survey shows the weak and strong yearclasses (Tables D5–D6). The most recent estimates are among the lowest observed. The area outside Spitsbergen was not properly covered in 1993, and this may account for some of the reduction compared to the year before. These results have been used in the VPA-tuning and as the basis for estimating the recruitment in the assessment in recent years (Table D6).

### 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 and 1993 have been distributed on age according to otolith readings. A Workshop continuing this work, and also investigating the possibility of using conversion factors on the long time series on scale readings, will now be held in Bremerhaven in 1995.

## 6.3 Data Used in the Assessment

### 6.3.1 Catch at Age (Tables 6.10 and 6.24)

Since 1992, catch in numbers at age of *S. mentella* from Russia is based on otolith readings. The Norwegian catch-at-age back to 1990 is based on otoliths. Before 1990, when the Norwegian catches of *S. mentella* were smaller, Russian scale-based age-length keys were used to convert the Norwegian length distribution to age. Data for 1993 for *S. mentella* were available from Russia and Norway, corresponding to 33% and 56% of the total landings, respectively. The landings from other countries were distributed on age according to the Russian age distribution.

There is a reduction in the catches of ages 6–9 in 1993 (Table 6.10). This is a result of a change in the Russian fishery from fishing in a wide area including the northern grounds with young fish in 1992, to a limited fishery on the spawning grounds in 1993 (ref. chapter 6.2.1).

For *S. marinus*, age composition data for 1993 (based on otoliths) were only provided by Norway, accounting for 84% of the total landings. The rest of the catches were distributed on age according to the German catch-at-length converted to age by using a Norwegian age-length key for trawl (Table 6.24). The total catch-at-age data back to 1991 are based on Norwegian otolith readings. In 1989–1990 it is a combination of the German scale readings on the German catches, and Norwegian otolith readings for the rest. In 1984–1989 only German scale readings are available, while in the years prior to 1984 also Russian scale readings exist.

### 6.3.2 Weight at Age (Tables 6.11 and 6.25, Figure 6.1)

Catch weight-at-age data were available from Russia for *S. mentella* for ages 6–23 in 1993 and from Norway for ages 5–19+. For fish aged 14–15 years and older, the Norwegian mean length-at-age and weight-at-age were lower than the Russian (Figure 6.1). This deviation is most probably explained by differences in the age readings. The weight-at-age data used in the assessment were weighted by the numbers caught at age by these two countries (Table 6.11). As in previous assessments weight at age in the stock was taken to be the same as the weight at age in the catch.

For *S. marinus* weight-at-age data for ages 6–24+ were available from the Norwegian landings in 1993 (Table 6.25).

### 6.3.3 Maturity at age (Tables 6.12 and D4)

Maturity-at-age ogives for *S. mentella*, sexes combined, are available from Russian research vessels (Table D4). The same input as in last year's assessment was used for the years prior to 1993 (Table 6.12). For 1993 an average of the 1992 and 1993 ogives was 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 (Table 6.13)

Regarding *S. mentella*, trawl effort and corresponding catch-at-age data were available for Russian PST-trawlers for the years 1982–1993, and these data were used for ages 9–18 (Table 6.13a).

Catch rates from the Russian bottom trawl survey in October–December are available on age back to 1978 (see Table D6), and the whole time series was used for ages 1–10 (Table 6.13b).

On the basis of catch-per-unit-effort from one Norwegian trawler since 1989, total Norwegian trawl effort

was calculated, and corresponding catch-at-age data were used for ages 8–18 (Table 6.13c).

### 6.3.5 Recruitment indices (Tables 6.13b and D6)

In order to use the only data on recruitment of *S. mentella* available on age (Tables D6 and 6.13b), the Working Group decided to run the tuning VPA down at age 1. The strength of the 1988–1990 year classes in the prediction were set according to the VPA estimate and projected forward to age 6 taking account of natural mortality.

## 6.4 Methods Used in the Assessment

### 6.4.1 VPA and tuning (Tables 6.14–6.16 and 6.26, Figure 6.2)

For *S. mentella* the Extended Survivors Analysis (XSA) was used to tune the VPA (1–19+) to CPUE data down to age 1 (Table 6.14). 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 2.0. The catchability was fixed to be constant and equal above age 15. Fishing mortalities and stock numbers from the tuning are given in Tables 6.15–6.16. The retrospective analysis showed that the assessment was rather consistent (Figure 6.2). Finally, a standard VPA was run with the fishing mortalities at ages 6–19+ from the tuning as input.

Attempts were made to evaluate the status of the *S. marinus* stock using a VPA, however, without success. Therefore, a SHOT forecast was conducted (Table 6.26). In this forecast 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 was set equal to that in last year's assessment, i.e., G-M = - 0.05 showing that 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.

## 6.5 Result of the Assessment

### 6.5.1 Fishing mortalities and VPA

*Sebastes mentella* (Tables 6.17–6.21 and Figure 6.3A,B)

Fishing mortalities, stock numbers, and stock biomasses from the standard VPA are given in Tables 6.17–6.21 and Figure 6.3 A and B. The fishing mortality ($F_{10\text{-}15}$) in 1993 is 0.083. The large variations in F in recent years is consistent with changes in the fisheries.

The assessment confirmed that the 1981–1983 yearclasses are stronger than those just before and after. Running the VPA down to age 1 also estimated the strength of the 1988–1989 yearclasses at a similar level as the 1981–1983 ones. This is consistent with survey observations not used in the tuning. Russian qualitative observations of young redfish in cod stomachs indicate the same. A slight improvement of the spawning stock is observed due to the 1981–1983 yearclasses now entering the spawning stock.

*Sebastes marinus* (Table 6.26)

The SHOT forecast (Table 6.26) for this species is entirely dependent on the recruitment index. However, a recent catch level of less than 20,000 t seems to have reversed a decreasing trend in the estimated exploitable biomass.

## 6.6 Prediction of Catch and Biomass

### 6.6.1 Data used in the prediction (Table 6.22)

Input to the prediction is shown in Table 6.22. Population numbers in 1994 are those calculated by VPA. For the 1988–1990 year classes the strength at age 6 has been set equal to that from the VPA run down to age 1, and projected forward to age 6 accounting for natural mortality only. The average fishing mortalities for the years 1991–1993, scaled to the 1993 level so that this level corresponds to an F-factor of 1, were used as the input exploitation pattern. The maturity ogive is the 1992-1993 average. Weight-at-age in the catch has been set equal to the average weight-at-age from the catches in 1992 and 1993. Weight-at-age in the stock has been set equal to the weight-at-age in the catch.

### 6.6.2 Biological reference points (Figures 6.3C and 6.4)

Yield and SSB per recruit were based on the parameters in Table 6.22. The calculations gave $F_{0.1}=0.03$ and $F_{max}=0.46$ (Figure 6.3C). From a stock and recruitment plot (Figure 6.4) the reference points $F_{low}=0.008$, $F_{med}=0.03$, and $F_{high}=0.10$ were calculated. The different $F_{0.1}$ and $F_{max}$ compared to last year's assessment is mainly due to an error in the input data last year, and to a minor degree a change of the input exploitation pattern this year towards younger fish.

### 6.6.3 Projections of catch and biomass (Tables 6.23 and Figure 6.3D)

The management options (Table 6.23) show that the expected catches in 1994 will give a further decrease in fishing mortality to 0.06. The status quo catch in 1995 ($F_{95}=F_{93}$) is 18,000 t compared to a catch at $F_{med}$ ($=F_{0.1}$) of 8,000 t. Fishing mortalities less than status quo in

1995 will lead to an increase of the spawning stock. The catch in 1995 and SSB in 1996 for various levels of F in 1995 are shown in Figure 6.3D.

### 6.7 MBAL - Minimum Biological Acceptable Level (Figure 6.4)

The stock and recruitment plot (Figure 6.4) reveals a fairly close relationship between recruitment and SSB. A SSB of about 350,000 t seems to be required to consistently produce average or good yearclasses.

### 6.8 Comments on the Stock Assessment

Although the age readings seem not to be fully harmonized yet, the fact that the catch-at-age data now are based on the same age reading method is promising for the future. Three series for tuning the VPA on *S. mentella* is also an improvement compared to previous assessments, and running the VPA down to age 1 to get direct advantage of the survey results made the assessment more consistent. The work has also shown that research surveys should be promoted and results presented on age. Such information will improve the recruitment data, and help evaluating often difficult fishery data.

Regarding *S. marinus*, an improvement of the CPUE-series from the Norwegian trawl fishery by further analyses of changes in CPUE in fishery subareas should be further investigated. Available survey data on length should be converted to age to be used in the assessment.

### 6.9 State of the stock

*Sebastes mentella*

The analytical assessment shows that the spawning stock still is at a historical low level although a slight improvement is expected in near future. Relatively abundant 1988–1989 yearclasses are showing up in the surveys. The historical low 0-group indices in 1991–1993, which also have been confirmed in the latest trawl/acoustic surveys, give reason for concern.

The assessment shows a strong stock-recruitment relationship. A relatively low fishing mortality will therefore improve the stock level.

*Sebastes marinus*

The assessment (SHOT-forecast) indicates that catches of more than 20,000 tonnes over time will have negative impact on this stock. The decreasing trend in exploitable biomass seems to have stabilized or reversed after the landings were reduced to less than 20,000 tonnes. Indices from surveys in youngfish areas in the Barents Sea indicate a fairly stable situation.

## 7 GREENLAND HALIBUT IN SUB-AREAS I AND II

### 7.1 Status of the fisheries

#### 7.1.1 Landings prior to 1994 (Tables 7.1–7.4, Fig. 7.1A)

Nominal catches by country for Sub-areas I and II combined are presented in Table 7.1. For most countries the catches listed in the table are similar to those officially reported to ICES. For Norway, however, the catches in the table are slightly different from the official ones. The Russian catches for 1990–1991 are those presented to the Working Group by Russian scientists.

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 increased to 32,133 t because of 2,564 t reported by Estonia. Revised landings for 1992 were 9,191 t, which is less than 30% of the 1991 level due to much reduced quotas. The preliminary figure of total catch in 1993 is 11,812 t, which is close to what was expected by last year's Working Group. Nominal catches decreased in Division IIb, while in Sub-area I they are still at the 1991-level. In Division IIa, where the highest proportion of the catch in 1993 was taken, the catches are again approaching the level in the years prior to 1992.

The fishery in 1992–1993 was regulated by forbidding a directed international trawl fishery and a directed long-line and gill-net fishery by vessels larger than 27.5 meters. The only directed fishery was a restricted near-coastal long line and gill-net fishery by smaller vessels. The regulated by-catch in the trawl fishery for other species was not to exceed 10% in weight in each haul.

The Norwegian landings of Greenland halibut caught by shrimp trawl went down from 1,825 t in 1992 to only 33 t in 1993. This is the result of the Norwegian-Russian regulations on by-catch levels of Greenland halibut in the shrimp fishery (since 1 July 1992), and the use of sorting-grid in the same fishery (since 1 January 1993).

In recent 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, 566 t in 1992, and 892 t in 1993. The increase up to 1991 was mainly due to a gill-net fishery, but in 1993 nearly 50% was taken by trawl. This fishery is in another management area, and is 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.

Also around Jan Mayen a few tonnes of Greenland halibut has been taken in some years. In 1992, 56 t were taken, while nothing has been reported taken in this area in 1993. Jan Mayen is within Sub-area IIa, but little is known about any connections to the stock handled by this Working Group. The catches from this area have not been included in the catches given for Subarea II.

### 7.1.2 Expected landings in 1994

Quotas were set by Norwegian authorities to limit the landings in 1994 to 11,000 t. Based upon reported catches from the first seven months of the year, it is estimated that the 1994 total catch will be about 14,500 t. It is expected that Norway will take 13,000 t and Russia 700 t of the total catch. The catch from Division IVa is expected to be reduced to the same level as in 1992 due to less trawling activity, i.e., 500–600 t.

In autumn 1994 Norwegian authorities changed the regulated by-catch of Greenland halibut in the trawl fishery for other species to not exceed 5% in weight in each haul.

## 7.2 Status of research

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

The severe regulations imposed on the trawl fishery after 1991 meant that the time series of commercial CPUE would be disrupted. However, an attempt to continue the series was made by a research programme using trawlers in a limited commercial fishery. This comprises fishing during two weeks in May-June and October, representing an effort somewhat less than 20% of the 1991 level. This fishery was, to the extent possible, conducted in the same way as the commercial fishery in the previous years. The CPUE was, however, found to be considerably higher than in the previous commercial fishery and has been increasing. Thus, the CPUE in 1993 was more than 3 times the 1991 level. Probable explanations for this increase are: 1) less competition on the fishery grounds, 2) above average strength of the yearclasses (in the surveys) in the period before the recruitment failed, and 3) good individual growth, listed in order of importance. The reduced overall effort is likely to have had some effect and may have resulted in some increase of the fishable stock. It is nevertheless inconceivable that the increase in CPUE reflects anywhere near a similar increase of the stock. The Working Group could therefore not treat the CPUE from this fishery as an extension of the commercial time series.

### 7.2.2 Survey results (Tables A12, E1–E5)

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 since remained at a historical low level (Table A12). Although the timing of this survey with regard to Greenland halibut may not be optimal, the fact that such a long period of extremely poor year class indices of this stock has never been observed before, gives cause for grave concern about the recruitment.

A pilot Norwegian survey targeting 0-2 year old Greenland halibut was conducted in the fjords and waters around Spitsbergen in September 1993. Only a small number was found, mainly north of Spitsbergen. Both pelagic and bottom sampling trawls were used showing that the 0-group had not yet settled. It is therefore likely that settling of 0-group Greenland halibut onto the bottom should not bias the one month earlier international 0-group survey.

In the Norwegian bottom trawl survey in the Svalbard area mainly for cod there is a considerable decrease in the abundance of 1-5 year old Greenland halibut (Table E1). This survey covers depths from less than 100 m to a maximum of 600 m.

Abundance indices of Greenland halibut taken in the Norwegian trawl survey for shrimp at Svalbard in July–August 1988–1992 and June 1993 were available for this year' assessment (Table E5). This survey uses the same stratification as the cod survey, but covers the area deeper than 200 m, and down to a maximum depth that usually exceeds that in the cod survey. A reduction in the recruitment of the same magnitude as described above is clearly seen.

Also indices (on length) from the Norwegian bottom trawl survey in the Barents Sea in February 1988–1994 (Table E2) show a decrease in the number of fish less than 35 cm.

In November–December 1993 two Russian research vessels carried out a stratified trawl survey for Greenland halibut in the Svalbard and Barents Sea regions from less than 100 m down to 900 m (Table E3). No big changes in the estimated number and biomass compared to the 1990–1992 surveys were detected, but also in this survey there is a decrease in numbers of fish younger than 5 years.

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

## 7.3 Data used in the assessment

### 7.3.1 Catch at age (Table 7.9)

The catch-at-age data for 1992 were updated by revised catch figures and revised Norwegian age composition. Catch-at-age data for 1993 were available for the Norwegian and Russian fisheries. These were combined and raised to account for the total international landings.

### 7.3.2 Weight at age (Table 7.10)

A constant set of weight-at-age data is used for all years in the period 1970–1978. For subsequent years annual estimates are used. The mean weight at age in the catch in 1993 (Table 7.10) was calculated as a weighted average of the weight in the catch from Norway and Russia. 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 7.11 and E4)

An average maturity ogive derived from Russian data (Table E4) from 1983–1987 has been used for 1970–1987. For 1988 and 1989 a three-year running average has been used. As no appropriate data were available for 1991 and 1992, the average of the 1989 and 1990 ogives was adopted for 1990–1992. A Russian maturity ogive, sampled in November–January 1993–1994, was adopted for 1993 in the assessment.

### 7.3.4 CPUE-data for tuning (Table 7.6)

Abundance indices from the Norwegian Svalbard bottom trawl survey for ages 1–8 in 1984-1993, from the Russian bottom trawl survey in the autumn for ages 4–9 in 1990–1993 and from the Norwegian Svalbard shrimp survey in July and autumn for ages 1–8 in 1988–1993 were used in the tuning.

### 7.3.5 Recruitment indices (Tables A12)

In addition to the indices mentioned in section 7.3.4 the 0-group indices from the International 0-group survey (Table A12) were available for recruitment estimation. All the indices seem to indicate extremely low recruitment in the last few years. The indices of age groups 1–4 from the 1993 Svalbard trawl survey are at the same low level as in 1992 and much lower than in the years prior to 1992. This picture is also confirmed by the Svalbard Shrimp survey, and this survey covers deeper waters where Greenland halibut is expected to be found. The 0-group indices of the 1989–1993 year classes are 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 appear much lower than the level experienced in the period 1978–1987.

## 7.4 Methods used in the assessment

### 7.4.1 VPA and tuning (Table 7.7–7.8)

The Extended Survivors analysis (XSA) was used to tune the VPA to the survey indices. 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 and was fixed to be constant above age 8. The diagnostics of the tuning are given in Table 7.7. The results show that there is no indication of stock dependency in the survey indices of the recruiting ages. The population numbers from the XSA extended to age 1 is given in Table 7.8

## 7.5 Results of the Assessment

### 7.5.1 Fishing mortalities and VPA (Tables 7.12–7.15, Fig 7.1A)

The fishing mortality ($F_{6\text{-}10}$) was relatively high in 1970–71 (0.45) and then showed a declining trend until 1981, when it was only 0.15. From that time it increased until 1991, when it reached 0.65. Following the drop in the catches in 1992 the $F_{6\text{-}10}$ in that year was calculated to be 0.21. $F_{6\text{-}10}$ in 1991 (0.65) is considerable higher than the value from last year's assessment (0.39) when the VPA only included the years 1991 and earlier. The level estimated in 1993 is $F_{6\text{-}10} = 0.30$.

### 7.5.2 Recruitment (Table A12)

The inclusion of only surveys in the tuning and also extending the ages down to age 1 seem to give results that fully reflects the trends in the surveys. The earlier recruitment of this stock seems to have been quite stable until it virtually collapsed in recent years. The 1989–1992 yearclasses are estimated to be 2,971, 221, 299 and 201 thousand individuals respectively compared to the long term average of about 26 millions individuals.

Concerning the 1993 year class, only the 0-group index is available (Table A12) and the RCT3 program was run using these indices and the XSA figures at age 1. This gave a calculated recruitment at age 3 of 5,284 thousand individuals. For the yearclasses 1994 and onwards an assumed low recruitment of 10 million individuals at age 3 is taken. It must be emphasized, however, that if the recruitment estimates continue at current levels, values for 1993 and coming yearclasses would be considered to be quite high.

### 7.5.3 State of the stock (Table 7.16)

A summary of the historical series of landings, fishing mortalities, stock biomasses and recruitment from 1970–1993 is given in Table 7.16.

The spawning stock was stable at around 60,000 t in the period 1976–1987 but was subsequently reduced to a level around 40,000 t in 1992–1993. This is the lowest level experienced in the time series. The lack of recruitment observed in the recent years indicate that this spawning stock biomass is below the level needed to ensure a more normal recruitment level under current conditions. This is clearly seen in the stock and recruitment plot in Figure 7.2. The total biomass of the stock has been relatively stable (around 100,000 t) since 1982, but the recent low recruitment have led to a decrease to about 65,000 t in 1992–1993.

The stock is clearly not within safe biological limits and the spawning stock will be further reduced in the years to come.

## 7.6 Predictions of Catches and Biomasses

### 7.6.1 Data used in the prediction (Table 7.17)

Input data used in the short-term prediction for 1994–1996 are shown in Table 7.17. Population numbers in 1994 are taken from the VPA.

The exploitation pattern used is the average of 1991–1993 scaled to give an F-factor of 1.0 corresponding to the 1993 fishing level. The maturity ogive is the average of the 1991–1993 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 1991–1993.

### 7.6.2 Biological reference points (Figure 7.1C)

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 7.1 C. The values of $F_{0.1}$ and $F_{max}$ are 0.09 and 0.16, respectively. Using the stock-recruitment plot given in Figure 7.2 the values of $F_{med}$ and $F_{high}$ have been taken as 0.12 and 0.30, respectively. $F_{low}$ is not defined. The $F_{med}$ is about half the level estimated last year, whereas $F_{high}$ is at about the same level. This is due to the new estimates of the recruiting yearclasses.

### 7.6.3 Projections of catches and biomass (Table 7.18, Fig. 7.1D)

If the expected catch of 14,500 t in 1994 is taken, the fishing mortality will be 0.31 compared to 0.30 in 1993 (Table 7.18). The spawning stock biomass will be at the same level as in 1993 but will be reduced to 38 thousand t in 1995 which would be the lowest level observed.

Medium-term predictions from 1994 to 1999 were run using the same input as in the short-term prediction, for no fishing, 0.1 *St.quo*, 0.2 *St.quo* and *Status quo* F, giving Fs of 0.0, 0.03, 0.06 and 0.30 respectively. The results are given in Tables 7.18 and 7.19 and Figure 7.1D. If fishing at F *Status quo* the spawning stock biomass will be reduced from 38 thousand t in 1995 to below 10 thousand t in 1999, while the spawning stock biomass will increase to 54 thousand t if no fishing is conducted.

## 7.7 Comments on the Results of the Assessments and Predictions

This assessment is relying very much on the observations from the surveys, and the Working Group strongly believe this reflects the situation in the stock.

The stock is at a very low level. Due to the lack of recruitment observed for this stock, and in order to have an increase in the spawning stock size, then a cessation of fishing is advised.

# 8 COASTAL COD IN SUB-AREAS I AND II

A programme for the assessment of the Norwegian coastal cod resources from the Russian border to Møre was started in 1991. The results from the 1992 investigations showed that there were Coastal cod (78,000 tonnes) along the coast off Finnmark and Troms Counties within the 12 n. mile limit (Eliassen *et al.*, 1993; Anon, 1994). The Northern areas surveyed in 1992 *were not* covered by the survey in 1993. The 1993-survey covered the areas from the southern Troms County to the southern Nordland County and to a depth of 900 m. The area covered was about 104,078 km$^2$ (30,339 n. miles$^2$) (Figure 8.1) (ICES SUB-AREA IIa - Norwegian statistical areas 05, 00 & 06) (Eliassen *et al.*, 1994).

The area under investigation in 1993 included the largest spawning area (Lofoten) for the North East Arctic cod stock. As a result this survey was conducted at the time of year when the NE Arctic cod stock, according to its general migration pattern, should be in the Barents Sea (August/September). The working hypothesis was therefore that the remaining fish would consist mostly of the Coastal cod type.

A historical background for the introduction of Norwegian Coastal cod and Russian Murman cod in the ICES-system was given in Anon (1994). The acoustic trawl survey data from the 1992 and 1993 cruises and a SHOT forecast will be used in this evaluation of the Coastal cod.

## 8.1 Data from landings (Table 8.1)

Catches in the fjords and in the coastal areas are used in the North East Arctic cod stock assessments, except from the catches in ICES Division IIa, Norwegian statistical areas 05 and 00 (Quarter 3 and 4), 06 (all year) and 07 (all year) (Table 8.1), is used in the SHOT forecast for the Coastal cod. The catches given here are not separated into Coastal cod and North East Arctic.

## 8.2 Survey results

### 8.2.1 Length and weight in the stock (Tables 8.2 and 8.3)

Samples of Coastal cod were not uniformly distributed among age groups (tables 8.2 and 8.3). Most frequent were the young yearclasses. For a comparison of sizes among the different areas it was therefore most convenient to use the ages 4, 5 and 6. In general there were large variations in length for the different age groups, but for ages 4 and 5 there was an apparent increase in length at age from the fjord areas to the more offshore areas. These observations were also made on Coastal cod from Finnmark and Troms Counties in 1992 (Eliassen et al., 1993). The mean weights at age for the same age-groups were also larger at the outer coastal areas compared to the fjords.

### 8.2.2 Maturity ogives (Table 8.4)

The proportion mature at age are varying between Coastal cod sampled in the fjords and Costal cod sampled at the outer areas, where most of the offshore caught Coastal cod where found to be mature (Table 8.4). On average the age of 50 % maturity is about 4.5 years for Coastal cod in the surveyed areas.

The area Vestfjord is of particular interest because this is the main spawning area for the NE Arctic cod stock. From the data in table 8.4 the age of 50 % maturity is between 4 and 5 years for Coastal cod from this area. From Norwegian and Russian data the age of 50 % maturity for the NE Arctic cod varies between 6.5 and 7.5 years in the period 1982–1993 (Anon, 1994). In 1993 it was estimated to be close to 7 years.

## 8.3 Stock assessment

### 8.3.1 The acoustic trawl survey (Tables 8.5–8.9)

The period for the coastal survey was 1 August to 10 September 1993. Details for the 1993 acoustic trawl survey, for the methods used in the biomass calculations and for the estimation of age and differentiating into Coastal and North East Arctic cod types are given in Eliassen et al., 1993; 1994. A total of 168 demersal trawl hauls, 130 pelagic trawl hauls and 10 jigging stations (308 sampling stations), each lasting for approximately one half hour, was conducted during the 1993 survey.

When splitting the total biomass/numbers into age-groups for cod that were not aged, age/length-weight keys were used to allocate those to age-groups. In some areas, rather few cod were aged due to little sampling and fewer cod in the samples. For those areas the proportion of coastal cod/North East Arctic cod was estimated using the average proportion from neighbouring areas. The coastal cod were distributed along the entire area surveyed, both at the inner fjords and outer fishing banks. Of 1332 cod otoliths 1262 (or 94.5 %) were classified to be of the Coastal type. A high proportion of coastal type otolith was found in most of the areas surveyed. Age 3 and younger cod were all classified to coastal type.

The total cod biomass (120,000 tonnes; and 50 million fish) was separated into Coastal cod which was estimated to be about 100,000 tonnes (41 million fish) and the North East Arctic cod was estimated to 20,000 tonnes (8.8 million fish). The spawning biomass of the Coastal cod was estimated to be about 84,000 tonnes (25 million fish) (tables 8.5–8.9).

Most of the cod were found in the more open areas off Vesterålen, outside and inside Lofoten (Vestfjorden), Trænabanken and outer Helgeland. Other areas with significant cod biomass were Andfjord, Fleinvær and Dønna. The data are presented in the same manner as given for the 1992 data (Eliassen *et al.*, 1993), showing some larger areas along the outer parts of the coastline, and some smaller areas connected to the fjords and near coastal regions.

### 8.3.2 The SHOT forecast (Table 8.10)

The results of the SHOT forecast are given in table 8.10, and this forecast was made using the landings of Norwegian Coastal cod from 1980 to 1993. the same $G=0.41$ as in 1993 was used (Anon, 1994). The natural mortality was set to $M=0.2$. 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 was 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 1990's. The SHOT forecast calculated the yield to be 43,000 tonnes in 1994 and 51,000 tonnes in 1995. The F-levels are are stable.

## 8.4 Comments on the stock situation and the assessments

The estimations using the SHOT-method forecast the yield of Coastal cod in 1995 to 51,000 tonnes to be a little larger than in 1994 (43,000 tonnes). This forecast was made without recruitment data, which should be available to improve the assessment. Anon (1994) calculated the 1994 catch to be 51,000 tonnes, but the provisional landings seem to be lower (43,000 tonnes) (Table 8.10).

The landings used in the SHOT forecast were derived from the ICES areas IIa and Norwegian statistical areas 05, 00, 06 and 07 as shown previously, and not for the Coastal cod specifically. Therefore the landings of cod should be sampled for investigating the proportions of Coastal cod and North East Arctic cod, and this will make the Coastal cod stock estimations more reliable.

As in the coastal survey in 1992 (Eliassen *et al.*, 1993) we observed a substantially larger proportion of Coastal cod in the catches compared to the North East Arctic cod. This strengthens the hypothesis of the existence of a stock of Coastal cod along the coastline and at the shelf. To be precise, in Finnmark and northern Troms the investigations in 1992 were conducted out to the 12 n. mile limit, while in southern Troms and in Nordland in 1993 the surveyed area covered both the fjords, the coastline and the rather wide areas on the continental shelf out to the 900 m depth isoline. Similar to the results from 1992 it was observed that the Coastal cod outside Nordland reaches an age of 50 % maturity around 4.5 years, compared to 7 years for the North East Arctic cod stock (Anon., 1994).

The total biomass of cod in the surveyed areas in 1993 is of the same magnitude as the biomass found for Finnmark/Troms in 1992:

| Area | Year | Coastal Cod | SSB Coastal cod | NE Arctic cod | Total |
|---|---|---|---|---|---|
| 1)Finnmark/ N. Tromsø | 1992 | 78,000 | 52,000 | 35,000 | 112,000 |
| 2)S. Tromsø/ Nordland | 1993 | 100,000 | 84,000 | 20,000 | 120,00 |
| Total | 1992-1993 | 178,000 | 136,000 | 55,000 | 232,000 |

The table given above show that the sum of Coastal cod in the surveyed area from the Russian border to Southern Nordland is about 178,000 tonnes and the spawning stock of Coastal cod about 136,000 tonnes. The total biomass of Coastal cod and NE Arctic cod in the area was estimated to 232,000 tonnes.

The sum of the total biomass estimates was derived from results of the coastal surveys in 1992 and 1993, each cruise covering different parts of the distribution area. It may be questioned whether the results should be additive due to migratory patterns of Coastal and North East Arctic cod. Tagging data from the Finnmark fjords in the early 1980's (Jakobsen, 1987) and from the fjords in Troms in the late 1980's (Eliassen *et al.*, 1993; and unpublished) seemed to strengthen the hypothesis that there is some migration between neighbouring fjords and that few cod do migrate from the fjords to the Barents Sea. To investigate migration patterns at the coast and fjords in Nordland County, a new tagging programme was initiated in November 1993.

Because only about 2/3 of the distribution area for the Coastal cod is covered so far, we can not give an estimate of the total stock size. During the autumn 1994 a coastal trawl acoustic survey from southern Nordland to Møre will be made along the lines of the two previous years, and thus the expected range of distribution of the Coastal cod will be covered. When all this material becomes available an estimation of the total Coastal stock biomass and yield can probably be made.

Due to similarities in the areas of distribution for North East Arctic saithe and the Norwegian Coastal cod, preliminary talks about joint surveys have started (see section 5.2.2).

# 9 ECOLOGICAL CONSIDERATIONS

In the terms of reference item b) and c) the Working Group is asked to perform tasks that imply ecological aspects of the assessments. Both in considering natural mortality and in evaluating predation effects the relations to the ecosystem is essential. Usually these considerations have been named Multispecies Considerations, but a wider name should be given.

The origin of the requests put forward in items b) and c) in the terms of reference is the work done in the Atlanto-Scandian Herring and Capelin Working Group (Anon, 1994). A similar approach would be useful to apply also in this Working Group, although not covering entirely the same items.

## 9.1 Growth of cod

Individual growth in the stock of North-East Arctic Cod has decreased considerably and is now below average and close to the very low levels recorded in the late 1980s. It is shown by Steinarson and Stefanson (1991) and Mehl and Sunnanå (1991) that growth of cod is highly variable and is related to abundance of capelin. Due to the decrease in the capelin stock, which is the

main food for young cod, it is difficult to predict the weights at age in the catch and in the stock without including capelin in the calculations. It is stated by the Atlanto-Scandian herring and capelin Working Group that increased predictive power of models is the way to go in solving these problems.

At this WG-meeting results were presented from an energetic growth-prediction model by Ajiad *et al.* (1994) predicting the growth of cod in 1993 and 1994 using available data on consumption and temperature in the Barents sea. The fit with the observed weights in 1993 and 1994 was very good. The temperature data are taken from a prognosis of the average temperature in the Kola-section developed at the Institute of Marine Research in Bergen, Norway, by the Center of Marine Environment (Ottersen *et al.*, 1994.)

Results of the modeling of the average length and weight of cod at ages 3–8 in the southern Barents Sea were also presented (Otzigin *et al.*, 1994). In this model mean temperature of water at 0–200m depth in the Kola section during the latest 2–4 years, indices of capelin abundance, the length of cod at ages 3–8 were used. Prediction of mean length have been done up to 1997. The results have a good agreement with the energetic model by Ajiad.

The main uncertainty in these calculations is the choice of consumption by cod of the various species. If this consumption can be predicted such a model may also be used to predict the growth for the medium term predictions. At present we must rely on evaluations on low, average or high growth based mainly on the expected abundance of prey stocks and changes in temperature.

### 9.2 Predation of cod on cod, haddock and redfish

Data for the cod consumption of various species are given in Table A15 in Appendix I. The data are from Bogstad and Mehl (1992). Cannibalism is shown to have removed between 11 and 129 thousand tonnes of 1, 2 and 3 year old cod each year in the period 1984–1992. Survey indices for these ages are now included in the tuning of the recruitment in the VPA. The quantities of cannibalism could have been included as "catch" of ages 1–3 to improve the tuning of these ages and data for this is given in Table A16 in Appendix I. If such data are made available also for the last year in the VPA this may be done in next years working group.

Another way of including cannibalism is to allow the cannibalism to be calculated in the VPA program. This is done by Korzev and Tretiak (1992) for the years 1984–1989. As seen in Table A15, cod is also an important predator on haddock and redfish. Provided the consumption is given by prey age, it may be included as catch at those ages in the tuning.

### 9.3 Predation by cod on capelin and herring.

The age groups 3 to 7 in the cod stock is responsible for most of the predation on capelin. It is therefore important to have absolute estimates of the numbers of these ages. VPA with tuning is primarily designed at predicting the catches and describing the relative changes in the abundance of the stock. The absolute level of abundance is very dependent of the natural mortality entered into the VPA. Several works have indicated that the natural mortality in the cod stock may be lower than 0.2 for ages in the middle part of the life span (Tretiak, 1984, Korzev and Tretiak, 1992) and perhaps higher than 0.2 for the youngest and the very oldest fish. If this is the case, the calculated consumption used in the capelin assessment may be wrong.

For the time being it is uncertain to what extent the different age groups of cod will prey on the Atlanto-Scandian herring. This is due to that it is uncertain to what degree the cod will shift its diet from capelin to other species.It is reasonable to believe that the natural mortality of the spawning stock of cod may be close to 0.2 and that the VPA estimate of this part of the stock is fairly correct. If mainly the mature part of the cod stock is preying on herring, estimates of that predation using stomach content may be reliable. Estimates of the predation by the premature stock may, however, suffer by the same uncertainties as the estimates of predation on capelin.

### 9.4 Natural mortality

As the above section points to, reliable estimates of natural mortality are essential if a VPA should be used to assess absolute stock levels. Multi Species Models should be the best way of exploring different scenarios of natural mortality with the aim of finding mortalities that explain observed stock interactions and dynamics. This Working Group will welcome any results of such work which will improve our assessments. The next meeting in the Multi Species WG (June 1995) will devote itself to boreal multi species interactions. This should give support to our Working Group on these problems.

The Working Group will use available data on consumption of the young ages of species being assessed to improve the tuning and thereby also estimating the additional natural mortality at these ages.

Concerning the possibilities of performing assessments using other natural mortalities, e.g for cod, it is believed that the improvements made this year by including survey results down to age 1 would allow other assessments to be made just by changing the input natural mortality file. It should therefore be possible for other Working Groups to make their own estimates of stock size at age

for multi species considerations.

## 10 RECOMMENDATIONS

The working group feels that the terms of reference given for the 1994 meeting do not reflect the views of its members and would recommend that the terms of reference for the meeting in 1995 be stated as follows:

"The Arctic Fisheries Working Group (Chairman: Mr K. Sunnanå, Norway) will meet at ICES Headquarters from xx August–x September 1995 to:

a) assess the status of and provide catch options for 1996 for the stocks of cod, haddock, saithe, redfish and Greenland halibut in Sub-areas I and II;

b) further consider how ecological aspects and biological interactions among the stocks under item a) and between these stocks and stocks assessed by other working groups may be included in the assessment of these stocks.

## 11 REFERENCES


Aglen, A. and Nakken, O. 1994. Length dependent corrections of survey estimates of cod and haddock in the Barents Sea. ICES C.M. 1994/G:27.

Ajiad, A.M., Smedstad, O. and Korsbrekke, K. 1994. Can a Bioenergetics Model Explain Growth of the Northeast Arctic Cod? ICES, C.M. 1994/G:7.

Anon., 1994. Report of the Arctic Fisheries Working Group. *ICES C.M.1994/Assess:2.*

Anon., 1994a. Report of the Atlanto-Scandian Herring and Capelin Working Group. ICES, Doc C.M. 1994/Assess:8.

Bogstad, B. , Lilly, G.R. , Mehl, S. , Palsson, O.K. and Stefansson, G. 1993. Cannibalism and year-class strength in Atlantic cod (Gadus morhua) in the Arcto-boreal ecosystems Barents Sea, Iceland and Newfoundland. ICES 1993/CCC Symposium/No.43.

Bogstad, B. and Mehl, S. 1992. The North-East Arctic cod stock's consumption of various prey species 1984–1989. Pp 59-72 in Bogstad, B. and Tjelmeland, S. (eds). Interrelations between fish populations in the Barents Sea. Proceedings of the fifth PINRO-IMR symposium Murmansk, 12–16 August 1991. Institute of Marine Research, Bergen.

Bogstad, B. and Mehl, S. 1994. Relations between recruitment indices and occurrence in cod stomachs of pre-recruits of cod and haddock in the Barents Sea. Sixth PINRO-IMR symposium, Bergen June 1994.

Eliassen, J.-E., Ahlquist, A., Sundet. J.H., Berg, E., Lørstrand, A., Jespersen, D.T., Skreslet, S. and S.Rubach. 1993. Coastal and fjord resources off Finnmark and Troms Counties, Northern Norway,based on the 1992 survey. Fiskeriforskning, Tromsø; 91 pp.

Eliassen, J.-E., Sundet, J.H., Ahlquist, I., Berg, E., Skreslet, S., Richardsen, W., Lyshoel, E. and D.T. Jespersen. 1994. Coastal and fjord resources off Nordland and Troms Counties, Norway, based on the 1993 survey. Fiskeriforskning, Tromsø; 99 pp.

Jakobsen, T. 1987. Coastal cod in Northern Norway. *Fisheries Research*: 223–234.

Jakobsen, T. 1992. Biological reference points for the North-East Arctic cod and haddock. ICES J. Mar. Sci. 49: 155–166.

Mehl, S. 1989. The North-East Arctic cod stock's consumption of commercially exploited prey species in 1984–1986. Rapp. P-v. int. Cons. Explor. Mer, 188: 185–205.

Mehl,S. and Sunnanå, K. 1991. Changes in growth in relation to food consumption in 1984–1988. ICES Mar. Sci. Symp., 193: 109–112.

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

| Year | Sub-area I | Division IIa | Division IIb | Unreported catches | 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 | 25,000 | 212,000 |
| 1991 | 70,970 | 156,966 | 41,222 | 50,000 | 319,158 |
| 1992 | 124,219 | 172,792 | 86,483 | 130,000 | 513,494 |
| 1993[1] | 195,676 | 269,249 | 67,555 | 50,000 | 582,480 |

[1]Provisional 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 | |
| 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 | 103.7 | 20.5 | 80.0 | 92.8 | 85.6 | 0.9 |
| 1993[1] | 166.1 | 29.6 | 162.6 | 106.6 | 67.5 | 0.1 |

[1]Provisional.

**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. | Fed.Rep Germany | Norway | Poland | United Kingdom | 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 |
| | | | | | | Spain | | | | |
| 1981 | 12,825 | 3,106 | 298 | 2,228 | 277,818 | 14,500 | 5,262 | 83,000 | - | 399,037 |
| 1982 | 11,998 | 761 | 302 | 1,717 | 287,525 | 14,515 | 6,601 | 40,311 | - | 363,730 |
| 1983 | 11,106 | 126 | 473 | 1,243 | 234,000 | 14,229 | 5,840 | 22,975 | - | 289,992 |
| 1984 | 10,674 | 11 | 686 | 1,010 | 230,743 | 8,608 | 3,663 | 22,256 | - | 277,651 |
| 1985 | 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 | Greenland | 2,613 | 126,226 | 3,677 | 3,981 | 119,427[3] | 3,278 | 269,158 |
| 1992 | 11,663 | 262 | 3,337 | 3,911 | 168,460 | 6,217 | 6,120 | 182,315 | 1,209 | 383,494 |
| 1993 | 17,435 | 3,572 | 5,389 | 5,912 | 221,822 | 8,800 | 11,337 | 244,860 | 13,353 | 532,480 |

[1]Provisional figures.
[2]USSR prior to 1991.
[3]Includes 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 | (1.20) | 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 | 0.56 | 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 | 0.54 | 0.55 | 0.82 | 1.36 | 2.38 | 3.75 | 5.84 | 7.05 | 8.55 | 11.28 | 11.63 | 14.10 | - | - |
| 1989 | 0.36 | 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 | 1.19 | 1.62 | 1.73 | 1.95 | 2.54 | 3.42 | 5.07 | 8.18 | 10.48 | 14.16 | 17.85 | - | 14.34 | - |
| 1991 | 1.05 | 1.47 | 1.86 | 2.34 | 3.00 | 3.66 | 4.60 | 6.02 | 8.97 | 11.75 | 17.32 | - | - | - |
| 1992 | 0.39 | 1.25 | 1.85 | 2.54 | 3.29 | 4.35 | 5.29 | 6.20 | 8.27 | 12.21 | 11.72 | - | 14.66 | 20.58 |
| 1993[1] | 0.58 | 0.94 | 1.70 | 2.38 | 3.42 | 4.48 | 5.40 | 6.46 | 7.06 | 8.36 | 11.10 | 16.28 | 18.48 | 18.79 |

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 | 0.20 | 0.65 | 1.30 | 2.03 | 2.76 | 4.36 | 5.97 | 6.94 | 8.15 | 11.12 | 15.24 | 17.28 | - | 22.30 |
| 1994[2] | 0.07 | 0.17 | 0.62 | 1.39 | 2.28 | 3.16 | 5.66 | 8.41 | 8.76 | 11.96 | 20.60 | - | - | - |

[1]Revised.

[2]Weights from the period January-June.

**Table 3.5** Cod in the North-East Arctic (Fishing Areas I and III)
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 | 0.05 | 0.32 | 1.01 | 1.55 | 2.30 | 3.26 | 4.51 | 5.60 | 6.58 | 8.86 | 12.21 | 11.72 | 12.50 | 14.66 | 20.58 |
| 1993 | 0.75 | 0.50 | 0.78 | 1.46 | 2.14 | 2.91 | 4.30 | 5.60 | 6.61 | 7.29 | 8.91 | 11.29 | 14.99 | 12.57 | 13.38 |

**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 | 0.45 | 0.93 | 1.74 | 2.73 | 3.90 | 4.98 | 6.62 | 11.18 | 9.25 | 10.85 | 12.50 | 13.90 | 15.00 |
| 1993 | -1.00 | -1.00 | 0.35 | 1.18 | 1.83 | 2.87 | 4.14 | 5.56 | 6.73 | 8.45 | 10.66 | 10.85 | 12.50 | 13.90 | 15.00 |
| 1994 | -1.00 | -1.00 | 0.24 | 0.76 | 1.37 | 2.28 | 3.44 | 4.98 | 6.84 | 7.78 | 8.59 | 8.60 | 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 |
| Norway | | | | | | | | |
| 1982 | - | 5 | 10 | 34 | 65 | 82 | 92 | 100 |
| 1983 | 5 | 8 | 10 | 30 | 73 | 88 | 97 | 100 |
| Russia | | | | | | | | |
| 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 |
| 1994 | - | 1 | 8 | 30 | 55 | 84 | 95 | 98 |

**Table 3.8** North-East Arctic COD. Input data to the tuning.

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

Norway Barents Trawl survey (shifted, ages 1 - 8) (code: FLT41)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1980 | 1 | 319.0 | 172.0 | 279.0 | 512.0 | 527.0 | 64.0 | 13.0 | 4.0 |
| 1981 | 1 | 27.0 | 306.0 | 337.0 | 310.0 | 216.0 | 210.0 | 19.0 | 3.0 |
| 1982 | 1 | 177.0 | 232.0 | 454.0 | 441.0 | 189.0 | 60.0 | 39.0 | 8.0 |
| 1983 | 1 | 3660.0 | 1220.0 | 327.0 | 254.0 | 144.0 | 42.0 | 6.0 | 3.0 |
| 1984 | 1 | 6470.0 | 620.0 | 1260.0 | 217.0 | 84.0 | 33.0 | 3.0 | 1.0 |
| 1985 | 1 | 4030.0 | 6790.0 | 1730.0 | 1020.0 | 306.0 | 73.0 | 8.0 | 2.0 |
| 1986 | 1 | 3870.0 | 2330.0 | 4150.0 | 611.0 | 154.0 | 18.0 | 5.0 | 1.0 |
| 1987 | 1 | 635.0 | 1800.0 | 1020.0 | 2310.0 | 257.0 | 48.0 | 8.0 | 1.0 |
| 1988 | 1 | 127.0 | 379.0 | 732.0 | 433.0 | 1040.0 | 117.0 | 10.0 | 2.0 |
| 1989 | 1 | 489.0 | 258.0 | 370.0 | 438.0 | 270.0 | 314.0 | 17.0 | 5.0 |
| 1990 | 1 | 2127.0 | 370.0 | 246.0 | 239.0 | 217.0 | 122.0 | 127.0 | 7.0 |
| 1991 | 1 | 4822.0 | 1704.0 | 627.0 | 250.0 | 157.0 | 99.0 | 52.0 | 35.0 |
| 1992 | 1 | 3048.0 | 3138.0 | 1953.0 | 911.0 | 204.0 | 92.0 | 57.0 | 29.0 |
| 1993 | 1 | 4100.0 | 2934.0 | 3782.0 | 2024.0 | 671.0 | 116.0 | 27.0 | 14.0 |

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

Norway Barents Acoustic (shifted, ages 1-8) (code: FLT42)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1980 | 1 | 610.0 | 340.0 | 590.0 | 1060.0 | 1090.0 | 160.0 | 30.0 | 12.0 |
| 1981 | 1 | 40.0 | 400.0 | 420.0 | 400.0 | 290.0 | 290.0 | 20.0 | 4.0 |
| 1982 | 1 | 140.0 | 110.0 | 230.0 | 280.0 | 160.0 | 70.0 | 40.0 | 8.0 |
| 1983 | 1 | 1750.0 | 420.0 | 160.0 | 120.0 | 80.0 | 30.0 | 2.0 | 1.0 |
| 1984 | 1 | 6960.0 | 2090.0 | 1690.0 | 320.0 | 130.0 | 60.0 | 6.0 | 3.0 |
| 1985 | 1 | 5030.0 | 6020.0 | 1540.0 | 730.0 | 80.0 | 20.0 | 3.0 | 1.0 |
| 1986 | 1 | 530.0 | 810.0 | 2490.0 | 510.0 | 140.0 | 20.0 | 7.0 | 4.0 |
| 1987 | 1 | 220.0 | 540.0 | 380.0 | 760.0 | 100.0 | 20.0 | 1.0 | 1.0 |
| 1988 | 1 | 70.0 | 180.0 | 390.0 | 260.0 | 600.0 | 80.0 | 11.0 | 1.0 |
| 1989 | 1 | 400.0 | 160.0 | 260.0 | 310.0 | 270.0 | 480.0 | 35.0 | 7.0 |
| 1990 | 1 | 2270.0 | 620.0 | 400.0 | 370.0 | 330.0 | 180.0 | 200.0 | 10.0 |
| 1991 | 1 | 5060.0 | 2020.0 | 590.0 | 230.0 | 140.0 | 100.0 | 50.0 | 30.0 |
| 1992 | 1 | 3540.0 | 3020.0 | 1950.0 | 1010.0 | 180.0 | 90.0 | 45.0 | 20.0 |
| 1993 | 1 | 5650.0 | 3490.0 | 4110.0 | 2070.0 | 580.0 | 120.0 | 26.0 | 13.0 |

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

Russian Trawl/Acoustic survey (ages 1-8) (code: FLT43)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1982 | 1 | 6 | 181 | 141 | 51 | 13 | 26 | 7 | 2 |
| 1983 | 1 | 89 | 43 | 56 | 73 | 47 | 20 | 8 | 11 |
| 1984 | 1 | 92 | 142 | 162 | 86 | 50 | 31 | 11 | 4 |
| 1985 | 1 | 49 | 430 | 303 | 405 | 188 | 49 | 19 | 6 |
| 1986 | 1 | 22 | 91 | 565 | 161 | 106 | 30 | 8 | 3 |
| 1987 | 1 | 2 | 40 | 59 | 426 | 54 | 31 | 6 | 1 |
| 1988 | 1 | 2 | 25 | 77 | 78 | 190 | 25 | 6 | 1 |
| 1989 | 1 | 1 | 6 | 34 | 88 | 111 | 155 | 114 | 26 |
| 1990 | 1 | 31 | 78 | 38 | 44 | 66 | 60 | 113 | 18 |
| 1991 | 1 | 59 | 98 | 110 | 62 | 68 | 77 | 56 | 46 |
| 1992 | 1 | 78 | 395 | 485 | 182 | 69 | 53 | 52 | 40 |
| 1993 | 1 | 28 | 131 | 647 | 597 | 334 | 91 | 34 | 33 |

**continued...**

**Table 3.8**

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

Russian acoustic survey (ages 1-8) (code: FLT44)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1985 | 1 | 1050.0 | 8950.0 | 4220.0 | 2550.0 | 830.0 | 440.0 | 500.0 | 210.0 |
| 1986 | 1 | 530.0 | 1410.0 | 9800.0 | 4440.0 | 1830.0 | 560.0 | 620.0 | 190.0 |
| 1987 | 1 | 150.0 | 1700.0 | 1700.0 | 7380.0 | 990.0 | 670.0 | 420.0 | 200.0 |
| 1988 | 1 | 5.0 | 430.0 | 1610.0 | 1060.0 | 2450.0 | 340.0 | 100.0 | 20.0 |
| 1989 | 1 | 10.0 | 40.0 | 170.0 | 440.0 | 560.0 | 990.0 | 820.0 | 200.0 |
| 1990 | 1 | 220.0 | 570.0 | 290.0 | 350.0 | 520.0 | 460.0 | 890.0 | 140.0 |
| 1991 | 1 | 440.0 | 750.0 | 890.0 | 510.0 | 530.0 | 610.0 | 450.0 | 430.0 |
| 1992 | 1 | 610.0 | 3330.0 | 3170.0 | 1100.0 | 450.0 | 370.0 | 380.0 | 290.0 |
| 1993 | 1 | 100.0 | 450.0 | 2150.0 | 2430.0 | 1360.0 | 430.0 | 140.0 | 140.0 |

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

Norwegian Svalbard Bottom Trawl Survey (ages 1-8) (code: FLT45)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1983 | 1 | 145.0 | 26.8 | 10.7 | 9.5 | 2.4 | 1.9 | 1.0 | 1.3 |
| 1984 | 1 | 499.0 | 113.0 | 7.3 | 4.3 | 4.7 | 1.8 | 0.4 | 0.4 |
| 1985 | 1 | 239.0 | 452.0 | 99.1 | 28.4 | 13.6 | 5.4 | 1.0 | 0.4 |
| 1986 | 1 | 40.9 | 181.0 | 297.0 | 42.8 | 15.3 | 2.6 | 1.0 | 0.3 |
| 1987 | 1 | 41.5 | 108.0 | 141.0 | 125.0 | 17.1 | 5.4 | 0.5 | 0.1 |
| 1988 | 1 | 3.1 | 16.6 | 33.2 | 31.8 | 37.1 | 9.5 | 0.6 | 0.6 |
| 1989 | 1 | 3.6 | 2.7 | 15.4 | 12.8 | 11.9 | 19.2 | 3.2 | 0.4 |
| 1990 | 1 | 70.1 | 9.4 | 8.6 | 14.6 | 23.4 | 16.5 | 20.0 | 2.0 |
| 1991 | 1 | 116.0 | 101.0 | 25.3 | 8.5 | 13.9 | 16.0 | 13.5 | 19.0 |
| 1992 | 1 | 91.8 | 130.0 | 105.0 | 56.0 | 16.2 | 7.3 | 5.7 | 3.3 |
| 1993 | 1 | 122.3 | 120.9 | 148.6 | 65.6 | 29.6 | 3.4 | 3.8 | 2.4 |

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

Norway Total Trawl survey (october) (code: FLT49) (Catch: Number) (Effort: 1)

| 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 | Catch, age 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | 1 | 437 | 1569 | 2097 | 6658 | 1627 | 191 | 23 | 1 | 0 |
| 1990 | 1 | 618 | 1606 | 2775 | 2390 | 5124 | 624 | 59 | 7 | 2 |
| 1991 | 1 | 2661 | 2534 | 3183 | 3528 | 2360 | 4468 | 391 | 19 | 1 |
| 1992 | 1 | 4187 | 8627 | 2745 | 1094 | 1017 | 573 | 907 | 57 | 9 |
| 1993 | 1 | 3057 | 6243 | 5691 | 2217 | 724 | 461 | 306 | 528 | 50 |

**Table 3.9** North-East Arctic COD. Input data to the RCT3 analysis.

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NORTHEAST ARCTIC COD : recruits as 3 year-olds (inc. data for ages 0,1,2 & 3)
16,37,2              (No. of surveys, No. of years, VPA Column No.)
1957,   790,   -11,   -11,   -11,   -11, 12,  16, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1958,   919,   -11,   -11,   -11,   -11, 16,  24, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1959,   730,   -11,   -11,   -11,   -11, 18,  14, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1960,   473,   -11,   -11,   -11,   -11,  9,  19, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1961,   339,   -11,   -11,   -11,   -11,  2,   2, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1962,   778,   -11,   -11,   -11,   -11,  7,   4, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1963,  1582,   -11,   -11,   -11,   -11, 21, 120, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1964,  1293,   -11,   -11,   -11,   -11, 49,  45, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1965,   170,   -11,   -11,   -11,   -11,  1,   1, -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1966,   112,   -11,   -11,   -11,   -11,  2,   1, 002,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1967,   197,   -11,   -11,   -11,   -11,  1,   1, 004,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1968,   405,   -11,   -11,   -11,   -11,  7,   1, 002,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1969,  1016,   -11,   -11,   -11,   -11, 11,   6, 025,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1970,  1819,    23,    64,    60,    42, 70,  85, 251,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1971,   525,     7,     9,     6,     3, 37,  24, 077,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1972,   622,     5,     4,    34,    15, 54,  17, 052,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1973,   614,    16,     5,    15,     2, 70,   5, 148,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1974,   348,     1,     1,     4,     1,  6,   1, 029,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1975,   639,    60,     1,    44,     1, 93,   4, 090,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1976,   199,     1,     1,     1,     1,  4,   1, 013,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1977,   140,     1,     1,     2,     1,  2,   1, 049,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11,   -11
1978,   158,     1,     2,     1,     1,  1,   3, 022,   -11,   -11,  17.2,   -11,   -11,   -11,   -11,   -11,    34
1979,   158,     1,     1,     1,     1,  1,   8, 040,   -11,  31.9,  30.6,   -11,   -11,   -11,   -11,    61,    40
1980,   169,     1,     1,     1,     1,  1,   8, 013,   3.5,   2.7,  23.2,   -11,   -11,  10.7,     4,     4,    11
1981,   384,     1,     1,     1,     1,  4,   4, 010,   0.6,  17.7, 122.0,   -11,  26.8,   7.3,     2,    14,    42
1982,   509,     1,     8,     8,    13,  8,  10, 059, 259.0, 366.0, 162.0, 145.0, 113.0,  99.1,   -11,   175,   209
1983,   972,     4,     9,    11,     7, 45,  41, 169,2170.0, 647.0, 679.0, 499.0, 452.0, 297.0,  1735,   696,   602
1984,   289,     1,     1,     2,     8,  7,  15, 155,  39.0, 403.0, 233.0, 239.0, 181.0, 141.0,    84,   503,    81
1985,   234,     3,    10,     2,     3,  4,   6, 246, 562.0, 387.0, 180.0,  40.9, 108.0,  33.2,   958,    53,    54
1986,   166,     1,     2,     1,     1,  2,   5, 137,  25.3,  63.5,  37.9,  41.5,  16.6,  15.4,     2,    22,    18
1987,   177,     1,     1,     1,     1,  1,   1, 017,   3.8,  12.7,  25.8,   3.1,   2.7,   8.6,     1,     7,    16
1988,   398,     1,     1,     1,     1,  7,   1, 033,   7.1,  48.9,  37.0,   3.6,   9.4,  25.3,     5,    40,    62
1989,   726,     1,     1,     4,     1,  7,  10, 038, 122.0, 213.0, 170.4,  70.1, 101.0, 105.0,   235,   227,   202
1990,   807,     6,     1,     4,     4, 26,  72, 123, 356.7, 482.2, 313.8, 116.0, 130.0, 148.6,   140,   506,   302
1991,   695,     3,     6,     3,    15,  8,  24, 230,  99.7, 304.8, 293.4,  91.8, 120.9,   -11,   237,   354,   349
1992,   616,    10,    60,     1,     6,-11, -11, 294, 423.0, 410.0,   -11, 122.3,   -11,   -11,   927,   565,   -11
1993,   -11,     2,     5,   -11,   -11,-11, -11, 209, 632.4,   -11,   -11,   -11,   -11,   -11,   787,   -11,   -11
R-1-1    Russian Bottom trawl survey, area I,   age 1
R-2B-1   Russian   "      "     "      "   IIb, age 1
R-1-2    Russian   "      "     "      "   I,   age 2
R-2B-2   Russian   "      "     "      "   IIb, age 2
R-1-3    Russian   "      "     "      "   I,   age 3
R-2B-3   Russian   "      "     "      "   IIb, age 3
INTOGP     International 0-group survey
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 3.10** North-East Arctic COD. Results from RCT3 analysis.

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

Data for 16 surveys over 37 years : 1957 - 1993

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 = 1993

| | 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-1-1 | 1.85 | 3.88 | 1.03 | .312 | 23 | 1.10 | 5.91 | 1.169 | .130 |
| R-2B-1 | 1.82 | 3.34 | 1.95 | .112 | 23 | 1.79 | 6.61 | 2.230 | .036 |
| R-1-2 | | | | | | | | | |
| R-2B-2 | | | | | | | | | |
| R-1-3 | | | | | | | | | |
| R-2B-3 | | | | | | | | | |
| INTOGP | 1.58 | -.89 | 1.68 | .144 | 27 | 5.35 | 7.56 | 1.986 | .045 |
| N-BST1 | .48 | 3.96 | .85 | .381 | 13 | 6.45 | 7.09 | 1.025 | .170 |
| N-BST2 | | | | | | | | | |
| N-BST3 | | | | | | | | | |
| N-SVT1 | | | | | | | | | |
| N-SVT2 | | | | | | | | | |
| N-SVT3 | | | | | | | | | |
| N-BSA1 | .38 | 4.44 | .76 | .453 | 12 | 6.67 | 6.98 | .924 | .209 |
| N-BSA2 | | | | | | | | | |
| N-BSA3 | | | | | | | | | |
| | | | | | VPA Mean = | | 5.95 | .659 | .410 |

| Year Class | Weighted Average Prediction | Log WAP | Int Std Error | Ext Std Error | Var Ratio | VPA | Log VPA |
|---|---|---|---|---|---|---|---|
| 1993 | 632 | 6.45 | .42 | .25 | .36 | | |

**Table 3.11** North-East Arctic COD. Tuning diagnostics from XSA.

```
Extended Survivors Analysis

Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN12)

CPUE data from file /users/ifad/ifapwork/wg_108/cod_arct/FLEET.012

Catch data for  48 years. 1946 to 1993. Ages  1 to  12.

     Fleet,           First, Last, First, Last, Alpha,  Beta
                    ,  year, year,  age ,  age
FLT41: Norway Barent,  1980, 1993,   1,     8,   .990,  1.000
FLT42: Norway Barent,  1980, 1993,   1,     8,   .990,  1.000
FLT43: Russian Trawl,  1982, 1993,   1,     8,   .900,  1.000
FLT44: Russian acous,  1985, 1993,   1,     8,   .900,  1.000
FLT45: Norwegian Sva,  1983, 1993,   1,     8,   .750,   .850
FLT49: Norway Total ,  1989, 1993,   3,    11,   .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  160 iterations


Total absolute residual between iterations



59 and 160 =     .00771

Final year F values
Age            ,      1,      2,      3,      4,      5,      6,      7,      8,      9,     10
Iteration **,  .0002,  .0009,  .0159,  .1012,  .3758,  .7492,  .5123,  .3284,  .3005,  .3265
Iteration **,  .0002,  .0009,  .0160,  .1017,  .3772,  .7486,  .5112,  .3272,  .2994,  .3279


Age            ,     11
Iteration **,  .2629
Iteration **,  .2629
```

**continued...**

**Table 3.11 (continued)**

Log catchability residuals.

Fleet : FLT41: Norway Barent

| Age | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|
| 1 | .06 | -1.50 | -1.18 | .37 |
| 2 | -.48 | -.05 | -.32 | .09 |
| 3 | .01 | .03 | .27 | -.06 |
| 4 | .34 | .14 | .47 | -.05 |
| 5 | .12 | .10 | .33 | .05 |
| 6 | -.17 | .30 | -.05 | -.11 |
| 7 | -.19 | .32 | .26 | -.73 |
| 8 | -.08 | -.05 | 1.00 | -.74 |
| 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 | | | |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .07 | 1.00 | 1.19 | .43 | -.61 | -.60 | -.31 | .09 | -.05 | .26 |
| 2 | -.69 | .45 | .87 | .88 | .06 | -.29 | -.83 | -.29 | .06 | .16 |
| 3 | .11 | .08 | .06 | .24 | .20 | .05 | -.33 | -.45 | -.19 | .18 |
| 4 | -.38 | .36 | -.39 | .26 | -.24 | -.01 | -.34 | -.36 | .20 | .39 |
| 5 | -.48 | .71 | -.67 | -.38 | .19 | -.13 | -.23 | -.20 | .12 | .66 |
| 6 | -.27 | .55 | -.76 | -.30 | .05 | -.08 | -.17 | -.21 | .24 | .89 |
| 7 | -.83 | .16 | -.28 | .41 | .07 | -.48 | .07 | .14 | .44 | .38 |
| 8 | -.78 | .40 | -.16 | -.39 | .68 | .72 | -.55 | -.42 | .45 | -.11 |
| 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 | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|
| Mean Log q | -5.7405 | -5.9283 | -6.3155 | -6.9645 | -7.2937 |
| S.E(Log q) | .3241 | .4136 | .4247 | .4182 | .5661 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .61 | 1.111 | 8.83 | .46 | 14 | .74 | -5.92 |
| 2 | .74 | .989 | 7.73 | .61 | 14 | .56 | -5.91 |
| 3 | .74 | 2.405 | 7.55 | .90 | 14 | .24 | -5.71 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .83 | 1.390 | 6.89 | .87 | 14 | .26 | -5.74 |
| 5 | 1.00 | -.016 | 5.91 | .66 | 14 | .44 | -5.93 |
| 6 | 1.07 | -.260 | 5.96 | .60 | 14 | .48 | -6.32 |
| 7 | .90 | .559 | 7.35 | .76 | 14 | .39 | -6.96 |
| 8 | 1.25 | -1.113 | 6.67 | .68 | 14 | .70 | -7.29 |

**continued...**

Table 3.11 (continued)

Fleet : FLT42: Norway Barent

| Age | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|
| 1 | .67 | -.67 | -.91 | .01 |
| 2 | .35 | .43 | -.35 | -.42 |
| 3 | .70 | .33 | -.08 | -.43 |
| 4 | 1.24 | .56 | .18 | -.64 |
| 5 | 1.05 | .59 | .36 | -.34 |
| 6 | .79 | .67 | .15 | -.40 |
| 7 | .76 | .49 | .41 | -1.71 |
| 8 | .96 | .18 | .93 | -1.90 |
| 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 | | | |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .01 | 1.07 | .22 | .15 | -.46 | -.44 | -.22 | .05 | .03 | .38 |
| 2 | .20 | .15 | .23 | .22 | -.06 | -.19 | -.24 | -.17 | -.05 | .18 |
| 3 | .45 | .12 | -.19 | -.34 | -.11 | -.06 | .17 | -.35 | -.07 | .36 |
| 4 | .17 | .19 | -.40 | -.68 | -.59 | -.19 | .26 | -.28 | .47 | .57 |
| 5 | .16 | -.43 | -.56 | -1.12 | -.16 | .07 | .39 | -.12 | .19 | .72 |
| 6 | .37 | -.70 | -.61 | -1.13 | -.29 | .39 | .26 | -.16 | .26 | .96 |
| 7 | -.02 | -.70 | .17 | -1.55 | .28 | .36 | .64 | .22 | .32 | .46 |
| 8 | .26 | -.35 | 1.16 | -.45 | -.08 | .99 | -.25 | -.64 | .02 | -.24 |
| 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 | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|
| Mean Log q | -5.9054 | -6.1293 | -6.3593 | -7.0829 | -7.2310 |
| S.E(Log q) | .5104 | .5458 | .6126 | .7604 | .7795 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .47 | 2.142 | 9.94 | .64 | 14 | .51 | -6.17 |
| 2 | .56 | 3.666 | 9.14 | .88 | 14 | .26 | -6.11 |
| 3 | .72 | 1.880 | 7.79 | .83 | 14 | .32 | -5.90 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | 1.12 | -.413 | 5.13 | .56 | 14 | .60 | -5.91 |
| 5 | 1.15 | -.444 | 5.23 | .47 | 14 | .66 | -6.13 |
| 6 | .83 | .559 | 7.20 | .55 | 14 | .53 | -6.36 |
| 7 | .60 | 2.087 | 8.53 | .75 | 14 | .40 | -7.08 |
| 8 | 1.50 | -1.395 | 5.95 | .45 | 14 | 1.12 | -7.23 |

continued...

**Table 3.11 (continued)**

Fleet : FLT43: Russian Trawl

| Age | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|
| 1 | 99.99 | 99.99 | -.45 | .72 |
| 2 | 99.99 | 99.99 | 1.41 | -.41 |
| 3 | 99.99 | 99.99 | .83 | .14 |
| 4 | 99.99 | 99.99 | -.21 | .18 |
| 5 | 99.99 | 99.99 | -1.28 | -.01 |
| 6 | 99.99 | 99.99 | -.39 | -.35 |
| 7 | 99.99 | 99.99 | -1.69 | -.68 |
| 8 | 99.99 | 99.99 | -1.00 | -.06 |
| 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 | | | |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .09 | .97 | .75 | -.19 | -.26 | -1.44 | -.20 | .04 | .34 | -.09 |
| 2 | .14 | .26 | .40 | .04 | .06 | -1.00 | -.03 | -.47 | .39 | -.22 |
| 3 | .01 | .16 | -.09 | -.36 | .02 | -.17 | -.17 | -.28 | .11 | .18 |
| 4 | .17 | .91 | -.25 | .05 | -.48 | -.13 | -.56 | -.28 | .07 | .64 |
| 5 | .07 | 1.28 | .02 | -.88 | -.44 | .05 | -.35 | .03 | .10 | 1.03 |
| 6 | .17 | .65 | .25 | -.25 | -1.00 | -.27 | -.36 | .05 | .20 | 1.14 |
| 7 | .22 | .78 | -.06 | -.13 | -.69 | 1.20 | -.25 | .00 | .14 | .39 |
| 8 | -.02 | .88 | .31 | -1.00 | -.63 | 1.76 | -.19 | -.73 | .19 | .17 |
| 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 | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|
| Mean Log q | -7.2322 | -7.0171 | -6.8515 | -6.7765 | -6.7344 |
| S.E(Log q) | .4402 | .6797 | .5736 | .6942 | .8112 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .53 | 1.285 | 11.76 | .47 | 12 | .68 | -10.36 |
| 2 | .69 | 1.061 | 9.93 | .58 | 12 | .58 | -8.52 |
| 3 | .66 | 2.390 | 9.41 | .85 | 12 | .29 | -7.64 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .77 | 1.405 | 8.43 | .81 | 12 | .32 | -7.23 |
| 5 | 1.24 | -.498 | 5.83 | .34 | 12 | .88 | -7.02 |
| 6 | 2.12 | -1.746 | 1.74 | .22 | 12 | 1.10 | -6.85 |
| 7 | 1.19 | -.473 | 6.00 | .41 | 12 | .87 | -6.78 |
| 8 | 1.18 | -.554 | 6.20 | .54 | 12 | .99 | -6.73 |

**continued...**

Table 3.11 (continued)

Fleet : FLT44: Russian acous

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 99.99 | 2.28 | 1.83 | .95 | -2.40 | -2.54 | -.15 | .42 | .88 | -.74 |
| 2 | 99.99 | .91 | .75 | 1.10 | .43 | -1.40 | -.24 | -.63 | .37 | -.97 |
| 3 | 99.99 | .41 | .27 | .41 | .59 | -.44 | -.19 | -.31 | -.12 | -.47 |
| 4 | 99.99 | .61 | .92 | .75 | -.02 | -.67 | -.63 | -.32 | -.28 | -.10 |
| 5 | 99.99 | .60 | .70 | -.14 | -.05 | -.49 | -.45 | -.08 | -.19 | .26 |
| 6 | 99.99 | .57 | .90 | .55 | -.66 | -.69 | -.60 | -.15 | -.13 | .42 |
| 7 | 99.99 | 1.26 | 1.50 | 1.33 | -.66 | .38 | -.98 | -.70 | -.66 | -.99 |
| 8 | 99.99 | 1.55 | 1.58 | 1.42 | -.52 | .92 | -1.02 | -1.38 | -.71 | -1.27 |
| 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 | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|
| Mean Log q | -5.0833 | -4.8516 | -4.5783 | -3.9872 | -3.8519 |
| S.E(Log q) | .5867 | .4152 | .5998 | 1.0527 | 1.2688 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .97 | .031 | 8.35 | .12 | 9 | 1.81 | -8.19 |
| 2 | .74 | .513 | 8.03 | .37 | 9 | .95 | -6.24 |
| 3 | .61 | 1.628 | 8.32 | .73 | 9 | .44 | -5.42 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .60 | 2.489 | 8.10 | .85 | 9 | .27 | -5.08 |
| 5 | .97 | .089 | 5.03 | .66 | 9 | .43 | -4.85 |
| 6 | 5.06 | -2.932 | -23.56 | .07 | 9 | 2.14 | -4.58 |
| 7 | -15.71 | -2.695 | 117.48 | .00 | 9 | 12.22 | -3.99 |
| 8 | 9.59 | -3.290 | -47.25 | .02 | 9 | 8.02 | -3.85 |

continued...

**Table 3.11 (continued)**

```
Fleet : FLT45: Norwegian Sva

 Age  ,  1980,  1981,  1982,  1983
    1 , 99.99, 99.99, 99.99,   .52
    2 , 99.99, 99.99, 99.99,  -.37
    3 , 99.99, 99.99, 99.99,  -.12
    4 , 99.99, 99.99, 99.99,  -.15
    5 , 99.99, 99.99, 99.99, -1.16
    6 , 99.99, 99.99, 99.99,  -.67
    7 , 99.99, 99.99, 99.99,  -.49
    8 , 99.99, 99.99, 99.99,  -.06
    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


 Age  ,  1984,  1985,  1986,  1987,  1988,  1989,  1990,  1991,  1992,  1993
    1 ,   .73,  1.43,   .42,   .77, -1.10, -1.80,  -.34,  -.09,  -.11,   .21
    2 ,   .24,   .44,  1.10,   .99,   .18, -1.00, -1.04,  -.18,  -.13,  -.03
    3 , -1.19,   .23,   .28,  1.01,   .29,   .14,  -.31,  -.42,  -.09,   .02
    4 , -1.10,  -.02,   .15,   .54,   .35,  -.34,   .08,  -.53,   .61,   .16
    5 ,  -.47,   .47,  -.12,  -.24,  -.26,  -.34,   .47,   .29,   .48,   .42
    6 ,  -.66,   .46,  -.22,  -.04,   .04,  -.31,   .42,   .55,   .26,  -.16
    7 ,  -.87,   .07,   .09,  -.40,  -.77,  -.08,   .36,   .91,   .25,   .50
    8 ,  -.21,   .30,   .12, -1.16,   .98,  -.24,  -.13,   .64,  -.07,  -.21
    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


Mean log catchability and standard error of ages with catchability
independent of year class strength and constant w.r.t. time

   Age ,        4,        5,        6,        7,        8
Mean Log q,  -9.0039,  -8.9163,  -8.9823,  -9.1874,  -9.0559,
S.E(Log q),    .4883,    .4951,    .4110,    .5536,    .5585,


Regression statistics :

Ages with q dependent on year class strength

Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e, Mean Log q

 1,     .70,     .594,     10.50,     .32,     11,     .97,   -9.23,
 2,     .61,     .985,     10.59,     .45,     11,     .74,   -8.98,
 3,     .64,    1.235,     10.29,     .60,     11,     .56,   -8.89,

Ages with q independent of year class strength and constant w.r.t. time.

Age, Slope , t-value , Intercept, RSquare, No Pts, Reg s.e,  Mean Q

 4,     .66,    2.428,     10.16,     .87,     11,     .26,   -9.00,
 5,    1.06,    -.179,      8.74,     .56,     11,     .55,   -8.92,
 6,     .94,     .257,      9.13,     .69,     11,     .41,   -8.98,
 7,     .69,    1.860,      9.66,     .82,     11,     .34,   -9.19,
 8,     .93,     .389,      9.11,     .80,     11,     .55,   -9.06,
```

**continued...**

Table 3.11 (continued)

Fleet : FLT49: Norway Total

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No data for this fleet at this age | | | | | | | | | |
| 2 | No data for this fleet at this age | | | | | | | | | |
| 3 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.17 | .02 | .33 | .09 | -.27 |
| 4 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.49 | -.18 | .21 | .69 | -.24 |
| 5 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.59 | -.18 | .30 | .19 | .26 |
| 6 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.16 | -.31 | .24 | -.42 | .64 |
| 7 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .30 | .04 | .21 | -.43 | -.11 |
| 8 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .40 | .05 | .54 | -.47 | -.51 |
| 9 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .62 | -.04 | .24 | -.39 | -.42 |
| 10 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -1.26 | 1.15 | .08 | -.40 | .40 |
| 11 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .09 | -.11 | -.11 | .12 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|
| Mean Log q | -4.0305 | -3.4752 | -3.2588 | -3.2939 | -3.4744 | -3.6407 | -4.4546 | -4.6433 |
| S.E(Log q) | .4619 | .3776 | .4413 | .2877 | .4819 | .4391 | .8990 | .1234 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 3 | .76 | 1.303 | 7.07 | .91 | 5 | .27 | -5.29 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .93 | .174 | 4.61 | .67 | 5 | .49 | -4.03 |
| 5 | 1.36 | -.405 | .44 | .30 | 5 | .58 | -3.48 |
| 6 | 1.27 | -.545 | .98 | .58 | 5 | .62 | -3.26 |
| 7 | .93 | .277 | 3.88 | .82 | 5 | .30 | -3.29 |
| 8 | 1.00 | -.010 | 3.45 | .78 | 5 | .56 | -3.47 |
| 9 | 1.28 | -2.250 | 2.04 | .96 | 5 | .40 | -3.64 |
| 10 | 1.00 | .015 | 4.47 | .83 | 5 | 1.04 | -4.45 |
| 11 | .97 | .643 | 4.70 | 1.00 | 4 | .13 | -4.64 |

continued...

**Table 3.11 (continued)**

Terminal year survivor and F summaries :

Age 1 Catchability dependent on age and year class strength

Year class = 1992

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 976245., | .785, | .000, | .00, | 1, .155, | .000 |
| FLT42: Norway Barent, | 1098310., | .557, | .000, | .00, | 1, .309, | .000 |
| FLT43: Russian Trawl, | 692075., | .719, | .000, | .00, | 1, .185, | .000 |
| FLT44: Russian acous, | 358981., | 1.915, | .000, | .00, | 1, .026, | .000 |
| FLT45: Norwegian Sva, | 934607., | 1.030, | .000, | .00, | 1, .090, | .000 |
| FLT49: Norway Total , | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| P shrinkage mean , | 440211., | .67,,,, | | | .211, | .000 |
| F shrinkage mean , | 223358., | 2.00,,,, | | | .024, | .001 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 752135., | .31, | .18, | 7, | .598, | .000 |

Age 2 Catchability dependent on age and year class strength

Year class = 1991

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 758870., | .477, | .100, | .21, | 2, .149, | .001 |
| FLT42: Norway Barent, | 805976., | .263, | .062, | .23, | 2, .488, | .001 |
| FLT43: Russian Trawl, | 699681., | .473, | .276, | .58, | 2, .151, | .001 |
| FLT44: Russian acous, | 389186., | .903, | .749, | .83, | 2, .041, | .002 |
| FLT45: Norwegian Sva, | 658794., | .624, | .039, | .06, | 2, .087, | .001 |
| FLT49: Norway Total , | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| P shrinkage mean , | 333621., | .67,,,, | | | .076, | .002 |
| F shrinkage mean , | 504521., | 2.00,,,, | | | .008, | .001 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 694594., | .18, | .10, | 12, | .544, | .001 |

Age 3 Catchability dependent on age and year class strength

Year class = 1990

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 756652., | .255, | .034, | .13, | 3, .208, | .014 |
| FLT42: Norway Barent, | 720261., | .216, | .130, | .60, | 3, .289, | .014 |
| FLT43: Russian Trawl, | 795895., | .277, | .072, | .26, | 3, .175, | .013 |
| FLT44: Russian acous, | 482675., | .415, | .240, | .58, | 3, .078, | .022 |
| FLT45: Norwegian Sva, | 621570., | .439, | .049, | .11, | 3, .070, | .017 |
| FLT49: Norway Total , | 499751., | .308, | .000, | .00, | 1, .142, | .021 |
| P shrinkage mean , | 242938., | .63,,,, | | | .034, | .042 |
| F shrinkage mean , | 425864., | 2.00,,,, | | | .003, | .024 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 648531., | .12, | .07, | 18, | .622, | .016 |

continued...

**Table 3.11 (continued)**

Age 4 Catchability constant w.r.t. time and dependent on age

Year class = 1989

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 427525., | .202, | .171, | .85, | 4, .244, | .102 |
| FLT42: Norway Barent, | 408672., | .195, | .147, | .75, | 4, .260, | .106 |
| FLT43: Russian Trawl, | 487626., | .232, | .210, | .90, | 4, .185, | .090 |
| FLT44: Russian acous, | 358531., | .347, | .097, | .28, | 4, .083, | .120 |
| FLT45: Norwegian Sva, | 416185., | .331, | .102, | .31, | 4, .091, | .104 |
| FLT49: Norway Total , | 423315., | .272, | .150, | .55, | 2, .134, | .103 |
| F shrinkage mean , | 425908., | 2.00,,,, | | | .003, | .102 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 425071., | .10, | .06, | 23, | .594, | .102 |

Age 5 Catchability constant w.r.t. time and dependent on age

Year class = 1988

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 120572., | .184, | .249, | 1.35, | 5, .231, | .401 |
| FLT42: Norway Barent, | 117820., | .183, | .197, | 1.07, | 5, .230, | .408 |
| FLT43: Russian Trawl, | 115914., | .217, | .264, | 1.22, | 5, .164, | .414 |
| FLT44: Russian acous, | 118217., | .272, | .203, | .75, | 5, .109, | .407 |
| FLT45: Norwegian Sva, | 131069., | .283, | .354, | 1.25, | 5, .100, | .374 |
| FLT49: Norway Total , | 188524., | .221, | .108, | .49, | 3, .163, | .274 |
| F shrinkage mean , | 223823., | 2.00,,,, | | | .003, | .235 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 129230., | .09, | .09, | 29, | 1.045, | .377 |

Age 6 Catchability constant w.r.t. time and dependent on age

Year class = 1987

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 25481., | .173, | .220, | 1.27, | 6, .236, | .765 |
| FLT42: Norway Barent, | 27312., | .180, | .173, | .96, | 6, .208, | .729 |
| FLT43: Russian Trawl, | 25906., | .215, | .257, | 1.20, | 6, .150, | .756 |
| FLT44: Russian acous, | 22605., | .260, | .197, | .76, | 6, .106, | .831 |
| FLT45: Norwegian Sva, | 21427., | .244, | .190, | .78, | 6, .128, | .862 |
| FLT49: Norway Total , | 33317., | .208, | .139, | .67, | 4, .167, | .631 |
| F shrinkage mean , | 81240., | 2.00,,,, | | | .005, | .308 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 26322., | .08, | .08, | 35, | .941, | .749 |

Age 7 Catchability constant w.r.t. time and dependent on age

Year class = 1986

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 20601., | .164, | .109, | .66, | 7, .237, | .490 |
| FLT42: Norway Barent, | 20754., | .179, | .074, | .41, | 7, .178, | .488 |
| FLT43: Russian Trawl, | 18038., | .208, | .120, | .57, | 7, .138, | .544 |
| FLT44: Russian acous, | 14755., | .257, | .148, | .58, | 7, .090, | .633 |
| FLT45: Norwegian Sva, | 26103., | .225, | .068, | .30, | 7, .130, | .405 |
| FLT49: Norway Total , | 17526., | .183, | .097, | .53, | 5, .222, | .556 |
| F shrinkage mean , | 32110., | 2.00,,,, | | | .004, | .341 |

continued...

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 19590., | .08, | .05, | 41, | .564, | .511 |

## Table 3.11

Age 8 Catchability constant w.r.t. time and dependent on age

Year class = 1985

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 25881., | .161, | .131, | .81, | 8, .241, | .294 |
| FLT42: Norway Barent, | 24205., | .178, | .083, | .47, | 8, .179, | .311 |
| FLT43: Russian Trawl, | 23841., | .201, | .082, | .41, | 8, .145, | .315 |
| FLT44: Russian acous, | 19361., | .247, | .238, | .96, | 8, .094, | .376 |
| FLT45: Norwegian Sva, | 28486., | .214, | .141, | .66, | 8, .148, | .270 |
| FLT49: Norway Total , | 16628., | .197, | .123, | .63, | 5, .189, | .426 |
| F shrinkage mean , | 23562., | 2.00,,,, | | | .004, | .319 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 22930., | .08, | .06, | 46, | .718, | .327 |

Age 9 Catchability constant w.r.t. time and dependent on age

Year class = 1984

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 18505., | .163, | .123, | .76, | 8, .230, | .270 |
| FLT42: Norway Barent, | 17449., | .182, | .153, | .84, | 8, .167, | .284 |
| FLT43: Russian Trawl, | 14504., | .205, | .142, | .69, | 8, .136, | .333 |
| FLT44: Russian acous, | 13491., | .250, | .198, | .79, | 8, .089, | .354 |
| FLT45: Norwegian Sva, | 24159., | .217, | .183, | .84, | 8, .142, | .213 |
| FLT49: Norway Total , | 13029., | .202, | .157, | .77, | 5, .231, | .365 |
| F shrinkage mean , | 16462., | 2.00,,,, | | | .005, | .299 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 16495., | .08, | .07, | 46, | .795, | .299 |

Age 10 Catchability constant w.r.t. time and dependent on age

Year class = 1983

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 28786., | .174, | .084, | .48, | 8, .230, | .320 |
| FLT42: Norway Barent, | 26767., | .197, | .151, | .77, | 8, .153, | .341 |
| FLT43: Russian Trawl, | 22886., | .225, | .100, | .45, | 8, .127, | .388 |
| FLT44: Russian acous, | 22992., | .274, | .263, | .96, | 7, .081, | .387 |
| FLT45: Norwegian Sva, | 34507., | .230, | .150, | .65, | 8, .146, | .274 |
| FLT49: Norway Total , | 28463., | .218, | .162, | .74, | 5, .255, | .323 |
| F shrinkage mean , | 38414., | 2.00,,,, | | | .007, | .249 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 27862., | .09, | .06, | 45, | .629, | .328 |

Age 11 Catchability constant w.r.t. time and dependent on age

Year class = 1982

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT41: Norway Barent, | 3074., | .209, | .099, | .47, | 8, .143, | .351 |
| FLT42: Norway Barent, | 3886., | .245, | .146, | .60, | 8, .087, | .287 |
| FLT43: Russian Trawl, | 4381., | .272, | .259, | .95, | 8, .076, | .259 |
| FLT44: Russian acous, | 3804., | .327, | .273, | .83, | 6, .045, | .293 |
| FLT45: Norwegian Sva, | 4112., | .271, | .052, | .19, | 8, .100, | .273 |
| FLT49: Norway Total , | 4904., | .207, | .067, | .33, | 5, .539, | .234 |
| F shrinkage mean , | 2300., | 2.00,,,, | | | .010, | .446 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 4298., | .12, | .05, | 44, | .420, | .263 |

**Table 3.12** North-East Arctic COD. Fishing mortalities from XSA.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN12)

At 28-Aug-94 13:13:11

Terminal Fs derived using XSA (With F shrinkage)

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 1, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 2, | .0008, | .0014, | .0006, | .0008, | .0000, | .0012, | .0013, | .0019, | .0023, | .0141, |
| 3, | .0171, | .0224, | .0392, | .0295, | .0250, | .0231, | .0402, | .0211, | .0389, | .1948, |
| 4, | .1435, | .1090, | .1028, | .1506, | .2047, | .2291, | .1432, | .1009, | .1656, | .1977, |
| 5, | .3520, | .3878, | .2077, | .1798, | .4039, | .4763, | .4015, | .2308, | .2920, | .3502, |
| 6, | .4750, | .4470, | .3774, | .1977, | .4651, | .5296, | .5633, | .2520, | .3916, | .3820, |
| 7, | .5711, | .3895, | .4675, | .4248, | .3904, | .7683, | .6046, | .5066, | .3437, | .4323, |
| 8, | .6799, | .5178, | .5499, | .6780, | .5162, | .8904, | .8392, | .7921, | .6425, | .7485, |
| 9, | 1.0866, | .6222, | .6901, | .7941, | .7907, | 1.1315, | .8689, | .9373, | 1.0026, | .9253, |
| 10, | .7351, | .8393, | .5826, | .8138, | .6506, | 1.0390, | .9652, | .6175, | 1.2629, | .5532, |
| 11, | .7163, | .5679, | .5378, | .5867, | .5673, | .8811, | .7759, | .6266, | .7358, | .6136, |
| +gp, | .7163, | .5679, | .5378, | .5867, | .5673, | .8811, | .7759, | .6266, | .7358, | .6136, |
| FBAR 5-10, | .6499, | .5339, | .4792, | .5147, | .5361, | .8059, | .7071, | .5560, | .6559, | .5653, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 1, | .0001, | .0000, | .0008, | .0000, | .0000, | .0000, | .0001, | .0000, | .0000, | .0000, |
| 2, | .0303, | .0017, | .0049, | .0157, | .0036, | .0014, | .0023, | .0012, | .0005, | .0002, |
| 3, | .2129, | .0830, | .1648, | .1332, | .1451, | .0485, | .0309, | .0239, | .0637, | .0204, |
| 4, | .4951, | .2091, | .3105, | .5663, | .2226, | .2077, | .1284, | .0973, | .2000, | .1936, |
| 5, | .5342, | .5200, | .4780, | .7554, | .6700, | .3466, | .3543, | .2278, | .2945, | .3071, |
| 6, | .5020, | .6967, | .5702, | .6838, | .8545, | .5459, | .6239, | .5138, | .5479, | .4808, |
| 7, | .4292, | .6936, | .6866, | .6749, | .8566, | .6695, | .6743, | .8565, | .7975, | .7757, |
| 8, | .5079, | .6632, | .8630, | .8858, | .9314, | .7744, | .7242, | 1.0821, | 1.0152, | 1.0292, |
| 9, | .5313, | .6618, | .6888, | 1.1343, | 1.2095, | 1.0436, | .9303, | 1.3644, | 1.1726, | 1.0544, |
| 10, | .7877, | .7505, | .5275, | .6062, | .8177, | .7874, | 1.0622, | 1.2065, | .8926, | .9454, |
| 11, | .5562, | .6997, | .6734, | .8051, | .9442, | .7718, | .8112, | 1.0162, | .8947, | .8428, |
| +gp, | .5562, | .6997, | .6734, | .8051, | .9442, | .7718, | .8112, | 1.0162, | .8947, | .8428, |
| FBAR 5-10, | .5487, | .6643, | .6357, | .7901, | .8899, | .6946, | .7282, | .8752, | .7867, | .7655, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 1, | .0000, | .0000, | .0000, | .0002, | .0000, | .0000, | .0000, | .0000, | .0012, | .0002, | .0004, |
| 2, | .0016, | .0016, | .0002, | .0008, | .0007, | .0007, | .0004, | .0012, | .0012, | .0009, | .0011, |
| 3, | .0202, | .0424, | .0193, | .0214, | .0189, | .0259, | .0096, | .0131, | .0355, | .0160, | .0216, |
| 4, | .1217, | .1460, | .1662, | .1523, | .1061, | .1231, | .0437, | .0648, | .1385, | .1017, | .1017, |
| 5, | .2888, | .3621, | .4750, | .4859, | .3407, | .1999, | .0895, | .1733, | .2953, | .3772, | .2820, |
| 6, | .5735, | .5827, | .7848, | .9510, | .6281, | .3398, | .1609, | .2173, | .3949, | .7486, | .4536, |
| 7, | 1.0741, | .9987, | 1.0034, | 1.1281, | 1.0864, | .5489, | .2031, | .3200, | .3576, | .5112, | .3963, |
| 8, | 1.2164, | 1.1077, | 1.2278, | .9773, | 1.1259, | .8130, | .2921, | .2682, | .3653, | .3272, | .3202, |
| 9, | 1.2936, | 1.0811, | .9443, | 1.0676, | .9575, | 1.1495, | .2975, | .2922, | .3024, | .2994, | .2980, |
| 10, | 1.1577, | .8369, | 1.1992, | 1.4758, | 1.3115, | .7434, | .6316, | .2313, | .2641, | .3279, | .2745, |
| 11, | 1.0720, | .8410, | 1.1554, | 1.2341, | 1.0073, | .6465, | .1888, | .2372, | .1569, | .2629, | .2190, |
| +gp, | 1.0720, | .8410, | 1.1554, | 1.2341, | 1.0073, | .6465, | .1888, | .2372, | .1569, | .2629, | |
| FBAR 5-10, | .9340, | .8282, | .9391, | 1.0143, | .9084, | .6324, | .2791, | .2504, | .3300, | .4319, | |

**Table 3.13** North-East Arctic COD. Population numbers from XSA.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN12)

At 28-Aug-94 13:13:11

Terminal Fs derived using XSA (With F shrinkage)

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 1, | 2401389, | 1957659, | 247742, | 166727, | 300446, | 612882, | 1537408, | 2747153, | 800800, | 966191, |
| 2, | 961077, | 1965998, | 1602796, | 202833, | 136504, | 245984, | 501785, | 1258722, | 2249145, | 655639, |
| 3, | 345755, | 786252, | 1607341, | 1311472, | 165929, | 111759, | 201145, | 410292, | 1028556, | 1837189, |
| 4, | 379556, | 278287, | 629500, | 1265366, | 1042555, | 132495, | 89413, | 158202, | 328902, | 809955, |
| 5, | 364834, | 269211, | 204317, | 465042, | 891176, | 695601, | 86268, | 63440, | 117093, | 228175, |
| 6, | 171192, | 210072, | 149564, | 135904, | 318098, | 487172, | 353696, | 47274, | 41235, | 71589, |
| 7, | 49891, | 87159, | 110001, | 83962, | 91308, | 163573, | 234871, | 164869, | 30084, | 22822, |
| 8, | 20525, | 23074, | 48337, | 56429, | 44949, | 50596, | 62111, | 105052, | 81336, | 17466, |
| 9, | 10334, | 8514, | 11257, | 22836, | 23454, | 21963, | 17004, | 21970, | 38955, | 35027, |
| 10, | 7544, | 2854, | 3742, | 4622, | 8451, | 8709, | 5800, | 5839, | 7045, | 11702, |
| 11, | 1692, | 2961, | 1010, | 1711, | 1677, | 3610, | 2523, | 1809, | 2578, | 1631, |
| +gp, | 2034, | 1181, | 1470, | 1465, | 914, | 1122, | 888, | 1487, | 1735, | 929, |
| TOTAL, | 4715824, | 5593224, | 4617076, | 3718369, | 3025458, | 2535465, | 3092913, | 4986107, | 4727464, | 4658314, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 1, | 927732, | 526009, | 977961, | 300833, | 212346, | 238739, | 239243, | 254139, | 579886, | 767475, |
| 2, | 791049, | 759459, | 430659, | 800048, | 246301, | 173852, | 195463, | 195847, | 208070, | 474768, |
| 3, | 529302, | 628341, | 620721, | 350867, | 644811, | 200928, | 142135, | 159667, | 160154, | 170269, |
| 4, | 1237905, | 350242, | 473469, | 430987, | 251439, | 456605, | 156725, | 112831, | 127641, | 123027, |
| 5, | 544155, | 617755, | 232647, | 284184, | 200299, | 164782, | 303726, | 112855, | 83813, | 85563, |
| 6, | 131619, | 261136, | 300697, | 118094, | 109309, | 83917, | 95391, | 174486, | 73575, | 51117, |
| 7, | 40001, | 65227, | 106517, | 139206, | 48799, | 38079, | 39802, | 41851, | 85460, | 34826, |
| 8, | 12127, | 21322, | 26691, | 43892, | 58034, | 16964, | 15962, | 16604, | 14550, | 31517, |
| 9, | 6765, | 5974, | 8994, | 9219, | 14819, | 18722, | 6402, | 6334, | 4607, | 4316, |
| 10, | 11368, | 3256, | 2523, | 3698, | 2428, | 3620, | 5398, | 2068, | 1325, | 1168, |
| 11, | 5510, | 4234, | 1258, | 1219, | 1651, | 877, | 1348, | 1528, | 507, | 444, |
| +gp, | 1584, | 1859, | 1470, | 1061, | 2299, | 496, | 268, | 255, | 546, | 300, |
| TOTAL, | 4239118, | 3244815, | 3183606, | 2483309, | 1792533, | 1397580, | 1201864, | 1078466, | 1340134, | 1744790, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 1, | 1461071, | 433860, | 351829, | 250299, | 267286, | 598426, | 1091101, | 1208309, | 1042990, | 922005, | 0, | 7162 |
| 2, | 628344, | 1196218, | 355213, | 288043, | 204879, | 218835, | 489950, | 893318, | 989259, | 852945, | 752135, | 5786 |
| 3, | 388630, | 513610, | 977843, | 290764, | 235634, | 167624, | 179045, | 400991, | 730492, | 808998, | 694594, | 4732 |
| 4, | 136592, | 311825, | 403061, | 785260, | 233018, | 189313, | 133734, | 145195, | 324018, | 577191, | 648531, | 3758 |
| 5, | 82996, | 99015, | 220625, | 279455, | 552079, | 171565, | 137051, | 104813, | 111421, | 230973, | 425071, | 2683 |
| 6, | 51528, | 50906, | 56441, | 112330, | 140742, | 321513, | 115017, | 102603, | 72161, | 67896, | 129230, | 1595 |
| 7, | 25875, | 23774, | 23272, | 21080, | 35533, | 61485, | 187406, | 80172, | 67596, | 39804, | 26322, | 813 |
| 8, | 13128, | 7236, | 7170, | 6985, | 5586, | 9817, | 29075, | 125239, | 47666, | 38703, | 19590, | 379 |
| 9, | 9219, | 3184, | 1957, | 1720, | 2152, | 1483, | 3565, | 17774, | 78415, | 27083, | 22930, | 165 |
| 10, | 1231, | 2070, | 884, | 623, | 484, | 676, | 385, | 2167, | 10865, | 47445, | 16495, | 69 |
| 11, | 371, | 317, | 734, | 218, | 117, | 107, | 263, | 167, | 1408, | 6831, | 27862, | 30 |
| +gp, | 384, | 369, | 294, | 426, | 227, | 57, | 192, | 78, | 667, | 1924, | 5509, | |
| TOTAL, | 2799370, | 2642385, | 2399324, | 2037205, | 1677737, | 1740902, | 2366783, | 3080826, | 3476958, | 3621797, | 2768266, | |

**Table 3.14** Nort-East Arctic COD. Catch numbers at age.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:04

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 5298, | 15725, | 55937, | 34467, | 3709, | 2307, | 7164, | 7754, | 35536, | 294262, |
| 4, | 45912, | 25999, | 55644, | 160048, | 174585, | 24545, | 10792, | 13739, | 45431, | 131493, |
| 5, | 97950, | 78299, | 34676, | 69235, | 267961, | 238511, | 25813, | 11831, | 26832, | 61000, |
| 6, | 58575, | 68511, | 42539, | 22061, | 107051, | 181239, | 137829, | 9527, | 12089, | 20569, |
| 7, | 19642, | 25444, | 37169, | 26295, | 26701, | 79363, | 96420, | 59290, | 7918, | 7248, |
| 8, | 9162, | 8438, | 18500, | 25139, | 16399, | 26989, | 31920, | 52003, | 34885, | 8328, |
| 9, | 6196, | 3569, | 5077, | 11323, | 11597, | 13463, | 8933, | 12093, | 22315, | 19130, |
| 10, | 3553, | 1467, | 1495, | 2329, | 3657, | 5092, | 3249, | 2434, | 4572, | 4499, |
| 11, | 783, | 1161, | 380, | 687, | 657, | 1913, | 1232, | 762, | 1215, | 677, |
| 12, | 172, | 131, | 403, | 316, | 122, | 414, | 260, | 418, | 353, | 195, |
| 13, | 387, | 67, | 77, | 225, | 124, | 121, | 106, | 149, | 315, | 81, |
| 14, | 264, | 91, | 9, | 40, | 70, | 23, | 39, | 42, | 121, | 59, |
| +gp, | 131, | 179, | 70, | 14, | 46, | 46, | 35, | 25, | 40, | 55, |
| TOTALNUM, | 248025, | 229081, | 251976, | 352179, | 612679, | 574026, | 323792, | 170067, | 191622, | 547596, |
| TONSLAND, | 437695, | 444930, | 483711, | 572605, | 1074084, | 1197226, | 933246, | 689048, | 565254, | 792685, |
| SOPCOF %, | 82, | 90, | 94, | 88, | 96, | 87, | 97, | 112, | 108, | 114, |

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 91855, | 45282, | 85337, | 39594, | 78822, | 8600, | 3911, | 3407, | 8948, | 3108, |
| 4, | 437377, | 59798, | 114341, | 168609, | 45400, | 77484, | 17086, | 9466, | 20933, | 19594, |
| 5, | 203772, | 226646, | 79993, | 136335, | 88495, | 43677, | 81986, | 20803, | 19345, | 20473, |
| 6, | 47006, | 118567, | 118236, | 52925, | 56823, | 31943, | 40061, | 63433, | 28084, | 17656, |
| 7, | 12630, | 29522, | 47872, | 61821, | 25407, | 16815, | 17664, | 21788, | 42496, | 17004, |
| 8, | 4370, | 9353, | 13962, | 23338, | 31821, | 8274, | 7442, | 9933, | 8395, | 18329, |
| 9, | 2523, | 2617, | 4051, | 5659, | 9408, | 10974, | 3508, | 4267, | 2878, | 2545, |
| 10, | 5607, | 1555, | 936, | 1521, | 1227, | 1785, | 3196, | 1311, | 708, | 646, |
| 11, | 2127, | 1928, | 558, | 610, | 913, | 427, | 678, | 882, | 271, | 229, |
| 12, | 322, | 575, | 442, | 271, | 446, | 103, | 79, | 109, | 260, | 74, |
| 13, | 151, | 231, | 139, | 122, | 748, | 59, | 24, | 37, | 27, | 58, |
| 14, | 83, | 15, | 26, | 92, | 48, | 38, | 26, | 3, | 5, | 20, |
| +gp, | 62, | 37, | 53, | 54, | 51, | 45, | 8, | 1, | 5, | 5, |
| TOTALNUM, | 807885, | 496126, | 465946, | 490951, | 339609, | 200224, | 175669, | 135440, | 132355, | 99741, |
| TONSLAND, | 1102433, | 829377, | 867463, | 905301, | 698715, | 440538, | 380434, | 399038, | 363730, | 289992, |
| SOPCOF %, | 103, | 90, | 102, | 99, | 100, | 107, | 97, | 110, | 108, | 98, |

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 7027, | 19282, | 16942, | 5570, | 3988, | 3874, | 1541, | 4737, | 23082, | 11622, |
| 4, | 14165, | 38322, | 55859, | 100391, | 21234, | 19833, | 5171, | 8239, | 37919, | 50523, |
| 5, | 18839, | 27216, | 75486, | 97318, | 144215, | 28126, | 10615, | 15089, | 25781, | 65677, |
| 6, | 20350, | 20342, | 27772, | 62371, | 59397, | 83802, | 15467, | 18133, | 21304, | 32374, |
| 7, | 15415, | 13588, | 13337, | 12901, | 21302, | 23501, | 31161, | 19864, | 18390, | 14415, |
| 8, | 8359, | 4385, | 4587, | 3942, | 3415, | 4943, | 6665, | 26659, | 13199, | 9772, |
| 9, | 6054, | 1904, | 1082, | 1021, | 1200, | 917, | 830, | 4075, | 18518, | 6341, |
| 10, | 764, | 1062, | 559, | 435, | 320, | 321, | 163, | 405, | 2282, | 12003, |
| 11, | 221, | 163, | 455, | 140, | 67, | 46, | 41, | 32, | 185, | 1429, |
| 12, | 153, | 59, | 124, | 233, | 60, | 8, | 14, | 8, | 73, | 306, |
| 13, | 56, | 51, | 29, | 17, | 51, | 1, | 9, | 1, | 3, | 62, |
| 14, | 12, | 45, | 32, | 21, | 7, | 9, | 5, | 1, | 8, | 25, |
| +gp, | 12, | 38, | 1, | 8, | 15, | 7, | 2, | 5, | 4, | 12, |
| TOTALNUM, | 91427, | 126457, | 196265, | 284368, | 255271, | 165388, | 71684, | 97248, | 160748, | 204561, |
| TONSLAND, | 277651, | 307920, | 430113, | 523071, | 434939, | 332481, | 212000, | 319158, | 513494, | 582480, |
| SOPCOF %, | 95, | 99, | 94, | 97, | 96, | 103, | 100, | 97, | 100, | 100, |

**Table 3.15** North-East Arctic COD. Fishing mortalities from final VPA.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:05

Traditional vpa using file input for terminal F

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .0174, | .0225, | .0398, | .0298, | .0244, | .0230, | .0409, | .0213, | .0393, | .1959, |
| 4, | .1445, | .1109, | .1036, | .1525, | .2069, | .2218, | .1422, | .1028, | .1672, | .1995, |
| 5, | .3525, | .3894, | .2117, | .1811, | .4088, | .4809, | .3829, | .2286, | .2977, | .3533, |
| 6, | .4812, | .4470, | .3797, | .2024, | .4671, | .5384, | .5713, | .2368, | .3854, | .3919, |
| 7, | .5734, | .3980, | .4673, | .4284, | .4012, | .7688, | .6214, | .5195, | .3159, | .4217, |
| 8, | .7205, | .5218, | .5672, | .6742, | .5221, | .9271, | .8390, | .8338, | .6701, | .6437, |
| 9, | 1.0530, | .6979, | .6973, | .8395, | .7795, | 1.1416, | .9599, | .9343, | 1.1369, | 1.0102, |
| 10, | .8351, | .7809, | .7263, | .8296, | .7333, | .9966, | .9938, | .7720, | 1.2387, | .7436, |
| 11, | 1.0823, | .7375, | .4721, | .9097, | .5924, | 1.1604, | .7081, | .6731, | 1.2199, | .5939, |
| 12, | .9420, | .5148, | .6223, | .9372, | .3923, | .9634, | .4587, | .5585, | .7819, | .6391, |
| 13, | 1.0812, | 1.3471, | .6584, | .8824, | 1.3452, | .8615, | .7109, | .5224, | 1.1459, | .4069, |
| 14, | 1.0120, | .8250, | .6390, | .8890, | .7750, | 1.0390, | .7740, | .6960, | 1.1210, | .6820, |
| +gp, | 1.0120, | .8250, | .6390, | .8890, | .7750, | 1.0390, | .7740, | .6960, | 1.1210, | .6820, |
| FBAR 5-10, | .6693, | .5392, | .5082, | .5259, | .5520, | .8089, | .7281, | .5875, | .6741, | .5941, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .2138, | .0836, | .1659, | .1339, | .1458, | .0489, | .0312, | .0241, | .0643, | .0205, |
| 4, | .4959, | .2102, | .3120, | .5668, | .2237, | .2086, | .1293, | .0982, | .2015, | .1950, |
| 5, | .5373, | .5212, | .4789, | .7536, | .6696, | .3481, | .3553, | .2294, | .2968, | .3094, |
| 6, | .5072, | .7016, | .5717, | .6828, | .8478, | .5468, | .6242, | .5144, | .5498, | .4844, |
| 7, | .4455, | .7036, | .6962, | .6768, | .8503, | .6613, | .6743, | .8524, | .7937, | .7766, |
| 8, | .4875, | .7042, | .8868, | .9089, | .9310, | .7633, | .7059, | 1.0703, | .9987, | 1.0108, |
| 9, | .4089, | .6137, | .7769, | 1.2139, | 1.2918, | 1.0394, | .8960, | 1.2454, | 1.1316, | 1.0073, |
| 10, | .9818, | .4778, | .4636, | .7738, | .9913, | .9540, | 1.0498, | 1.0785, | .7047, | .8635, |
| 11, | 1.0065, | 1.1997, | .3136, | .6315, | 1.8483, | 1.2634, | 1.3324, | .9852, | .6793, | .5200, |
| 12, | .6365, | .8546, | 1.0522, | .2469, | 1.4951, | 1.3559, | .8604, | .8039, | .9284, | .3943, |
| 13, | 1.7817, | 1.4679, | .5124, | .9914, | 2.4485, | .8319, | 1.6914, | 1.4825, | .4707, | .5440, |
| 14, | .9750, | .9340, | .6260, | .7740, | 1.6430, | 1.1040, | 1.1860, | 1.1440, | .8380, | .7790, |
| +gp, | .9750, | .9340, | .6260, | .7740, | 1.6430, | 1.1040, | 1.1860, | 1.1440, | .8380, | .7790, |
| FBAR 5-10, | .5614, | .6203, | .6457, | .8350, | .9303, | .7188, | .7176, | .8317, | .7459, | .7420, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 3, | .0204, | .0427, | .0194, | .0215, | .0190, | .0260, | .0097, | .0132, | .0357, | .0160, | .0216, |
| 4, | .1225, | .1473, | .1671, | .1527, | .1064, | .1234, | .0439, | .0654, | .1389, | .1020, | .1021, |
| 5, | .2909, | .3634, | .4777, | .4860, | .3405, | .2001, | .0898, | .1740, | .2973, | .3770, | .2828, |
| 6, | .5769, | .5854, | .7817, | .9502, | .6264, | .3395, | .1612, | .2176, | .3954, | .7490, | .4540, |
| 7, | 1.0740, | 1.0003, | 1.0022, | 1.1059, | 1.0800, | .5471, | .2034, | .3197, | .3573, | .5110, | .3960, |
| 8, | 1.2047, | 1.1064, | 1.2253, | .9747, | 1.0617, | .8064, | .2921, | .2684, | .3646, | .3270, | .3200, |
| 9, | 1.2138, | 1.0538, | .9452, | 1.0656, | .9516, | .9707, | .2963, | .2921, | .3026, | .2990, | .2979, |
| 10, | 1.0142, | .7153, | 1.1071, | 1.4546, | 1.2936, | .7365, | .4448, | .2303, | .2642, | .3280, | .2742, |
| 11, | .8514, | .6176, | .7899, | .9701, | .9733, | .6338, | .1880, | .1450, | .1563, | .2630, | .1881, |
| 12, | .8074, | .5795, | 1.5271, | 1.3698, | 1.8719, | .2782, | .4007, | .0507, | .5653, | .4160, | .3440, |
| 13, | .5894, | .7062, | .6367, | .9392, | 1.5267, | .1222, | .5774, | .0442, | .0241, | 1.5000, | .5228, |
| 14, | .2030, | 1.5000, | 1.5000, | 1.5000, | 1.5000, | 1.5000, | 1.5000, | .1130, | .5760, | .2840, | .3243, |
| +gp, | .2030, | 1.5000, | 1.5000, | 1.5000, | 1.5000, | 1.5000, | 1.5000, | .1130, | .5760, | .2840, | |
| FBAR 5-10, | .8957, | .8041, | .9232, | 1.0062, | .8923, | .6001, | .2479, | .2504, | .3303, | .4318, | |

**Table 3.16** North-East Arctic COD. Stock number at age.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:05

Traditional vpa using file input for terminal F

| Table 10 Stock number at age (start of year) | | | | | | | | Numbers*10**-3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 3, | 338955, | 778090, | 1582377, | 1292664, | 169748, | 111968, | 197050, | 404979, | 1015579, | 1818797, |
| 4, | 375592, | 272729, | 622846, | 1245045, | 1027225, | 135629, | 89589, | 154864, | 324567, | 799407, |
| 5, | 361707, | 266135, | 199849, | 459765, | 875147, | 683854, | 88953, | 63623, | 114402, | 224808, |
| 6, | 167870, | 208175, | 147618, | 132409, | 314070, | 476086, | 346146, | 49658, | 41444, | 69546, |
| 7, | 49195, | 84947, | 109007, | 82674, | 88545, | 161181, | 227518, | 160064, | 32085, | 23080, |
| 8, | 19454, | 22702, | 46716, | 55931, | 44102, | 48535, | 61173, | 100065, | 77949, | 19153, |
| 9, | 10321, | 7749, | 11030, | 21692, | 23334, | 21422, | 15724, | 21644, | 35588, | 32653, |
| 10, | 6830, | 2948, | 3157, | 4496, | 7671, | 8762, | 5600, | 4930, | 6962, | 9348, |
| 11, | 1284, | 2426, | 1105, | 1250, | 1606, | 3017, | 2648, | 1697, | 1865, | 1652, |
| 12, | 306, | 356, | 950, | 564, | 412, | 727, | 774, | 1068, | 709, | 451, |
| 13, | 635, | 98, | 174, | 417, | 181, | 228, | 227, | 401, | 500, | 266, |
| 14, | 450, | 176, | 21, | 74, | 141, | 39, | 79, | 91, | 194, | 130, |
| +gp, | 223, | 347, | 162, | 26, | 93, | 77, | 71, | 54, | 64, | 121, |
| TOTAL, | 1332822, | 1646877, | 2725013, | 3297008, | 2552275, | 1651524, | 1035552, | 963138, | 1651909, | 2999413, |

| Table 10 Stock number at age (start of year) | | | | | | | | Numbers*10**-3 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 3, | 524555, | 621899, | 614151, | 347710, | 639421, | 198853, | 140443, | 157843, | 158448, | 168631, |
| 4, | 1224154, | 346788, | 468320, | 425949, | 248994, | 452483, | 155045, | 111454, | 126155, | 121652, |
| 5, | 536111, | 610384, | 230097, | 280674, | 197847, | 163000, | 300711, | 111539, | 82714, | 84441, |
| 6, | 129276, | 256484, | 296761, | 116698, | 108157, | 82920, | 94226, | 172576, | 72600, | 50331, |
| 7, | 38479, | 63735, | 104116, | 137165, | 48270, | 37930, | 39294, | 41328, | 84477, | 34300, |
| 8, | 12395, | 20179, | 25820, | 42492, | 57075, | 16887, | 16030, | 16391, | 14428, | 31273, |
| 9, | 8238, | 6232, | 8170, | 8709, | 14018, | 18419, | 6445, | 6479, | 4602, | 4351, |
| 10, | 9735, | 4481, | 2762, | 3076, | 2118, | 3154, | 5333, | 2154, | 1527, | 1215, |
| 11, | 3638, | 2986, | 2275, | 1423, | 1162, | 644, | 995, | 1528, | 600, | 618, |
| 12, | 747, | 1089, | 737, | 1361, | 619, | 150, | 149, | 215, | 467, | 249, |
| 13, | 195, | 323, | 379, | 211, | 871, | 114, | 32, | 52, | 79, | 151, |
| 14, | 145, | 27, | 61, | 186, | 64, | 62, | 41, | 5, | 10, | 40, |
| +gp, | 108, | 66, | 124, | 109, | 68, | 73, | 12, | 2, | 10, | 10, |
| TOTAL, | 2487775, | 1934674, | 1753773, | 1365762, | 1318684, | 974688, | 758753, | 621564, | 546114, | 497262, |

| Table 10 Stock number at age (start of year) | | | | | | | | Numbers*10**-3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 3, | 383823, | 509134, | 971556, | 289159, | 234239, | 166273, | 176968, | 398247, | 726386, | 807645, | 0, | 4664 |
| 4, | 135256, | 307902, | 399438, | 780143, | 231714, | 188177, | 132634, | 143498, | 321779, | 573876, | 650749, | 3697 |
| 5, | 81957, | 97969, | 217556, | 276713, | 548271, | 170564, | 136187, | 103924, | 110051, | 229276, | 424289, | 2632 |
| 6, | 50735, | 50165, | 55773, | 110468, | 139347, | 319347, | 114323, | 101926, | 71495, | 66928, | 128757, | 1559 |
| 7, | 25386, | 23330, | 22873, | 20896, | 34970, | 60984, | 186183, | 79666, | 67129, | 39416, | 25910, | 786 |
| 8, | 12917, | 7100, | 7025, | 6874, | 5661, | 9723, | 28891, | 124380, | 47376, | 38447, | 19359, | 360 |
| 9, | 9318, | 3170, | 1923, | 1689, | 2124, | 1603, | 3554, | 17663, | 77859, | 26937, | 22698, | 154 |
| 10, | 1301, | 2266, | 905, | 612, | 476, | 671, | 497, | 2164, | 10798, | 47102, | 16354, | 61 |
| 11, | 420, | 386, | 907, | 245, | 117, | 107, | 263, | 261, | 1407, | 6788, | 27780, | 24 |
| 12, | 301, | 147, | 171, | 337, | 76, | 36, | 46, | 179, | 185, | 985, | 4272, | 9 |
| 13, | 137, | 110, | 67, | 30, | 70, | 10, | 22, | 25, | 139, | 86, | 532, | 4 |
| 14, | 72, | 62, | 44, | 29, | 10, | 12, | 7, | 10, | 20, | 111, | 16, | 1 |
| +gp, | 72, | 53, | 1, | 11, | 21, | 10, | 3, | 52, | 10, | 53, | 101, | |
| TOTAL, | 701694, | 1001794, | 1678239, | 1487208, | 1197096, | 917516, | 779581, | 971994, | 1434634, | 1837651, | 1320816, | |

**Table 3.17** North-East Arctic COD. Stock biomass at age.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:05

Traditional vpa using file input for terminal F

Table 12 Stock biomass at age (start of year) Tonnes

| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 220321, | 505759, | 1028545, | 840232, | 110336, | 72780, | 128083, | 263236, | 660127, | 1182219, |
| 4, | 375592, | 272729, | 622846, | 1245045, | 1027225, | 135629, | 89589, | 154864, | 324567, | 799407, |
| 5, | 560646, | 412509, | 309766, | 712636, | 1356477, | 1059974, | 137877, | 98616, | 177324, | 348452, |
| 6, | 394493, | 489211, | 346902, | 311160, | 738065, | 1118803, | 813443, | 116697, | 97393, | 163433, |
| 7, | 169723, | 293067, | 376076, | 285225, | 305482, | 556075, | 784937, | 552222, | 110692, | 79628, |
| 8, | 91432, | 106697, | 219563, | 262874, | 207282, | 228114, | 287512, | 470305, | 366361, | 90021, |
| 9, | 63681, | 47809, | 68053, | 133837, | 143971, | 132172, | 97016, | 133541, | 219579, | 201467, |
| 10, | 52588, | 22701, | 24308, | 34623, | 59067, | 67465, | 43121, | 37958, | 53606, | 71977, |
| 11, | 11875, | 22438, | 10226, | 11564, | 14855, | 27904, | 24493, | 15699, | 17251, | 15278, |
| 12, | 3323, | 3864, | 10307, | 6125, | 4472, | 7889, | 8397, | 11586, | 7691, | 4891, |
| 13, | 7936, | 1222, | 2178, | 5217, | 2263, | 2849, | 2840, | 5007, | 6252, | 3319, |
| 14, | 6257, | 2451, | 289, | 1027, | 1965, | 537, | 1096, | 1270, | 2703, | 1810, |
| +gp, | 3350, | 5203, | 2428, | 388, | 1394, | 1158, | 1061, | 816, | 964, | 1821, |
| TOTALBIO, | 1961219, | 2185660, | 3021485, | 3849953, | 3972853, | 3411347, | 2419464, | 1861817, | 2044511, | 2963722, |

Table 12 Stock biomass at age (start of year) Tonnes

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 340961, | 404235, | 399198, | 226012, | 415623, | 129254, | 91288, | 102598, | 102991, | 60707, |
| 4, | 1224154, | 346788, | 468320, | 425949, | 248994, | 452483, | 155045, | 111454, | 126155, | 122868, |
| 5, | 830972, | 946096, | 356651, | 435045, | 306663, | 252650, | 466101, | 172885, | 128206, | 137638, |
| 6, | 303798, | 602738, | 697388, | 274240, | 254169, | 194863, | 221430, | 405553, | 170609, | 127338, |
| 7, | 132753, | 219884, | 359201, | 473218, | 166532, | 130858, | 135564, | 142581, | 291447, | 118335, |
| 8, | 58256, | 94841, | 121356, | 199711, | 268254, | 79369, | 75339, | 77037, | 67810, | 146985, |
| 9, | 50828, | 38453, | 50407, | 53737, | 86494, | 113643, | 39765, | 39975, | 28393, | 26848, |
| 10, | 74961, | 34504, | 21270, | 23683, | 16309, | 24284, | 41065, | 16585, | 11756, | 9356, |
| 11, | 33656, | 27621, | 21045, | 13159, | 10745, | 5953, | 9200, | 14136, | 5548, | 5715, |
| 12, | 8101, | 11814, | 7992, | 14770, | 6720, | 1625, | 1616, | 2331, | 5069, | 2701, |
| 13, | 2435, | 4044, | 4741, | 2632, | 10884, | 1421, | 395, | 645, | 984, | 1889, |
| 14, | 2012, | 373, | 848, | 2585, | 889, | 856, | 563, | 66, | 133, | 560, |
| +gp, | 1622, | 993, | 1866, | 1638, | 1020, | 1094, | 187, | 24, | 144, | 151, |
| TOTALBIO, | 3064510, | 2732382, | 2510282, | 2146378, | 1793296, | 1388355, | 1237558, | 1085870, | 939244, | 761090, |

Table 12 Stock biomass at age (start of year) Tonnes

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 203426, | 234201, | 310898, | 60723, | 44505, | 49882, | 70787, | 191158, | 326874, | 282676, |
| 4, | 162308, | 280191, | 371477, | 390072, | 83417, | 95970, | 90191, | 163587, | 299254, | 677174, |
| 5, | 155719, | 167527, | 341563, | 345891, | 383790, | 146685, | 157977, | 179789, | 191490, | 419575, |
| 6, | 147639, | 147486, | 140548, | 234192, | 220168, | 469440, | 196636, | 251758, | 195181, | 192085, |
| 7, | 100782, | 97285, | 87604, | 72299, | 94418, | 159778, | 495248, | 261303, | 261804, | 163184, |
| 8, | 60709, | 35786, | 37232, | 35884, | 24344, | 45697, | 130300, | 544786, | 235932, | 213763, |
| 9, | 57491, | 19560, | 11863, | 10422, | 13102, | 9892, | 21928, | 130174, | 515428, | 181285, |
| 10, | 10018, | 17450, | 6967, | 4710, | 3669, | 5169, | 3829, | 16660, | 120718, | 398009, |
| 11, | 3880, | 3574, | 8393, | 2265, | 1082, | 990, | 2434, | 2414, | 13014, | 72360, |
| 12, | 3263, | 1591, | 1851, | 3658, | 824, | 392, | 504, | 1937, | 2005, | 10690, |
| 13, | 1718, | 1373, | 840, | 379, | 877, | 120, | 280, | 319, | 1737, | 1075, |
| 14, | 998, | 867, | 617, | 405, | 135, | 173, | 96, | 143, | 278, | 1543, |
| +gp, | 1077, | 790, | 21, | 166, | 312, | 146, | 42, | 773, | 150, | 800, |
| TOTALBIO, | 909028, | 1007681, | 1319873, | 1161068, | 870644, | 984333, | 1170252, | 1744800, | 2163864, | 2614219, |

**Table 3.18** North-East Arctic COD. Spawning stock biomass at age.

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:05

Traditional vpa using file input for terminal F

| Table 13 Spawning stock biomass at age (spawning time) Tonnes<br>YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 4, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 5, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 6, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 7, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 8, | 91432, | 106697, | 219563, | 262874, | 207282, | 228114, | 287512, | 470305, | 366361, | 90021, |
| 9, | 63681, | 47809, | 68053, | 133837, | 143971, | 132172, | 97016, | 133541, | 219579, | 201467, |
| 10, | 52588, | 22701, | 24308, | 34623, | 59067, | 67465, | 43121, | 37958, | 53606, | 71977, |
| 11, | 11875, | 22438, | 10226, | 11564, | 14855, | 27904, | 24493, | 15699, | 17251, | 15278, |
| 12, | 3323, | 3864, | 10307, | 6125, | 4472, | 7889, | 8397, | 11586, | 7691, | 4891, |
| 13, | 7936, | 1222, | 2178, | 5217, | 2263, | 2849, | 2840, | 5007, | 6252, | 3319, |
| 14, | 6257, | 2451, | 289, | 1027, | 1965, | 537, | 1096, | 1270, | 2703, | 1810, |
| +gp, | 3350, | 5203, | 2428, | 388, | 1394, | 1158, | 1061, | 816, | 964, | 1821, |
| TOTSPBIO, | 240444, | 212385, | 337351, | 455654, | 435269, | 468089, | 465535, | 676182, | 674409, | 390583, |

| Table 13 Spawning stock biomass at age (spawning time) Tonnes<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 607, |
| 4, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 6308, | 9829, |
| 5, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 12821, | 13764, |
| 6, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 58007, | 38201, |
| 7, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 189441, | 86384, |
| 8, | 58256, | 94841, | 121356, | 199711, | 268254, | 79369, | 75339, | 77037, | 55604, | 129347, |
| 9, | 50828, | 38453, | 50407, | 53737, | 86494, | 113643, | 39765, | 39975, | 26122, | 26042, |
| 10, | 74961, | 34504, | 21270, | 23683, | 16309, | 24284, | 41065, | 16585, | 11756, | 9356, |
| 11, | 33656, | 27621, | 21045, | 13159, | 10745, | 5953, | 9200, | 14136, | 5548, | 5715, |
| 12, | 8101, | 11814, | 7992, | 14770, | 6720, | 1625, | 1616, | 2331, | 5069, | 2701, |
| 13, | 2435, | 4044, | 4741, | 2632, | 10884, | 1421, | 395, | 645, | 984, | 1889, |
| 14, | 2012, | 373, | 848, | 2585, | 889, | 856, | 563, | 66, | 133, | 560, |
| +gp, | 1622, | 993, | 1866, | 1638, | 1020, | 1094, | 187, | 24, | 144, | 151, |
| TOTSPBIO, | 231871, | 212642, | 229524, | 311915, | 401315, | 228246, | 168130, | 150799, | 371935, | 324547, |

| Table 13 Spawning stock biomass at age (spawning time) Tonnes<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 4, | 8115, | 2802, | 7430, | 3901, | 834, | 0, | 1804, | 4908, | 2993, | 20315, |
| 5, | 28029, | 16753, | 30741, | 31130, | 11514, | 2934, | 9479, | 1798, | 15319, | 29370, |
| 6, | 45768, | 48670, | 26704, | 53864, | 55042, | 70416, | 39327, | 57904, | 60506, | 40338, |
| 7, | 56438, | 57398, | 49058, | 19521, | 50042, | 62313, | 232766, | 172460, | 191117, | 91383, |
| 8, | 54638, | 30418, | 28296, | 21889, | 19232, | 26961, | 80786, | 446724, | 217057, | 190249, |
| 9, | 56916, | 17995, | 10558, | 8442, | 13102, | 8210, | 17761, | 124967, | 489657, | 172221, |
| 10, | 10018, | 17450, | 6967, | 3768, | 3669, | 5169, | 3637, | 16660, | 120718, | 394030, |
| 11, | 3880, | 3574, | 8393, | 2265, | 1082, | 990, | 2434, | 2414, | 13014, | 72360, |
| 12, | 3263, | 1591, | 1851, | 3658, | 824, | 392, | 504, | 1937, | 2005, | 10690, |
| 13, | 1718, | 1373, | 840, | 379, | 877, | 120, | 280, | 319, | 1737, | 1075, |
| 14, | 998, | 867, | 617, | 405, | 135, | 173, | 96, | 143, | 278, | 1543, |
| +gp, | 1077, | 790, | 21, | 166, | 312, | 146, | 42, | 773, | 150, | 800, |
| TOTSPBIO, | 270859, | 199681, | 171475, | 149389, | 156664, | 177824, | 388917, | 831007, | 1114550, | 1024374, |

**Table 3.19** North-East Arctic COD. Summary table (without SOP correction).

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:05

Table 16 Summary (without SOP correction)

Traditional vpa using file input for terminal F

| | RECRUITS, Age 3 | TOTALBIO, | TOTSPBIO, | LANDINGS, | YIELD/SSB, | FBAR 5-10, |
|---|---|---|---|---|---|---|
| 1946, | 729759, | 6283210, | 3838598, | 706000, | .1839, | .1928, |
| 1947, | 419945, | 5976132, | 3162691, | 882017, | .2789, | .3130, |
| 1948, | 440690, | 5086867, | 2202922, | 774295, | .3515, | .3521, |
| 1949, | 466659, | 4423296, | 1696645, | 800122, | .4716, | .3705, |
| 1950, | 705512, | 3992349, | 1538692, | 731982, | .4757, | .3652, |
| 1951, | 1085887, | 4099898, | 1442636, | 827180, | .5734, | .3983, |
| 1952, | 1190838, | 4327210, | 1168197, | 876795, | .7506, | .5386, |
| 1953, | 1592006, | 4667130, | 905299, | 695546, | .7683, | .3605, |
| 1954, | 644331, | 4953660, | 825775, | 826021, | 1.0003, | .4006, |
| 1955, | 272941, | 4742530, | 866848, | 1147841, | 1.3242, | .5498, |
| 1956, | 440230, | 4099686, | 989479, | 1343068, | 1.3573, | .6431, |
| 1957, | 805056, | 3298285, | 923837, | 792557, | .8579, | .5059, |
| 1958, | 497100, | 2977140, | 1012332, | 769313, | .7599, | .5123, |
| 1959, | 684731, | 2824171, | 854886, | 744607, | .8710, | .5602, |
| 1960, | 790432, | 2733659, | 597947, | 622042, | 1.0403, | .4727, |
| 1961, | 918947, | 2940935, | 509636, | 783221, | 1.5368, | .6226, |
| 1962, | 729959, | 2889304, | 468672, | 909266, | 1.9401, | .7515, |
| 1963, | 473302, | 2504464, | 372504, | 776337, | 2.0841, | .9697, |
| 1964, | 338955, | 1961219, | 240444, | 437695, | 1.8204, | .6693, |
| 1965, | 778090, | 2185660, | 212385, | 444930, | 2.0949, | .5392, |
| 1966, | 1582377, | 3021486, | 337351, | 483711, | 1.4339, | .5082, |
| 1967, | 1292665, | 3849952, | 455654, | 572605, | 1.2567, | .5259, |
| 1968, | 169748, | 3972853, | 435269, | 1074084, | 2.4676, | .5520, |
| 1969, | 111969, | 3411348, | 468088, | 1197226, | 2.5577, | .8089, |
| 1970, | 197050, | 2419464, | 465535, | 933246, | 2.0047, | .7281, |
| 1971, | 404979, | 1861817, | 676182, | 689048, | 1.0190, | .5875, |
| 1972, | 1015580, | 2044510, | 674409, | 565254, | .8381, | .6741, |
| 1973, | 1818798, | 2963721, | 390584, | 792685, | 2.0295, | .5941, |
| 1974, | 524555, | 3064508, | 231871, | 1102433, | 4.7545, | .5614, |
| 1975, | 621899, | 2732383, | 212642, | 829377, | 3.9003, | .6203, |
| 1976, | 614151, | 2510282, | 229524, | 867463, | 3.7794, | .6457, |
| 1977, | 347710, | 2146379, | 311915, | 905301, | 2.9024, | .8350, |
| 1978, | 639420, | 1793296, | 401315, | 698715, | 1.7411, | .9303, |
| 1979, | 198853, | 1388355, | 228246, | 440538, | 1.9301, | .7188, |
| 1980, | 140443, | 1237558, | 168130, | 380434, | 2.2627, | .7176, |
| 1981, | 157843, | 1085870, | 150799, | 399038, | 2.6462, | .8317, |
| 1982, | 158448, | 939244, | 371935, | 363730, | .9779, | .7459, |
| 1983, | 168630, | 761090, | 324547, | 289992, | .8935, | .7420, |
| 1984, | 383823, | 909028, | 270859, | 277651, | 1.0251, | .8957, |
| 1985, | 509134, | 1007681, | 199681, | 307920, | 1.5421, | .8041, |
| 1986, | 971556, | 1319873, | 171475, | 430113, | 2.5083, | .9232, |
| 1987, | 289159, | 1161067, | 149389, | 523071, | 3.5014, | 1.0062, |
| 1988, | 234239, | 870644, | 156664, | 434939, | 2.7762, | .8923, |
| 1989, | 166273, | 984333, | 177824, | 332481, | 1.8697, | .6001, |
| 1990, | 176968, | 1170253, | 388917, | 212000, | .5451, | .2479, |
| 1991, | 398247, | 1744800, | 831006, | 319158, | .3841, | .2504, |
| 1992, | 726386, | 2163864, | 1114550, | 513494, | .4607, | .3303, |
| 1993, | 807645, | 2614219, | 1024373, | 582480, | .5686, | .4318, |
| Arith. Mean , | 600707, | 2752431, | 726024, | 675188, | 1.5650, | .5999, |
| Units, | (Thousands), | (Tonnes), | (Tonnes), | (Tonnes), | | |

**Table 3.20** North-East Arctic COD. Summary table (with SOP correction)

Run title : Cod in the North-East Arctic (Fishing Areas I and II) (run name: RUN16)

At 30-Aug-94 12:41:05

Table 17 Summary (with SOP correction)

Traditional vpa using file input for terminal F

| | RECRUITS, Age 3 | TOTALBIO, | TOTSPBIO, | LANDINGS, | YIELD/SSB, | SOPCOFAC, | FBAR 5-10, |
|---|---|---|---|---|---|---|---|
| 1946, | 729759, | 4231927, | 2585409, | 706000, | .2731, | .6735, | .1928, |
| 1947, | 419945, | 3410905, | 1805121, | 882017, | .4886, | .5708, | .3130, |
| 1948, | 440690, | 3129347, | 1355197, | 774295, | .5714, | .6152, | .3521, |
| 1949, | 466659, | 3007242, | 1153489, | 800122, | .6937, | .6799, | .3705, |
| 1950, | 705512, | 3106404, | 1197239, | 731982, | .6114, | .7781, | .3652, |
| 1951, | 1085887, | 3613344, | 1271431, | 827180, | .6506, | .8813, | .3983, |
| 1952, | 1190838, | 3245128, | 876072, | 876795, | 1.0008, | .7499, | .5386, |
| 1953, | 1592006, | 3918483, | 760081, | 695546, | .9151, | .8396, | .3605, |
| 1954, | 644331, | 3858692, | 643244, | 826021, | 1.2841, | .7790, | .4006, |
| 1955, | 272941, | 3874768, | 708237, | 1147841, | 1.6207, | .8170, | .5498, |
| 1956, | 440230, | 3463563, | 835948, | 1343068, | 1.6066, | .8448, | .6431, |
| 1957, | 805056, | 2752695, | 771019, | 792557, | 1.0279, | .8346, | .5059, |
| 1958, | 497100, | 2629141, | 894000, | 769313, | .8605, | .8831, | .5123, |
| 1959, | 684731, | 2418065, | 731957, | 744607, | 1.0173, | .8562, | .5602, |
| 1960, | 790432, | 2410924, | 527354, | 622042, | 1.1796, | .8819, | .4727, |
| 1961, | 918947, | 2667130, | 462188, | 783221, | 1.6946, | .9069, | .6226, |
| 1962, | 729959, | 2651070, | 430028, | 909266, | 2.1144, | .9175, | .7515, |
| 1963, | 473302, | 1960799, | 291642, | 776337, | 2.6620, | .7829, | .9697, |
| 1964, | 338955, | 1605043, | 196777, | 437695, | 2.2243, | .8184, | .6693, |
| 1965, | 778090, | 1959472, | 190406, | 444930, | 2.3367, | .8965, | .5392, |
| 1966, | 1582377, | 2844752, | 317618, | 483711, | 1.5229, | .9415, | .5082, |
| 1967, | 1292665, | 3383014, | 400391, | 572605, | 1.4301, | .8787, | .5259, |
| 1968, | 169748, | 3798364, | 416152, | 1074084, | 2.5810, | .9561, | .5520, |
| 1969, | 111969, | 2982695, | 409271, | 1197226, | 2.9253, | .8743, | .8089, |
| 1970, | 197050, | 2355046, | 453141, | 933246, | 2.0595, | .9734, | .7281, |
| 1971, | 404979, | 2081820, | 756084, | 689048, | .9113, | 1.1182, | .5875, |
| 1972, | 1015580, | 2205553, | 727531, | 565254, | .7769, | 1.0788, | .6741, |
| 1973, | 1818798, | 3387558, | 446440, | 792685, | 1.7756, | 1.1430, | .5941, |
| 1974, | 524555, | 3147436, | 238146, | 1102433, | 4.6292, | 1.0271, | .5614, |
| 1975, | 621899, | 2461043, | 191526, | 829377, | 4.3304, | .9007, | .6203, |
| 1976, | 614151, | 2569453, | 234935, | 867463, | 3.6924, | 1.0236, | .6457, |
| 1977, | 347710, | 2131002, | 309681, | 905301, | 2.9233, | .9928, | .8350, |
| 1978, | 639420, | 1800006, | 402816, | 698715, | 1.7346, | 1.0037, | .9303, |
| 1979, | 198853, | 1487406, | 244530, | 440538, | 1.8016, | 1.0713, | .7188, |
| 1980, | 140443, | 1204326, | 163615, | 380434, | 2.3252, | .9731, | .7176, |
| 1981, | 157843, | 1199858, | 166629, | 399038, | 2.3948, | 1.1050, | .8317, |
| 1982, | 158448, | 1011289, | 400464, | 363730, | .9083, | 1.0767, | .7459, |
| 1983, | 168630, | 748652, | 319243, | 289992, | .9084, | .9837, | .7420, |
| 1984, | 383823, | 867074, | 258358, | 277651, | 1.0747, | .9538, | .8957, |
| 1985, | 509134, | 1001210, | 198399, | 307920, | 1.5520, | .9936, | .8041, |
| 1986, | 971556, | 1239359, | 161015, | 430113, | 2.6713, | .9390, | .9232, |
| 1987, | 289159, | 1122788, | 144463, | 523071, | 3.6208, | .9670, | 1.0062, |
| 1988, | 234239, | 834791, | 150213, | 434939, | 2.8955, | .9588, | .8923, |
| 1989, | 166273, | 1018213, | 183945, | 332481, | 1.8075, | 1.0344, | .6001, |
| 1990, | 176968, | 1168337, | 388281, | 212000, | .5460, | .9984, | .2479, |
| 1991, | 398247, | 1689446, | 804642, | 319158, | .3966, | .9683, | .2504, |
| 1992, | 726386, | 2165498, | 1115392, | 513494, | .4604, | 1.0008, | .3303, |
| 1993, | 807645, | 2619522, | 1026451, | 582480, | .5675, | 1.0020, | .4318, |
| Arith. Mean , | 600707, | 2384160, | 598254, | 675188, | 1.6678 | | .5999, |
| Units, | (Thousands), | (Tonnes), | (Tonnes), | (Tonnes), | | | |

**Table 3.21** North-East Arctic COD. Input data to the management option table.

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: 1994 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 695000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.236 | 0.0276 | 0.520 |
| 4 | 650749.00 | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.757 | 0.1306 | 1.110 |
| 5 | 424289.00 | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.366 | 0.3618 | 1.730 |
| 6 | 128757.00 | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.283 | 0.5809 | 2.580 |
| 7 | 25910.000 | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.439 | 0.5067 | 3.850 |
| 8 | 19359.000 | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.982 | 0.4094 | 5.380 |
| 9 | 22698.000 | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.841 | 0.3812 | 6.610 |
| 10 | 16354.000 | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 7.777 | 0.3508 | 7.290 |
| 11 | 27780.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.590 | 0.2407 | 8.910 |
| 12 | 4272.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.600 | 0.4401 | 10.850 |
| 13 | 532.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | 16.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | 101.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 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 | 616000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.155 | 0.0276 | 0.770 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.643 | 0.1306 | 1.060 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.323 | 0.3618 | 1.550 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.027 | 0.5809 | 2.270 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.170 | 0.5067 | 3.570 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.680 | 0.4094 | 5.120 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.610 | 0.3812 | 6.610 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 7.290 | 0.3508 | 7.290 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.910 | 0.2407 | 8.910 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1996 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 632000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.280 | 0.0276 | 0.770 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.510 | 0.1306 | 1.060 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 0.990 | 0.3618 | 1.550 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 1.720 | 0.5809 | 2.270 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 2.860 | 0.5067 | 3.570 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.680 | 0.4094 | 5.120 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.610 | 0.3812 | 6.610 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 7.290 | 0.3508 | 7.290 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 8.910 | 0.2407 | 8.910 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : PRED102
Date and time: 01SEP94:14:47

**Table 3.22** Medium term prediction, input data, medium growth.

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: Input data

(cont.)

| Year: 1997 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 466000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.360 | 0.0276 | 0.910 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.840 | 0.1306 | 1.390 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.450 | 0.3618 | 1.990 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.350 | 0.5809 | 2.730 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.470 | 0.5067 | 3.780 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.860 | 0.4094 | 5.150 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.410 | 0.3812 | 6.760 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 8.060 | 0.3508 | 8.280 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 9.310 | 0.2407 | 10.200 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1998 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 466000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.360 | 0.0276 | 0.910 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.840 | 0.1306 | 1.390 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.450 | 0.3618 | 1.990 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.350 | 0.5809 | 2.730 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.470 | 0.5067 | 3.780 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.860 | 0.4094 | 5.150 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.410 | 0.3812 | 6.760 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 8.060 | 0.3508 | 8.280 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 9.310 | 0.2407 | 10.200 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1999 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 466000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.360 | 0.0276 | 0.910 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.840 | 0.1306 | 1.390 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.450 | 0.3618 | 1.990 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.350 | 0.5809 | 2.730 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.470 | 0.5067 | 3.780 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.860 | 0.4094 | 5.150 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.410 | 0.3812 | 6.760 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 8.060 | 0.3508 | 8.280 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 9.310 | 0.2407 | 10.200 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : SOP01
Date and time: 01SEP94:16:57

**continued...**

**Table 3.22 (continued)** Medium term prediction, input data, low growth.

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: Input data

(cont.)

| Year: 1997 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 466000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.360 | 0.0276 | 0.770 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.840 | 0.1306 | 1.060 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.450 | 0.3618 | 1.550 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.350 | 0.5809 | 2.270 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.470 | 0.5067 | 3.570 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.860 | 0.4094 | 5.120 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.410 | 0.3812 | 6.610 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 8.060 | 0.3508 | 7.290 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 9.310 | 0.2407 | 8.910 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1998 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 466000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.360 | 0.0276 | 0.770 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.840 | 0.1306 | 1.060 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.450 | 0.3618 | 1.550 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.350 | 0.5809 | 2.270 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.470 | 0.5067 | 3.570 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.860 | 0.4094 | 5.120 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.410 | 0.3812 | 6.610 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 8.060 | 0.3508 | 7.290 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 9.310 | 0.2407 | 8.910 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1999 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 466000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.360 | 0.0276 | 0.770 |
| 4 | . | 0.2000 | 0.0167 | 0.0000 | 0.0000 | 0.840 | 0.1306 | 1.060 |
| 5 | . | 0.2000 | 0.0767 | 0.0000 | 0.0000 | 1.450 | 0.3618 | 1.550 |
| 6 | . | 0.2000 | 0.2733 | 0.0000 | 0.0000 | 2.350 | 0.5809 | 2.270 |
| 7 | . | 0.2000 | 0.6133 | 0.0000 | 0.0000 | 3.470 | 0.5067 | 3.570 |
| 8 | . | 0.2000 | 0.8833 | 0.0000 | 0.0000 | 4.860 | 0.4094 | 5.120 |
| 9 | . | 0.2000 | 0.9500 | 0.0000 | 0.0000 | 6.410 | 0.3812 | 6.610 |
| 10 | . | 0.2000 | 0.9900 | 0.0000 | 0.0000 | 8.060 | 0.3508 | 7.290 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 9.310 | 0.2407 | 8.910 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 10.850 | 0.4401 | 10.850 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 12.500 | 0.6689 | 12.500 |
| 14 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 13.900 | 0.4149 | 13.900 |
| 15+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 15.000 | 0.4149 | 15.000 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : SOP01
Date and time: 01SEP94:14:54

**Table 3.23** North-East Arctic COD. Management option table.

14:46 Thursday, September 1, 1994 3

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: 1994 | | | | | Year: 1995 | | | | | Year: 1996 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 1.2638 | 0.5457 | 2281938 | 830020 | 770000 | 0.0000 | 0.0000 | 2138184 | 747457 | 0 | 2699001 | 1170298 |
| . | . | . | . | . | 0.0500 | 0.0216 | . | 747457 | 41139 | 2655543 | 1144491 |
| . | . | . | . | . | 0.1000 | 0.0432 | . | 747457 | 81429 | 2613041 | 1119293 |
| . | . | . | . | . | 0.1500 | 0.0648 | . | 747457 | 120888 | 2571471 | 1094691 |
| . | . | . | . | . | 0.2000 | 0.0864 | . | 747457 | 159537 | 2530812 | 1070670 |
| . | . | . | . | . | 0.2500 | 0.1080 | . | 747457 | 197394 | 2491041 | 1047214 |
| . | . | . | . | . | 0.3000 | 0.1295 | . | 747457 | 234478 | 2452138 | 1024311 |
| . | . | . | . | . | 0.3500 | 0.1511 | . | 747457 | 270806 | 2414080 | 1001946 |
| . | . | . | . | . | 0.4000 | 0.1727 | . | 747457 | 306396 | 2376849 | 980106 |
| . | . | . | . | . | 0.4500 | 0.1943 | . | 747457 | 341265 | 2340425 | 958779 |
| . | . | . | . | . | 0.5000 | 0.2159 | . | 747457 | 375429 | 2304788 | 937951 |
| . | . | . | . | . | 0.5500 | 0.2375 | . | 747457 | 408906 | 2269919 | 917610 |
| . | . | . | . | . | 0.6000 | 0.2591 | . | 747457 | 441710 | 2235801 | 897745 |
| . | . | . | . | . | 0.6500 | 0.2807 | . | 747457 | 473857 | 2202415 | 878343 |
| . | . | . | . | . | 0.7000 | 0.3023 | . | 747457 | 505362 | 2169744 | 859394 |
| . | . | . | . | . | 0.7500 | 0.3239 | . | 747457 | 536241 | 2137772 | 840886 |
| . | . | . | . | . | 0.8000 | 0.3454 | . | 747457 | 566506 | 2106481 | 822808 |
| . | . | . | . | . | 0.8500 | 0.3670 | . | 747457 | 596173 | 2075856 | 805150 |
| . | . | . | . | . | 0.9000 | 0.3886 | . | 747457 | 625254 | 2045881 | 787902 |
| . | . | . | . | . | 0.9500 | 0.4102 | . | 747457 | 653764 | 2016541 | 771054 |
| . | . | . | . | . | 1.0000 | 0.4318 | . | 747457 | 681714 | 1987820 | 754595 |
| . | . | . | . | . | 1.0500 | 0.4534 | . | 747457 | 709118 | 1959705 | 738516 |
| . | . | . | . | . | 1.1000 | 0.4750 | . | 747457 | 735989 | 1932181 | 722809 |
| . | . | . | . | . | 1.1500 | 0.4966 | . | 747457 | 762337 | 1905234 | 707464 |
| . | . | . | . | . | 1.2000 | 0.5182 | . | 747457 | 788175 | 1878851 | 692472 |
| . | . | . | . | . | 1.2500 | 0.5398 | . | 747457 | 813515 | 1853018 | 677824 |
| . | . | . | . | . | 1.3000 | 0.5613 | . | 747457 | 838367 | 1827723 | 663513 |
| . | . | . | . | . | 1.3500 | 0.5829 | . | 747457 | 862743 | 1802954 | 649530 |
| . | . | . | . | . | 1.4000 | 0.6045 | . | 747457 | 886653 | 1778697 | 635868 |
| . | . | . | . | . | 1.4500 | 0.6261 | . | 747457 | 910107 | 1754942 | 622518 |
| . | . | . | . | . | 1.5000 | 0.6477 | . | 747457 | 933116 | 1731676 | 609472 |
| . | . | . | . | . | 1.5500 | 0.6693 | . | 747457 | 955690 | 1708889 | 596725 |
| . | . | . | . | . | 1.6000 | 0.6909 | . | 747457 | 977838 | 1686569 | 584268 |
| . | . | . | . | . | 1.6500 | 0.7125 | . | 747457 | 999570 | 1664705 | 572094 |
| . | . | . | . | . | 1.7000 | 0.7341 | . | 747457 | 1020894 | 1643287 | 560197 |
| . | . | . | . | . | 1.7500 | 0.7557 | . | 747457 | 1041821 | 1622305 | 548570 |
| . | . | . | . | . | 1.8000 | 0.7772 | . | 747457 | 1062358 | 1601748 | 537206 |
| . | . | . | . | . | 1.8500 | 0.7988 | . | 747457 | 1082515 | 1581608 | 526099 |
| . | . | . | . | . | 1.9000 | 0.8204 | . | 747457 | 1102299 | 1561874 | 515244 |
| . | . | . | . | . | 1.9500 | 0.8420 | . | 747457 | 1121719 | 1542537 | 504633 |
| . | . | . | . | . | 2.0000 | 0.8636 | . | 747457 | 1140783 | 1523588 | 494262 |
| - | - | Tonnes | Tonnes | Tonnes | - | - | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name : PRED102
Date and time : 01SEP94:14:47
Computation of ref. F: Simple mean, age 5 - 10
Basis for 1994 : TAC constraints

**Table 3.24** North-East Arctic COD. Medium term predictions.

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

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.2638 | 0.5457 | 355488 | 770016 | 2015817 | 2281938 | 182045 | 830040 | 182045 | 830040 |
| 1995 | 1.0650 | 0.4599 | 343209 | 717228 | 1947458 | 2138166 | 192789 | 747458 | 192789 | 747458 |
| 1996 | 1.0650 | 0.4599 | 350384 | 773306 | 1918436 | 1951375 | 219939 | 733751 | 219939 | 733751 |
| 1997 | 1.0650 | 0.4599 | 332017 | 753858 | 1722359 | 1909707 | 232748 | 783378 | 232748 | 783378 |
| 1998 | 1.0650 | 0.4599 | 308654 | 723713 | 1578286 | 1852797 | 231634 | 822590 | 231634 | 822590 |
| 1999 | 1.0650 | 0.4599 | 279427 | 671879 | 1481310 | 1762506 | 222428 | 825724 | 222428 | 825724 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : SOP01
Date and time : 31AUG94:16:24
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

**Low growth $F_{med}$**

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

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.2638 | 0.5457 | 355488 | 770016 | 2015817 | 2281938 | 182045 | 830040 | 182045 | 830040 |
| 1995 | 0.7410 | 0.3200 | 252166 | 530723 | 1947458 | 2138166 | 192789 | 747458 | 192789 | 747458 |
| 1996 | 0.7410 | 0.3200 | 280048 | 640174 | 1999705 | 2143463 | 250204 | 844166 | 250204 | 844166 |
| 1997 | 0.7410 | 0.3200 | 279098 | 677582 | 1851505 | 2284640 | 295271 | 1036096 | 295271 | 1036096 |
| 1998 | 0.7410 | 0.3200 | 267447 | 690277 | 1731026 | 2378410 | 317839 | 1217876 | 317839 | 1217876 |
| 1999 | 0.7410 | 0.3200 | 247541 | 670889 | 1642868 | 2392547 | 322259 | 1329835 | 322259 | 1329835 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : SOP01
Date and time : 31AUG94:16:24
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

**Low growth $F_{low}$**

**continued...**

Table 3.24

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

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.2638 | 0.5457 | 355488 | 770016 | 2015817 | 2281938 | 182045 | 830040 | 182045 | 830040 |
| 1995 | 0.7410 | 0.3200 | 252166 | 530723 | 1947458 | 2138166 | 192789 | 747458 | 192789 | 747458 |
| 1996 | 0.7410 | 0.3200 | 280048 | 640174 | 1999705 | 2143463 | 250204 | 844166 | 250204 | 844166 |
| 1997 | 0.7410 | 0.3200 | 279098 | 776587 | 1851505 | 2924219 | 295271 | 1164069 | 295271 | 1164069 |
| 1998 | 0.7410 | 0.3200 | 267447 | 783873 | 1731026 | 2956805 | 317839 | 1338809 | 317839 | 1338809 |
| 1999 | 0.7410 | 0.3200 | 247541 | 759199 | 1642868 | 2929439 | 322259 | 1451977 | 322259 | 1451977 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : SOP01
Date and time : 01SEP94:16:57
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors

**Medium growth $F_{low}$**

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

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.2638 | 0.5457 | 355488 | 770016 | 2015817 | 2281938 | 182045 | 830040 | 182045 | 830040 |
| 1995 | 1.0650 | 0.4599 | 343209 | 717228 | 1947458 | 2138166 | 192789 | 747458 | 192789 | 747458 |
| 1996 | 1.0650 | 0.4599 | 350384 | 773306 | 1918436 | 1951375 | 219939 | 733751 | 219939 | 733751 |
| 1997 | 1.0650 | 0.4599 | 332017 | 873869 | 1722359 | 2487748 | 232748 | 886059 | 232748 | 886059 |
| 1998 | 1.0650 | 0.4599 | 308654 | 835322 | 1578286 | 2368792 | 231634 | 916498 | 231634 | 916498 |
| 1999 | 1.0650 | 0.4599 | 279427 | 774018 | 1481310 | 2235840 | 222428 | 917195 | 222428 | 917195 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : SOP01
Date and time : 01SEP94:16:57
Computation of ref. F: Simple mean, age 5 - 10
Prediction basis : F factors



**Medium growth $F_{med}$**

**Table 3.25** Medium term prediction, detailed output. Low growth $F_{med}$

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: 1994 F-factor: 1.2638 Reference F: 0.5457

| | | | | | | 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 | 0.0349 | 21606 | 11235 | 695000 | 164020 | 0 | 0 | 0 | 0 |
| 4 | 0.1651 | 89986 | 99884 | 650749 | 492617 | 10868 | 8227 | 10868 | 8227 |
| 5 | 0.4572 | 142193 | 245994 | 424289 | 579579 | 32543 | 44454 | 32543 | 44454 |
| 6 | 0.7341 | 61430 | 158490 | 128757 | 293952 | 35189 | 80337 | 35189 | 80337 |
| 7 | 0.6404 | 11223 | 43209 | 25910 | 89104 | 15891 | 54648 | 15891 | 54648 |
| 8 | 0.5174 | 7148 | 38458 | 19359 | 96447 | 17100 | 85191 | 17100 | 85191 |
| 9 | 0.4818 | 7928 | 52403 | 22698 | 155277 | 21563 | 147513 | 21563 | 147513 |
| 10 | 0.4433 | 5347 | 38981 | 16354 | 127185 | 16190 | 125913 | 16190 | 125913 |
| 11 | 0.3042 | 6637 | 59138 | 27780 | 238630 | 27780 | 238630 | 27780 | 238630 |
| 12 | 0.5562 | 1667 | 18088 | 4272 | 36739 | 4272 | 36739 | 4272 | 36739 |
| 13 | 0.8454 | 279 | 3487 | 532 | 6650 | 532 | 6650 | 532 | 6650 |
| 14 | 0.5244 | 6 | 83 | 16 | 222 | 16 | 222 | 16 | 222 |
| 15+ | 0.5244 | 38 | 565 | 101 | 1515 | 101 | 1515 | 101 | 1515 |
| Total | | 355488 | 770016 | 2015817 | 2281938 | 182045 | 830040 | 182045 | 830040 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1995 F-factor: 1.0650 Reference F: 0.4599

| | | | | | | 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 | 0.0294 | 16180 | 12459 | 616000 | 95480 | 0 | 0 | 0 | 0 |
| 4 | 0.1391 | 64821 | 68710 | 549512 | 353336 | 9177 | 5901 | 9177 | 5901 |
| 5 | 0.3853 | 131757 | 204223 | 451724 | 597631 | 34647 | 45838 | 34647 | 45838 |
| 6 | 0.6187 | 92890 | 210859 | 219900 | 445737 | 60099 | 121820 | 60099 | 121820 |
| 7 | 0.5396 | 19294 | 68880 | 50592 | 160375 | 31028 | 98358 | 31028 | 98358 |
| 8 | 0.4360 | 3607 | 18470 | 11182 | 52329 | 9877 | 46223 | 9877 | 46223 |
| 9 | 0.4060 | 2876 | 19014 | 9448 | 62448 | 8975 | 59326 | 8975 | 59326 |
| 10 | 0.3736 | 3264 | 23791 | 11479 | 83682 | 11364 | 82845 | 11364 | 82845 |
| 11 | 0.2563 | 1769 | 15761 | 8595 | 76578 | 8595 | 76578 | 8595 | 76578 |
| 12 | 0.4687 | 5735 | 62222 | 16779 | 182051 | 16779 | 182051 | 16779 | 182051 |
| 13 | 0.7124 | 937 | 11713 | 2005 | 25069 | 2005 | 25069 | 2005 | 25069 |
| 14 | 0.4419 | 61 | 848 | 187 | 2600 | 187 | 2600 | 187 | 2600 |
| 15+ | 0.4419 | 18 | 277 | 57 | 851 | 57 | 851 | 57 | 851 |
| Total | | 343209 | 717228 | 1947458 | 2138166 | 192789 | 747458 | 192789 | 747458 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1996 F-factor: 1.0650 Reference F: 0.4599

| | | | | | | 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 | 0.0294 | 16600 | 12782 | 632000 | 176960 | 0 | 0 | 0 | 0 |
| 4 | 0.1391 | 57769 | 61235 | 489729 | 249762 | 8178 | 4171 | 8178 | 4171 |
| 5 | 0.3853 | 114186 | 176988 | 391483 | 387568 | 30027 | 29726 | 30027 | 29726 |
| 6 | 0.6187 | 106271 | 241236 | 251578 | 432715 | 68756 | 118261 | 68756 | 118261 |
| 7 | 0.5396 | 36985 | 132038 | 96981 | 277365 | 59478 | 170108 | 59478 | 170108 |
| 8 | 0.4360 | 7790 | 39885 | 24147 | 113007 | 21329 | 99819 | 21329 | 99819 |
| 9 | 0.4060 | 1802 | 11913 | 5919 | 39128 | 5624 | 37171 | 5624 | 37171 |
| 10 | 0.3736 | 1465 | 10682 | 5154 | 37573 | 5102 | 37197 | 5102 | 37197 |
| 11 | 0.2563 | 1331 | 11862 | 6468 | 57633 | 6468 | 57633 | 6468 | 57633 |
| 12 | 0.4687 | 1861 | 20194 | 5445 | 59083 | 5445 | 59083 | 5445 | 59083 |
| 13 | 0.7124 | 4017 | 50212 | 8597 | 107462 | 8597 | 107462 | 8597 | 107462 |
| 14 | 0.4419 | 263 | 3650 | 805 | 11194 | 805 | 11194 | 805 | 11194 |
| 15+ | 0.4419 | 42 | 627 | 128 | 1924 | 128 | 1924 | 128 | 1924 |
| Total | | 350384 | 773306 | 1918436 | 1951375 | 219939 | 733751 | 219939 | 733751 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |



(cont.)

continued..

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: 1997 F-factor: 1.0650 Reference F: 0.4599

| | | | | | | 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 | 0.0294 | 12240 | 9425 | 466000 | 167760 | 0 | 0 | 0 | 0 |
| 4 | 0.1391 | 59270 | 62826 | 502450 | 422058 | 8391 | 7048 | 8391 | 7048 |
| 5 | 0.3853 | 101763 | 157733 | 348893 | 505894 | 26760 | 38802 | 26760 | 38802 |
| 6 | 0.6187 | 92099 | 209065 | 218028 | 512367 | 59587 | 140030 | 59587 | 140030 |
| 7 | 0.5396 | 42314 | 151060 | 110952 | 385003 | 68047 | 236122 | 68047 | 236122 |
| 8 | 0.4360 | 14933 | 76458 | 46288 | 224959 | 40886 | 198706 | 40886 | 198706 |
| 9 | 0.4060 | 3892 | 25727 | 12783 | 81941 | 12144 | 77844 | 12144 | 77844 |
| 10 | 0.3736 | 918 | 6693 | 3229 | 26028 | 3197 | 25768 | 3197 | 25768 |
| 11 | 0.2563 | 598 | 5326 | 2904 | 27039 | 2904 | 27039 | 2904 | 27039 |
| 12 | 0.4687 | 1401 | 15198 | 4098 | 44466 | 4098 | 44466 | 4098 | 44466 |
| 13 | 0.7124 | 1304 | 16296 | 2790 | 34876 | 2790 | 34876 | 2790 | 34876 |
| 14 | 0.4419 | 1126 | 15648 | 3452 | 47987 | 3452 | 47987 | 3452 | 47987 |
| 15+ | 0.4419 | 160 | 2403 | 491 | 7371 | 491 | 7371 | 491 | 7371 |
| Total | | 332017 | 753858 | 1722359 | 2487748 | 232748 | 886059 | 232748 | 886059 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1998 F-factor: 1.0650 Reference F: 0.4599

| | | | | | | 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 | 0.0294 | 12240 | 9425 | 466000 | 167760 | 0 | 0 | 0 | 0 |
| 4 | 0.1391 | 43702 | 46324 | 370477 | 311201 | 6187 | 5197 | 6187 | 5197 |
| 5 | 0.3853 | 104407 | 161830 | 357955 | 519034 | 27455 | 39810 | 27455 | 39810 |
| 6 | 0.6187 | 82079 | 186320 | 194308 | 456625 | 53105 | 124796 | 53105 | 124796 |
| 7 | 0.5396 | 36671 | 130914 | 96155 | 333660 | 58972 | 204633 | 58972 | 204633 |
| 8 | 0.4360 | 17084 | 87472 | 52956 | 257366 | 46776 | 227331 | 46776 | 227331 |
| 9 | 0.4060 | 7461 | 49317 | 24505 | 157075 | 23280 | 149222 | 23280 | 149222 |
| 10 | 0.3736 | 1983 | 14454 | 6974 | 56209 | 6904 | 55647 | 6904 | 55647 |
| 11 | 0.2563 | 375 | 3337 | 1820 | 16941 | 1820 | 16941 | 1820 | 16941 |
| 12 | 0.4687 | 629 | 6824 | 1840 | 19965 | 1840 | 19965 | 1840 | 19965 |
| 13 | 0.7124 | 981 | 12264 | 2100 | 26248 | 2100 | 26248 | 2100 | 26248 |
| 14 | 0.4419 | 365 | 5079 | 1120 | 15574 | 1120 | 15574 | 1120 | 15574 |
| 15+ | 0.4419 | 677 | 10152 | 2076 | 31134 | 2076 | 31134 | 2076 | 31134 |
| Total | | 308654 | 723713 | 1578286 | 2368792 | 231634 | 916498 | 231634 | 916498 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1999 F-factor: 1.0650 Reference F: 0.4599

| | | | | | | 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 | 0.0294 | 12240 | 9425 | 466000 | 167760 | 0 | 0 | 0 | 0 |
| 4 | 0.1391 | 43702 | 46324 | 370477 | 311201 | 6187 | 5197 | 6187 | 5197 |
| 5 | 0.3853 | 76983 | 119324 | 263935 | 382706 | 20244 | 29354 | 20244 | 29354 |
| 6 | 0.6187 | 84211 | 191160 | 199355 | 468485 | 54484 | 128037 | 54484 | 128037 |
| 7 | 0.5396 | 32681 | 116672 | 85694 | 297360 | 52556 | 182371 | 52556 | 182371 |
| 8 | 0.4360 | 14806 | 75807 | 45894 | 223044 | 40538 | 197015 | 40538 | 197015 |
| 9 | 0.4060 | 8536 | 56421 | 28035 | 179704 | 26633 | 170718 | 26633 | 170718 |
| 10 | 0.3736 | 3801 | 27707 | 13368 | 107749 | 13235 | 106671 | 13235 | 106671 |
| 11 | 0.2563 | 809 | 7207 | 3930 | 36585 | 3930 | 36585 | 3930 | 36585 |
| 12 | 0.4687 | 394 | 4276 | 1153 | 12510 | 1153 | 12510 | 1153 | 12510 |
| 13 | 0.7124 | 441 | 5507 | 943 | 11785 | 943 | 11785 | 943 | 11785 |
| 14 | 0.4419 | 275 | 3822 | 843 | 11721 | 843 | 11721 | 843 | 11721 |
| 15+ | 0.4419 | 549 | 8228 | 1682 | 25231 | 1682 | 25231 | 1682 | 25231 |
| Total | | 279427 | 671879 | 1481310 | 2235840 | 222428 | 917195 | 222428 | 917195 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

**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 | 30,746 | 22,177 | 964 | 53,887 |
| 1993[1] | 46,596 | 26,840 | 2,480 | 75,916 |

[1]Provisional 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 | 21.2 | 9.5 | 9.3 | 12.9 | 1.0 |
| 1993[1] | 34.0 | 12.6 | 12.9 | 13.9 | 2.5 |

[1]Provisional

**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 | 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 | 266,153 |
| 1973 | 1,212 | 3,214 | 22 | 9,534 | 86,767 | 34 | 32,408 | 186,534 | 2,501 | 322,626 |
| 1974 | 925 | 3,601 | 454 | 23,409 | 66,164 | 3,045 | 37,663 | 78,548 | 7,348 | 221,157 |
| 1975 | 299 | 5,191 | 437 | 15,930 | 55,966 | 1,080 | 28,677 | 65,015 | 3,163 | 175,758 |
| 1976 | 536 | 4,459 | 348 | 16,660 | 49,492 | 986 | 16,940 | 42,485 | 5,358 | 137,265 |
| 1977 | 213 | 1,510 | 144 | 4,798 | 40,118 | - | 10,878 | 52,210 | 287 | 110,158 |
| 1978 | 466 | 1,411 | 369 | 1,521 | 39,955 | 1 | 5,766 | 45,895 | 38 | 95,422 |
| 1979 | 343 | 1,198 | 10 | 1,948 | 66,849 | 2 | 6,454 | 26,365 | 454 | 103,623 |
| 1980 | 497 | 226 | 15 | 1,365 | 61,886 | - | 2,948 | 20,706 | 246 | 87,889 |
| 1981 | 381 | 414 | 22 | 2,398 | 58,856 | Spain | 1,682 | 13,400 | - | 77,153 |
| 1982 | 496 | 53 | - | 1,258 | 41,421 | - | 827 | 2,900 | - | 46,955 |
| 1983 | 428 | - | 1 | 729 | 19,371 | 139 | 259 | 680 | - | 21,607 |
| 1984 | 297 | 15 | 4 | 400 | 15,186 | 37 | 276 | 1,103 | - | 17,318 |
| 1985 | 424 | 21 | 20 | 395 | 17,490 | 77 | 153 | 22,690 | - | 41,270 |
| 1986 | 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 | - | 25,816 |
| 1991 | 1,117 | 60 | Greenland | 219 | 19,285 | - | 514 | 12,388 | 22 | 33,605 |
| 1992 | 1,093 | 151 | 1,719 | 387 | 30,203 | 38 | 596 | 19,699 | 1 | 53,887 |
| 1993[1] | 546 | 1,215 | 880 | 1,165 | 35,469 | 76 | 1,802 | 34,700 | 63 | 75,916 |

[1]Provisional figures.
[2]USSR prior to 1991.

**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 | 0.36 | 0.93 | 1.37 | 1.62 | 1.84 | 1.98 | 2.09 | 2.20 | 2.72 | 3.14 | 2.92 | 2.28 | 3.29 |
| 1993[1] | 0.37 | 0.82 | 1.19 | 1.59 | 1.81 | 2.00 | 2.07 | 2.30 | 2.41 | 2.78 | 3.52 | 2.49 | 4.14 |

**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 | 0.24 | 0.77 | 1.33 | 1.91 | 2.17 | 2.56 | 2.78 | 3.13 | 3.77 | - | - | - | - |
| 1993[1] | 0.16 | 0.45 | 0.98 | 1.44 | 1.93 | 2.41 | 2.62 | 2.88 | 3.27 | 3.73 | 4.14 | - | - |
| 1994[2] | 0.08 | 0.18 | 0.65 | 1.17 | 1.59 | 1.80 | - | - | 3.15 | - | 4.10 | - | - |

[1]Provisional.
[2]Data from January–June.

**Table 4.5** Haddock 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1950 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1951 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1952 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1953 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1954 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1955 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1956 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1957 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1958 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1959 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1960 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1961 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1962 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1963 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1964 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1965 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1966 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1967 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1968 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1969 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1970 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1971 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1972 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1973 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1974 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1975 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1976 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1977 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1978 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1979 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1980 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1981 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1982 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1983 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1984 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1985 | -1.00 | -1.00 | 0.440 | 0.820 | 1.780 | 2.400 | 2.690 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1986 | -1.00 | -1.00 | 0.280 | 0.820 | 1.530 | 2.260 | 2.260 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1987 | -1.00 | -1.00 | 0.240 | 0.480 | 0.930 | 2.220 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1988 | 0.030 | 0.090 | 0.270 | 0.390 | 0.610 | 1.100 | 1.560 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1989 | 0.040 | 0.100 | 0.280 | 0.440 | 0.700 | 1.020 | 1.430 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1990 | 0.030 | 0.120 | 0.280 | 0.720 | 0.950 | 1.270 | 1.510 | 1.900 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1991 | 0.050 | 0.140 | 0.390 | 0.750 | 1.480 | 1.620 | 1.690 | 2.080 | 2.360 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1992 | 0.043 | 0.142 | 0.370 | 0.900 | 1.530 | 2.240 | 2.440 | 3.050 | 3.390 | 3.400 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1993 | 0.033 | 0.103 | 0.304 | 0.819 | 1.437 | 2.115 | 2.344 | 2.700 | 3.100 | 3.380 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1994 | 0.028 | 0.094 | 0.234 | 0.545 | 1.052 | 1.536 | 1.954 | 2.374 | 2.621 | 3.160 | 5.400 | 6.700 | 7.400 | 8.000 |

**Table 4.6** Haddock 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1950 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1951 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1952 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1953 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1954 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1955 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1956 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1957 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1958 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1959 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1960 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1961 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1962 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1963 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1964 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1965 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1966 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1967 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1968 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1969 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1970 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1971 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1972 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1973 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1974 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1975 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1976 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1977 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1978 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1979 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1980 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1981 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1982 | -1.00 | -1.00 | 0.660 | 1.030 | 1.790 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1983 | -1.00 | -1.00 | 1.520 | 1.860 | 2.100 | 2.380 | 2.860 | 3.330 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1984 | -1.00 | -1.00 | 1.570 | 1.990 | 2.420 | 2.680 | 2.930 | 3.370 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1985 | -1.00 | -1.00 | 0.920 | 1.660 | 2.390 | 2.710 | 2.890 | 3.220 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1986 | -1.00 | -1.00 | 0.860 | 1.250 | 1.880 | 2.410 | 2.660 | 3.040 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1987 | -1.00 | -1.00 | 0.640 | 0.860 | 1.330 | 2.450 | 2.980 | 2.980 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1988 | -1.00 | -1.00 | 0.580 | 0.840 | 1.050 | 1.430 | 1.970 | 2.520 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1989 | -1.00 | -1.00 | 0.800 | 0.890 | 1.170 | 1.370 | 1.710 | 2.010 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1990 | 0.250 | 0.640 | 0.890 | 1.220 | 1.400 | 1.600 | 1.770 | 2.160 | 3.700 | 4.410 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1991 | -1.00 | -1.00 | 0.770 | 1.310 | 1.610 | 1.860 | 2.110 | 2.340 | 2.930 | 2.340 | 5.400 | 6.700 | 7.400 | 8.000 |
| 1992 | 0.040 | 0.280 | 0.840 | 1.360 | 1.700 | 1.960 | 2.290 | 2.390 | 2.320 | 2.880 | 3.140 | 2.920 | 2.280 | 3.290 |
| 1993 | 0.080 | 0.250 | 0.600 | 1.060 | 1.530 | 1.880 | 2.190 | 2.360 | 2.510 | 2.680 | 3.350 | 3.930 | 2.490 | 4.450 |

**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 |
| 1994 | - | 2 | 13 | 41 | 90 | 88 | 100 | 100 |

**Table 4.8** Haddock in the North-East Arctic (Fishing Areas I and II)
Data for tuning.

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

Russian bottom trawl, total area, Nov-Dec, age 1-7, calendar (code: FLT23)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 |
|---|---|---|---|---|---|---|---|---|
| 1983 | 1 | 592.0 | 95.0 | 5.0 | 4.0 | 0.1 | 0.0 | 0.0 |
| 1984 | 1 | 586.0 | 584.0 | 15.0 | 2.0 | 1.0 | 0.1 | 0.0 |
| 1985 | 1 | 144.0 | 1343.0 | 900.0 | 4.0 | 1.0 | 1.0 | 0.0 |
| 1986 | 1 | 14.0 | 107.0 | 363.0 | 164.0 | 1.0 | 0.1 | 0.1 |
| 1987 | 1 | 9.0 | 17.0 | 83.0 | 225.0 | 57.0 | 0.1 | 0.1 |
| 1988 | 1 | 3.0 | 7.0 | 17.0 | 40.0 | 76.0 | 8.0 | 0.1 |
| 1989 | 1 | 18.0 | 24.0 | 4.0 | 14.0 | 41.0 | 81.0 | 11.0 |
| 1990 | 1 | 143.0 | 106.0 | 73.0 | 42.0 | 73.0 | 74.0 | 57.0 |
| 1991 | 1 | 429.0 | 176.0 | 62.0 | 9.0 | 3.0 | 6.0 | 18.0 |
| 1992 | 1 | 282.0 | 1286.0 | 346.0 | 50.0 | 4.0 | 6.0 | 9.0 |
| 1993 | 1 | 48.0 | 357.0 | 1985.0 | 356.0 | 48.0 | 8.0 | 4.0 |

Russian acoustic survey, total area, Oct-Dec, age 1-7, calendar (code: FLT24)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 |
|---|---|---|---|---|---|---|---|---|
| 1985 | 1 | 4340 | 14680 | 6360 | 30 | 10 | 1 | 0 |
| 1986 | 1 | 370 | 2080 | 9170 | 9100 | 20 | 1 | 1 |
| 1987 | 1 | 160 | 290 | 620 | 1970 | 610 | 1 | 0 |
| 1988 | 1 | 10 | 30 | 180 | 830 | 3010 | 460 | 0 |
| 1989 | 1 | 320 | 940 | 20 | 140 | 350 | 670 | 90 |
| 1990 | 1 | 1760 | 750 | 280 | 170 | 230 | 430 | 440 |
| 1991 | 1 | 3680 | 1430 | 650 | 110 | 40 | 70 | 210 |
| 1992 | 1 | 2450 | 7580 | 2180 | 350 | 30 | 40 | 70 |
| 1993 | 1 | 260 | 1990 | 10760 | 2280 | 310 | 50 | 20 |

Norway bott trawl survey, Barents sea, Jan-Mar, age 1-7, shifted (code: FLT25)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 |
|---|---|---|---|---|---|---|---|---|
| 1980 | 1 | 70.0 | 260.0 | 110.0 | 27.0 | 81.0 | 7.0 | 3.0 |
| 1981 | 1 | 14.0 | 20.0 | 24.0 | 29.0 | 73.0 | 36.0 | 3.0 |
| 1982 | 1 | 57.0 | 31.0 | 35.0 | 19.0 | 19.0 | 42.0 | 19.0 |
| 1983 | 1 | 5920.0 | 169.0 | 21.0 | 10.0 | 3.0 | 4.0 | 4.0 |
| 1984 | 1 | 11800.0 | 4360.0 | 82.0 | 6.0 | 3.0 | 4.0 | 4.0 |
| 1985 | 1 | 3120.0 | 3850.0 | 1660.0 | 67.0 | 7.0 | 2.0 | 2.0 |
| 1986 | 1 | 782.0 | 1870.0 | 3550.0 | 753.0 | 2.0 | 3.0 | 0.5 |
| 1987 | 1 | 150.0 | 303.0 | 830.0 | 1550.0 | 238.0 | 3.0 | 0.1 |
| 1988 | 1 | 60.0 | 101.0 | 192.0 | 379.0 | 409.0 | 44.0 | 0.1 |
| 1989 | 1 | 492.0 | 48.0 | 49.0 | 77.0 | 143.0 | 184.0 | 26.0 |
| 1990 | 1 | 4047.0 | 905.0 | 176.0 | 47.0 | 36.0 | 46.0 | 85.0 |
| 1991 | 1 | 11688.0 | 3511.0 | 899.0 | 62.0 | 13.0 | 20.0 | 78.0 |
| 1992 | 1 | 4680.0 | 5266.0 | 1482.0 | 149.0 | 6.0 | 8.0 | 4.0 |
| 1993 | 1 | 1565.0 | 3168.0 | 5727.0 | 760.0 | 49.0 | 3.0 | 2.0 |

Norway acoustic survey, Barents sea, Jan-Mar, age 1-7, shifted (code: FLT26)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 |
|---|---|---|---|---|---|---|---|---|
| 1980 | 1 | 110 | 50 | 220 | 630 | 190 | 10 | 3 |
| 1981 | 1 | 20 | 20 | 30 | 50 | 110 | 50 | 3 |
| 1982 | 1 | 30 | 220 | 30 | 20 | 10 | 30 | 20 |
| 1983 | 1 | 1990 | 70 | 20 | 10 | 3 | 3 | 3 |
| 1984 | 1 | 7880 | 2840 | 80 | 10 | 3 | 3 | 10 |
| 1985 | 1 | 2760 | 4740 | 1960 | 10 | 3 | 3 | 3 |
| 1986 | 1 | 200 | 600 | 1990 | 550 | 3 | 3 | 3 |
| 1987 | 1 | 30 | 70 | 210 | 460 | 80 | 3 | 3 |
| 1988 | 1 | 40 | 60 | 100 | 190 | 210 | 20 | 3 |
| 1989 | 1 | 360 | 40 | 30 | 50 | 90 | 120 | 20 |
| 1990 | 1 | 2470 | 610 | 100 | 30 | 30 | 30 | 60 |
| 1991 | 1 | 6520 | 1290 | 270 | 30 | 3 | 3 | 10 |
| 1992 | 1 | 5370 | 6140 | 1340 | 140 | 3 | 3 | 10 |
| 1993 | 1 | 1820 | 2570 | 6630 | 1140 | 120 | 3 | 3 |

**Table 4.9** North-East Arctic Haddock: Recruits as 3 year-olds (revised)

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NORTHEAST ARCTIC HADDOCK : recruits as 3 year-olds (inc. data for ages 0,1,2 & 3)
10,37,2                  (No. of surveys, No. of years, VPA Column No.)
1957,   243,    38,     9,    14,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1958,   109,     2,     4,     5,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1959,   241,     7,    14,    33,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1960,   275,    30,    40,    72,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1961,   320,    32,    50,    34,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1962,   100,     5,     3,     4,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1963,   240,    16,     9,    12,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1964,   291,    11,    12,    15,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1965,    20,   0.3,   0.3,   0.3,  -11,    -11,    -11,   -11,   -11,   -11,   -11
1966,    17,   0.3,   0.3,   0.3,  001,    -11,    -11,   -11,   -11,   -11,   -11
1967,   164,     3,    13,     8,  008,    -11,    -11,   -11,   -11,   -11,   -11
1968,    95,   0.3,   0.3,     3,  000.3,  -11,    -11,   -11,   -11,   -11,   -11
1969,  1018,    31,    69,   120,  029,    -11,    -11,   -11,   -11,   -11,   -11
1970,   270,    10,    33,    31,  064,    -11,    -11,   -11,   -11,   -11,   -11
1971,    54,     3,     3,     9,  026,    -11,    -11,   -11,   -11,   -11,   -11
1972,    49,     2,     9,     3,  016,    -11,    -11,   -11,   -11,   -11,   -11
1973,    56,    13,     8,     5,  026,    -11,    -11,   -11,   -11,   -11,   -11
1974,   114,    15,    35,    14,  051,    -11,    -11,   -11,   -11,   -11,   -11
1975,   172,   163,    96,    59,  060,    -11,    -11,   -11,   -11,   -11,   -11
1976,   135,     6,    13,     4,  038,    -11,    -11,   -11,   -11,   -11,   -11
1977,    19,     1,     1,   0.3,  033,    -11,    -11,   -11,   -11,   -11,   -11
1978,     6,   0.3,   0.3,     1,  012,    -11,    -11,   2.6,   -11,   -11,     5
1979,     8,   0.3,   0.3,   0.3,  020,    -11,     7.0,   2.0,   -11,    11,     2
1980,     5,   0.3,   0.3,   0.3,  015,     2.0,    1.4,   3.1,     4,     2,     2
1981,     9,   0.3,   0.3,     8,  003,     2.5,    5.7,  16.9,     4,     3,     7
1982,   256,    23,    59,    63,  038,  1780.0,  592.0,  436.0,   0.3,   199,   284
1983,   342,    40,    79,   239,  062,  3450.0, 1180.0,  385.0,  1334,   788,   474
1984,    91,     9,    19,    18,  078,   911.0,  312.0,  187.0,  1168,   276,    60
1985,    31,     5,     2,     3,  027,   416.0,   78.2,   30.3,   413,    20,     7
1986,    15,   0.3,     1,     1,  039,    86.1,   15.0,   10.1,    58,     3,     6
1987,    17,   0.3,   0.3,     4,  010,    28.6,    6.0,    4.8,    10,     4,     4
1988,    66,     2,     3,    21,  013,    51.7,   49.2,   90.5,    29,    36,    61
1989,   160,     3,    25,    30,  014,   356.0,  404.7,  351.1,   273,   247,   129
1990,   272,    81,    67,   173,  058,   978.2, 1168.8,  526.6,  1344,   652,   614
1991,   153,    17,    44,    69,  117,   821.9,  468.0,  316.8,   580,   537,   257
1992,    69,    20,     8,   -11,  087,   431.9,  156.5,   -11,   832,   182,   -11
1993,   -11,     6,   -11,   -11,  064,   369.9,   -11,    -11,   538,   -11,   -11
R-T-1    Russian Bottom Trawl Survey, age 0+
R-T-2    Russian Bottom Trawl Survey, age 1+
R-T-3    Russian Bottom Trawl Survey, age 2+
INTOGP   International 0 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
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**Table 4.10** North-East Arctic Haddock: Recruits as 3 year-olds.

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

Data for 10 surveys over 37 years : 1957 - 1993

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 | 142 | 4.96 | .24 | .09 | .14 | 100 | 4.62 |
| 1963 | 180 | 5.20 | .19 | .07 | .13 | 241 | 5.48 |
| 1964 | 196 | 5.28 | .19 | .02 | .01 | 292 | 5.68 |
| 1965 | 81 | 4.40 | .28 | .03 | .01 | 21 | 3.04 |
| 1966 | 38 | 3.65 | .36 | .03 | .01 | 18 | 2.89 |
| 1967 | 120 | 4.79 | .32 | .28 | .76 | 165 | 5.11 |
| 1968 | 43 | 3.76 | .34 | .27 | .61 | 96 | 4.56 |
| 1969 | 609 | 6.41 | .39 | .21 | .28 | 1019 | 6.93 |
| 1970 | 330 | 5.80 | .34 | .19 | .31 | 271 | 5.60 |
| 1971 | 116 | 4.76 | .32 | .17 | .28 | 55 | 4.01 |
| 1972 | 89 | 4.50 | .35 | .24 | .49 | 50 | 3.91 |
| 1973 | 127 | 4.85 | .35 | .27 | .59 | 56 | 4.04 |
| 1974 | 209 | 5.34 | .37 | .16 | .20 | 115 | 4.74 |
| 1975 | 518 | 6.25 | .41 | .26 | .42 | 173 | 5.15 |
| 1976 | 89 | 4.50 | .41 | .20 | .23 | 135 | 4.91 |
| 1977 | 44 | 3.80 | .44 | .32 | .53 | 20 | 3.00 |
| 1978 | 37 | 3.61 | .43 | .18 | .17 | 6 | 1.95 |
| 1979 | 24 | 3.19 | .51 | .26 | .25 | 9 | 2.20 |
| 1980 | 19 | 2.96 | .51 | .22 | .18 | 6 | 1.79 |
| 1981 | 1 | .19 | .14 | .45 | 9.61 | 10 | 2.30 |
| 1982 | 89 | 4.50 | .43 | .44 | 1.05 | 256 | 5.55 |
| 1983 | 314 | 5.75 | .28 | .50 | 3.23 | 342 | 5.84 |
| 1984 | 126 | 4.84 | .17 | .12 | .46 | 92 | 4.52 |
| 1985 | 33 | 3.53 | .19 | .22 | 1.38 | 32 | 3.47 |
| 1986 | 15 | 2.75 | .21 | .14 | .46 | 16 | 2.77 |
| 1987 | 11 | 2.40 | .19 | .10 | .25 | 18 | 2.89 |
| 1988 | 41 | 3.74 | .19 | .16 | .67 | 67 | 4.20 |
| 1989 | 117 | 4.76 | .20 | .18 | .77 | 160 | 5.08 |
| 1990 | 299 | 5.70 | .21 | .13 | .37 | 273 | 5.61 |
| 1991 | 187 | 5.23 | .19 | .06 | .12 | 153 | 5.04 |
| 1992 | 89 | 4.50 | .23 | .13 | .33 | 69 | 4.25 |
| 1993 | 80 | 4.39 | .47 | .12 | .06 | | |

Yearclass = 1993

| | 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-1 | .77 | 2.64 | .70 | .739 | 36 | 1.95 | 4.13 | .796 | .342 |
| R-T-2 | | | | | | | | | |
| R-T-3 | | | | | | | | | |
| INTOGP | .81 | 1.29 | 1.12 | .331 | 27 | 4.17 | 4.66 | 1.305 | .127 |
| N-BST1 | .54 | 1.25 | .63 | .770 | 13 | 5.92 | 4.47 | .730 | .406 |
| N-BST2 | | | | | | | | | |
| N-BST3 | | | | | | | | | |
| N-BSA1 | .28 | 2.85 | 1.12 | .273 | 13 | 6.29 | 4.61 | 1.318 | .125 |
| N-BSA2 | | | | | | | | | |
| N-BSA3 | | | | | | | | | |
| | | | | | VPA Mean = | | 4.08 | 1.305 | .000 |

**Table 4.11** Extended Survivors Analysis.

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Lowestoft VPA Version 3.1

  28-Aug-94  15:33:26

Extended Survivors Analysis

Haddock in the North-East Arctic (Fishing Areas I and II) (run name: H9302)

CPUE data from file /users/ifad/ifapwork/wg_108/had_arct/FLEET.941

Catch data for  44 years. 1950 to 1993. Ages  1 to  11.

     Fleet,           First, Last, First, Last, Alpha,  Beta
                ,      year, year,  age ,  age
FLT23: Russian botto,   1983, 1993,   1,     7,   .900,  1.000
FLT24: Russian acous,   1985, 1993,   1,     7,   .900,  1.000
FLT25: Norway bott t,   1980, 1993,   1,     7,   .990,  1.000
FLT26: Norway acoust,   1980, 1993,   1,     7,   .990,  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 = P
        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 =     .00484


Final year F values
Age         ,     1,     2,     3,     4,     5,     6,     7,     8,     9,    10
Iteration 29,  .0008,  .0018,  .0532,  .2689,  .6215,  .7918,  .5396,  .4082,  .3402,  .3561
Iteration 30,  .0008,  .0018,  .0532,  .2688,  .6212,  .7913,  .5388,  .4074,  .3393,  .3547
```

**continued..**

Table 4.11 (continued)

Log catchability residuals.

Fleet : FLT23: Russian botto

| Age | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|
| 1 | 99.99 | 99.99 | 99.99 | .11 |
| 2 | 99.99 | 99.99 | 99.99 | 1.98 |
| 3 | 99.99 | 99.99 | 99.99 | .73 |
| 4 | 99.99 | 99.99 | 99.99 | -.18 |
| 5 | 99.99 | 99.99 | 99.99 | -2.69 |
| 6 | 99.99 | 99.99 | 99.99 | 99.99 |
| 7 | 99.99 | 99.99 | 99.99 | 99.99 |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -.19 | .34 | .10 | .55 | -.17 | -.53 | -.22 | -.13 | .21 | .01 |
| 2 | -.30 | -.07 | -.33 | -.40 | -.26 | .43 | -.02 | -.58 | .13 | -.09 |
| 3 | .84 | .02 | -.86 | -.49 | -.42 | -.60 | 1.12 | -.35 | -.13 | .42 |
| 4 | -.46 | -.48 | .09 | .09 | -.65 | -.60 | 1.17 | -.44 | .06 | 1.12 |
| 5 | -.58 | -.18 | -.94 | .57 | .18 | .31 | 1.82 | -.57 | -.28 | 1.26 |
| 6 | -2.05 | .36 | -1.69 | -2.58 | .14 | 1.13 | 1.44 | -.02 | .93 | 1.54 |
| 7 | 99.99 | 99.99 | -1.28 | -1.23 | -2.25 | 1.16 | 1.10 | .31 | .79 | 1.08 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 |
|---|---|---|---|---|
| Mean Log q | -6.5001 | -6.9287 | -7.0906 | -6.9104 |
| S.E(Log q) | .6647 | 1.1366 | 1.4944 | 1.3398 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .57 | -7.356 | 9.24 | .92 | 11 | .32 | -7.34 |
| 2 | .63 | -2.924 | 8.25 | .75 | 11 | .67 | -6.37 |
| 3 | .63 | -3.284 | 8.01 | .80 | 11 | .69 | -6.28 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .77 | -2.124 | 7.38 | .87 | 11 | .56 | -6.50 |
| 5 | .58 | -4.643 | 8.05 | .83 | 11 | .63 | -6.93 |
| 6 | .48 | -5.909 | 8.01 | .81 | 10 | .66 | -7.09 |
| 7 | .52 | -5.800 | 7.60 | .87 | 8 | .55 | -6.91 |

continued...

Table 4.11 (continued)

Fleet : FLT24: Russian acous

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 99.99 | .63 | .61 | .94 | -.38 | -.22 | -.33 | -.54 | -.14 | -.34 |
| 2 | 99.99 | -.09 | .17 | .17 | -.37 | 1.42 | -.08 | -.60 | -.22 | -.37 |
| 3 | 99.99 | -.07 | -.19 | -.33 | .07 | -.40 | .92 | .01 | -.20 | .12 |
| 4 | 99.99 | -.87 | 1.71 | -.14 | -.02 | -.69 | .17 | -.33 | -.39 | .58 |
| 5 | 99.99 | -.47 | -.54 | .35 | 1.27 | -.14 | .37 | -.57 | -.86 | .53 |
| 6 | 99.99 | -1.93 | -1.68 | -2.57 | 1.90 | .96 | .91 | .15 | .54 | 1.08 |
| 7 | 99.99 | 99.99 | -1.63 | 99.99 | 99.99 | .61 | .49 | .11 | .19 | .04 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 |
|---|---|---|---|---|
| Mean Log q | -4.1025 | -4.3348 | -4.8022 | -4.2600 |
| S.E(Log q) | .7559 | .6888 | 1.5567 | .7861 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .44 | -5.107 | 8.65 | .72 | 9 | .58 | -5.06 |
| 2 | .55 | -3.451 | 7.51 | .73 | 9 | .65 | -4.24 |
| 3 | .54 | -6.215 | 7.49 | .89 | 9 | .43 | -4.25 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .66 | -3.776 | 6.34 | .89 | 9 | .46 | -4.10 |
| 5 | .69 | -5.205 | 6.07 | .95 | 9 | .33 | -4.33 |
| 6 | .47 | -8.076 | 7.05 | .88 | 9 | .50 | -4.80 |
| 7 | .64 | -4.512 | 5.91 | .94 | 6 | .35 | -4.26 |

continued...

Table 4.11 (continued)

Fleet : FLT25: Norway bott t

| Age | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|
| 1 | .39 | -.10 | .23 | -.34 |
| 2 | 1.58 | -.57 | .24 | .91 |
| 3 | -.06 | -.05 | -.06 | .07 |
| 4 | -2.53 | -.68 | .16 | -.60 |
| 5 | .27 | -.11 | .26 | -.38 |
| 6 | .05 | .49 | .20 | -.75 |
| 7 | 1.21 | .69 | 1.10 | -1.03 |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -.21 | .30 | .54 | .22 | -.43 | -.51 | -.10 | .02 | .04 | .17 |
| 2 | -.22 | -.59 | .22 | .02 | -.06 | -.67 | .02 | .10 | -.14 | .08 |
| 3 | .53 | -.50 | -.24 | -.07 | -.14 | -.47 | .41 | .32 | -.15 | .35 |
| 4 | -.70 | .99 | .28 | .69 | .25 | -.24 | -.06 | .15 | -.19 | .54 |
| 5 | -.57 | .67 | -1.34 | .94 | .78 | .47 | .01 | -.19 | -.97 | .20 |
| 6 | .35 | -.21 | .43 | -.46 | .60 | .69 | -.32 | -.09 | -.05 | -.70 |
| 7 | .35 | .87 | -.22 | -1.79 | -2.81 | 1.47 | .93 | 1.21 | -.59 | -.17 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 |
|---|---|---|---|---|
| Mean Log q | -5.1369 | -5.8121 | -5.7895 | -6.3213 |
| S.E(Log q) | .6981 | .6918 | .4821 | 1.3244 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .61 | -7.830 | 7.07 | .94 | 14 | .33 | -4.34 |
| 2 | .71 | -3.538 | 6.39 | .88 | 14 | .52 | -4.43 |
| 3 | .78 | -3.851 | 5.93 | .95 | 14 | .35 | -4.57 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .77 | -2.148 | 6.32 | .84 | 14 | .60 | -5.14 |
| 5 | .70 | -4.188 | 6.95 | .91 | 14 | .43 | -5.81 |
| 6 | .81 | -2.264 | 6.38 | .91 | 14 | .41 | -5.79 |
| 7 | .49 | -5.014 | 7.28 | .72 | 14 | .73 | -6.32 |

continued...

Table 4.11 (continued)

Fleet : FLT26: Norway acoust

| Age | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|
| 1 | 1.02 | .54 | .24 | -.77 |
| 2 | .76 | -.20 | 1.93 | .63 |
| 3 | .77 | .49 | .18 | .40 |
| 4 | .88 | .13 | .47 | -.34 |
| 5 | 1.45 | .63 | -.06 | -.05 |
| 6 | .80 | 1.21 | .25 | -.65 |
| 7 | .55 | .03 | .50 | -1.97 |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -.27 | .45 | .03 | -.35 | -.28 | -.40 | -.17 | -.15 | .32 | .50 |
| 2 | -.28 | -.22 | -.30 | -.68 | -.08 | -.45 | .03 | -.34 | .19 | .18 |
| 3 | .84 | -.16 | -.47 | -.84 | -.33 | -.50 | .28 | -.33 | .00 | .64 |
| 4 | .07 | -.65 | .23 | -.27 | -.18 | -.41 | -.25 | -.32 | .01 | 1.20 |
| 5 | -.25 | .15 | -.61 | .17 | .44 | .33 | .15 | -1.33 | -1.34 | 1.42 |
| 6 | .46 | .58 | .82 | -.07 | .20 | .65 | -.36 | -1.60 | -.64 | -.31 |
| 7 | .61 | .62 | .91 | .96 | -.07 | .55 | -.07 | -1.51 | -.33 | -.42 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 |
|---|---|---|---|---|
| Mean Log q | -5.3984 | -6.1385 | -6.1791 | -5.6652 |
| S.E(Log q) | .5173 | .8378 | .7556 | .8705 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 1 | .57 | -6.630 | 7.63 | .89 | 14 | .46 | -4.80 |
| 2 | .68 | -3.258 | 6.85 | .84 | 14 | .62 | -4.84 |
| 3 | .75 | -2.828 | 6.41 | .88 | 14 | .55 | -4.94 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | .81 | -2.377 | 6.30 | .92 | 14 | .43 | -5.40 |
| 5 | .66 | -3.815 | 7.32 | .86 | 14 | .55 | -6.14 |
| 6 | .77 | -1.498 | 6.81 | .73 | 14 | .71 | -6.18 |
| 7 | .97 | -.105 | 5.74 | .55 | 14 | .92 | -5.67 |

continued...

**Table 4.11 (continued)**

Terminal year survivor and F summaries :

Age 1 Catchability dependent on age and year class strength

Year class = 1992

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 84700., | .338, | .000, | .00, | 1, .331, | .001 |
| FLT24: Russian acous, | 60169., | .617, | .000, | .00, | 1, .099, | .001 |
| FLT25: Norway bott t, | 99745., | .350, | .000, | .00, | 1, .310, | .001 |
| FLT26: Norway acoust, | 139322., | .480, | .000, | .00, | 1, .164, | .001 |
| P shrinkage mean , | 66096., | 1.44,,,, | | | .018, | .001 |
| F shrinkage mean , | 23251., | .70,,,, | | | .077, | .003 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 84170., | .19, | .20, | 6, | 1.038, | .001 |

Age 2 Catchability dependent on age and year class strength

Year class = 1991

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 178452., | .313, | .118, | .38, | 2, .295, | .002 |
| FLT24: Russian acous, | 119587., | .466, | .115, | .25, | 2, .133, | .002 |
| FLT25: Norway bott t, | 161232., | .301, | .019, | .06, | 2, .318, | .002 |
| FLT26: Norway acoust, | 200573., | .399, | .069, | .17, | 2, .181, | .001 |
| P shrinkage mean , | 47398., | 1.47,,,, | | | .013, | .006 |
| F shrinkage mean , | 52060., | .70,,,, | | | .059, | .005 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 152795., | .17, | .12, | 10, | .709, | .002 |

Age 3 Catchability dependent on age and year class strength

Year class = 1990

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 208592., | .299, | .140, | .47, | 3, .234, | .054 |
| FLT24: Russian acous, | 184064., | .343, | .200, | .58, | 3, .179, | .061 |
| FLT25: Norway bott t, | 237892., | .244, | .135, | .55, | 3, .353, | .048 |
| FLT26: Norway acoust, | 248069., | .344, | .236, | .69, | 3, .178, | .046 |
| P shrinkage mean , | 29603., | 1.42,,,, | | | .011, | .330 |
| F shrinkage mean , | 141796., | .70,,,, | | | .045, | .078 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 211884., | .15, | .10, | 14, | .664, | .053 |

**continued...**

**Table 4.11 (continued)**

Age 4 Catchability constant w.r.t. time and dependent on age

Year class = 1989

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 71498., | .263, | .299, | 1.13, | 4, .235, | .281 |
| FLT24: Russian acous, | 62588., | .301, | .206, | .69, | 4, .180, | .316 |
| FLT25: Norway bott t, | 73874., | .223, | .119, | .53, | 4, .327, | .274 |
| FLT26: Norway acoust, | 94908., | .279, | .361, | 1.29, | 4, .211, | .219 |
| F shrinkage mean , | 81816., | .70,,,, | | | .047, | .250 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 75386., | .13, | .11, | 17, | .869, | .269 |

Age 5 Catchability constant w.r.t. time and dependent on age

Year class = 1988

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 10631., | .261, | .232, | .89, | 5, .207, | .735 |
| FLT24: Russian acous, | 13551., | .280, | .144, | .51, | 5, .190, | .616 |
| FLT25: Norway bott t, | 12623., | .212, | .177, | .84, | 5, .320, | .649 |
| FLT26: Norway acoust, | 13509., | .265, | .283, | 1.07, | 5, .207, | .618 |
| F shrinkage mean , | 31148., | .70,,,, | | | .076, | .315 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 13411., | .13, | .11, | 21, | .857, | .621 |

Age 6 Catchability constant w.r.t. time and dependent on age

Year class = 1987

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 2212., | .276, | .264, | .96, | 6, .173, | .727 |
| FLT24: Russian acous, | 2825., | .288, | .379, | 1.32, | 6, .164, | .608 |
| FLT25: Norway bott t, | 1445., | .206, | .219, | 1.06, | 6, .355, | .969 |
| FLT26: Norway acoust, | 1429., | .263, | .183, | .70, | 6, .209, | .976 |
| F shrinkage mean , | 5033., | .70,,,, | | | .099, | .385 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 1959., | .13, | .14, | 25, | 1.058, | .791 |

Age 7 Catchability constant w.r.t. time and dependent on age

Year class = 1986

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 2032., | .278, | .239, | .86, | 7, .174, | .378 |
| FLT24: Russian acous, | 1289., | .305, | .203, | .67, | 7, .174, | .545 |
| FLT25: Norway bott t, | 1181., | .206, | .100, | .49, | 7, .331, | .583 |
| FLT26: Norway acoust, | 830., | .266, | .125, | .47, | 7, .220, | .754 |
| F shrinkage mean , | 2392., | .70,,,, | | | .101, | .330 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 1310., | .14, | .10, | 29, | .723, | .539 |



continued...

## Table 4.11

Age 8 Catchability constant w.r.t. time and dependent on age

Year class = 1985

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 2235., | .270, | .232, | .86, | 7, | .173, | .398 |
| FLT24: Russian acous, | 2531., | .279, | .137, | .49, | 7, | .182, | .359 |
| FLT25: Norway bott t, | 2274., | .200, | .125, | .62, | 7, | .330, | .392 |
| FLT26: Norway acoust, | 1421., | .256, | .206, | .81, | 7, | .213, | .570 |
| F shrinkage mean , | 3376., | .70,,,, | | | | .102, | .280 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 2177., | .13, | .09, | 29, | .688, | .407 |

Age 9 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1984

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 5196., | .271, | .204, | .75, | 7, | .174, | .318 |
| FLT24: Russian acous, | 4981., | .283, | .142, | .50, | 7, | .178, | .329 |
| FLT25: Norway bott t, | 5318., | .208, | .140, | .67, | 7, | .325, | .311 |
| FLT26: Norway acoust, | 3455., | .261, | .251, | .96, | 7, | .213, | .446 |
| F shrinkage mean , | 5829., | .70,,,, | | | | .110, | .288 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 4825., | .14, | .09, | 29, | .648, | .339 |

Age 10 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1983

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT23: Russian botto, | 4373., | .347, | .248, | .71, | 7, | .123, | .319 |
| FLT24: Russian acous, | 5828., | .400, | .232, | .58, | 6, | .141, | .248 |
| FLT25: Norway bott t, | 5240., | .252, | .212, | .84, | 7, | .262, | .272 |
| FLT26: Norway acoust, | 3913., | .330, | .158, | .48, | 7, | .185, | .350 |
| F shrinkage mean , | 2269., | .70,,,, | | | | .289, | .544 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 3870., | .23, | .12, | 28, | .497, | .355 |

**Table 4.12** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: H9302)

At 28-Aug-94 15:36:22

Terminal Fs derived using XSA (With F shrinkage)

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 1, | .0005, | .0000, | .0000, | .0000, | .0000, | .0000, | .0003, | .0000, | .0017, | .0000, |
| 2, | .0075, | .0133, | .0078, | .0027, | .0017, | .0058, | .0026, | .0031, | .0307, | .0956, |
| 3, | .0802, | .0678, | .1309, | .0613, | .0424, | .1008, | .1671, | .0233, | .2858, | .3365, |
| 4, | .3182, | .2371, | .3938, | .3149, | .3978, | .1723, | .2296, | .2682, | .3901, | .6055, |
| 5, | .6957, | .4663, | .5870, | .4374, | .5994, | .4991, | .2468, | .1799, | 1.0812, | .9919, |
| 6, | .8683, | .7027, | .7397, | .5112, | .4853, | .6173, | .4951, | .1838, | .9458, | .4806, |
| 7, | .8432, | .6672, | .8330, | .5307, | .6813, | .4394, | .5751, | .4006, | .5640, | .2898, |
| 8, | .9627, | .5901, | .5119, | .5972, | .7127, | .4725, | .4594, | .4541, | .5743, | .2786, |
| 9, | 1.3399, | 1.0549, | .5807, | .3680, | .5179, | .4937, | .3514, | .3539, | .9269, | .2696, |
| 10, | .9524, | .7029, | .6564, | .4927, | .6045, | .5084, | .4286, | .3163, | .8269, | .4656, |
| +gp, | .9524, | .7029, | .6564, | .4927, | .6045, | .5084, | .4286, | .3163, | .8269, | .4656, |
| FBAR 4- 7, | .6814, | .5183, | .6384, | .4485, | .5410, | .4320, | .3866, | .2581, | .7453, | .5920, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 1, | .0034, | .0080, | .0135, | .0010, | .0018, | .0000, | .0000, | .0001, | .0002, | .0000, |
| 2, | .0661, | .0671, | .0570, | .0920, | .0134, | .0023, | .0000, | .0075, | .0053, | .0174, |
| 3, | .2240, | .2557, | .3178, | .7659, | .3590, | .1535, | .0379, | .0960, | .1268, | .1699, |
| 4, | .3428, | .5909, | .6480, | 1.2732, | .6396, | .5001, | .3069, | .2142, | .2588, | .4478, |
| 5, | .4248, | .5202, | .6453, | .9419, | .8698, | .9651, | .6724, | .5520, | .4848, | .4374, |
| 6, | .6984, | .4537, | .7166, | .5458, | .4468, | .9006, | .8073, | .8537, | .6859, | .3718, |
| 7, | .6049, | .6019, | .8321, | .6517, | .8154, | .5145, | .3743, | .7506, | .5185, | .3912, |
| 8, | .4704, | .3612, | .8892, | .5750, | .4691, | .7274, | .7136, | .4452, | .6059, | .3375, |
| 9, | .8527, | .1944, | .8674, | .5737, | .7639, | .5324, | .7993, | .5256, | .3814, | .1670, |
| 10, | .6156, | .4293, | .7982, | .6637, | .6793, | .7351, | .6797, | .6311, | .5397, | .3282, |
| +gp, | .6156, | .4293, | .7982, | .6637, | .6793, | .7351, | .6797, | .6311, | .5397, | .3282, |
| FBAR 4- 7, | .5177, | .5417, | .7105, | .8532, | .6929, | .7201, | .5402, | .5927, | .4870, | .4121, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 1, | .0000, | .0000, | .0023, | .0004, | .0000, | .0000, | .0000, | .0001, | .0061, | .0008, | .0023, |
| 2, | .0009, | .0060, | .0068, | .0045, | .0027, | .0096, | .0040, | .0019, | .0088, | .0018, | .0042, |
| 3, | .0621, | .1348, | .0856, | .0487, | .0287, | .0781, | .0346, | .0678, | .0887, | .0532, | .0699, |
| 4, | .3150, | .2206, | .4567, | .4724, | .1510, | .1948, | .1175, | .1785, | .3190, | .2688, | .2554, |
| 5, | .3551, | .3476, | .3078, | .9293, | .5531, | .3164, | .1328, | .2807, | .3461, | .6212, | .4160, |
| 6, | .2650, | .5893, | .4302, | .2939, | 1.1797, | .5251, | .1659, | .3101, | .4543, | .7913, | .5186, |
| 7, | .3656, | .4803, | .6433, | .4486, | .3175, | .6617, | .2842, | .2699, | .3851, | .5388, | .3980, |
| 8, | .5123, | .5920, | .4203, | .4976, | .2448, | .3497, | .3353, | .3050, | .2525, | .4074, | .3216, |
| 9, | .3148, | .6473, | .6142, | .3974, | .2537, | .0590, | 1.6357, | .2582, | .3141, | .3393, | .3039, |
| 10, | .3550, | .4728, | .5280, | .5411, | .4375, | .4507, | .4119, | .3182, | .2457, | .3547, | .3062, |
| +gp, | .3550, | .4728, | .5280, | .5411, | .4375, | .4507, | .4119, | .3182, | .2457, | .3547, | |
| FBAR 4- 7, | .3252, | .4095, | .4595, | .5360, | .5503, | .4245, | .1751, | .2598, | .3761, | .5550, | |

**Table 4.13** Haddock in the North-Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: H9302)

At 28-Aug-94 15:36:22

Terminal Fs derived using XSA (With F shrinkage)

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 1, | 356440, | 444633, | 26137, | 26192, | 247901, | 142336, | 1532166, | 417773, | 87684, | 78347, |
| 2, | 122706, | 291694, | 364034, | 21398, | 21444, | 202963, | 116534, | 1253998, | 342030, | 71669, |
| 3, | 319860, | 99712, | 235667, | 295730, | 17471, | 17527, | 165215, | 95160, | 1023488, | 271553, |
| 4, | 199335, | 241697, | 76288, | 169280, | 227720, | 13710, | 12974, | 114452, | 76120, | 629641, |
| 5, | 67446, | 118718, | 156116, | 42129, | 101159, | 125246, | 9448, | 8444, | 71664, | 42193, |
| 6, | 11046, | 27539, | 60975, | 71062, | 22272, | 45482, | 62254, | 6044, | 5775, | 19902, |
| 7, | 6827, | 3795, | 11166, | 23827, | 34894, | 11224, | 20086, | 31067, | 4118, | 1836, |
| 8, | 4843, | 2405, | 1594, | 3974, | 11475, | 14454, | 5922, | 9253, | 17040, | 1918, |
| 9, | 1246, | 1514, | 1091, | 782, | 1791, | 4606, | 7378, | 3063, | 4811, | 7856, |
| 10, | 187, | 267, | 432, | 500, | 443, | 874, | 2302, | 4251, | 1760, | 1559, |
| +gp, | 1111, | 1180, | 513, | 745, | 609, | 280, | 827, | 2145, | 3136, | 1668, |
| TOTAL, | 1091047, | 1233154, | 934014, | 655622, | 687180, | 578702, | 1935106, | 1945648, | 1637624, | 1128141, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 1, | 90899, | 184030, | 287331, | 206210, | 27895, | 8750, | 12314, | 7468, | 12700, | 386669, |
| 2, | 64144, | 74167, | 149475, | 232103, | 168664, | 22797, | 7164, | 10082, | 6114, | 10396, |
| 3, | 53326, | 49157, | 56782, | 115597, | 173330, | 136251, | 18621, | 5865, | 8193, | 4979, |
| 4, | 158805, | 34897, | 31165, | 33832, | 44002, | 99102, | 95682, | 14678, | 4363, | 5909, |
| 5, | 281359, | 92286, | 15823, | 13346, | 7754, | 19004, | 49206, | 57637, | 9700, | 2757, |
| 6, | 12812, | 150631, | 44910, | 6795, | 4260, | 2660, | 5927, | 20566, | 27170, | 4891, |
| 7, | 10077, | 5217, | 78345, | 17958, | 3223, | 2231, | 885, | 2165, | 7170, | 11203, |
| 8, | 1125, | 4506, | 2340, | 27910, | 7663, | 1168, | 1092, | 498, | 837, | 3495, |
| 9, | 1188, | 575, | 2571, | 787, | 12859, | 3925, | 462, | 438, | 261, | 374, |
| 10, | 4912, | 415, | 388, | 884, | 363, | 4904, | 1887, | 170, | 212, | 146, |
| +gp, | 4305, | 2486, | 2590, | 853, | 885, | 676, | 3230, | 2247, | 1702, | 635, |
| TOTAL, | 682952, | 598367, | 671721, | 656275, | 450898, | 301468, | 196470, | 121815, | 78421, | 431455, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 1, | 517581, | 137192, | 46583, | 23123, | 25329, | 100224, | 240221, | 410673, | 229655, | 102851, | 0, | 1297 |
| 2, | 316578, | 423759, | 112322, | 38052, | 18924, | 20738, | 82057, | 196671, | 336212, | 186888, | 84170, | 1078 |
| 3, | 8365, | 258964, | 344874, | 91337, | 31015, | 15452, | 16816, | 66916, | 160723, | 272853, | 152795, | 849 |
| 4, | 3440, | 6436, | 185286, | 259199, | 71227, | 24675, | 11701, | 13299, | 51196, | 120421, | 211884, | 615 |
| 5, | 3091, | 2055, | 4226, | 96079, | 132320, | 50144, | 16627, | 8518, | 9108, | 30468, | 75386, | 363 |
| 6, | 1458, | 1775, | 1189, | 2543, | 31058, | 62307, | 29920, | 11920, | 5267, | 5276, | 13411, | 177 |
| 7, | 2761, | 916, | 806, | 633, | 1552, | 7816, | 30172, | 20752, | 7157, | 2738, | 1959, | 81 |
| 8, | 6203, | 1568, | 464, | 347, | 331, | 925, | 3302, | 18592, | 12971, | 3987, | 1310, | 35 |
| 9, | 2042, | 3043, | 710, | 249, | 173, | 212, | 534, | 1933, | 11220, | 8250, | 2177, | 15 |
| 10, | 259, | 1220, | 1304, | 315, | 137, | 110, | 164, | 85, | 1223, | 6710, | 4825, | 6 |
| +gp, | 1065, | 328, | 419, | 746, | 958, | 199, | 97, | 68, | 91, | 1216, | 4568, | |
| TOTAL, | 862841, | 837256, | 698183, | 512623, | 313023, | 282801, | 431611, | 749428, | 824824, | 741657, | 552485, | |

**Table 4.14** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: H94FINAL)

At 31-Aug-94 09:18:19

Table 1 Catch numbers at age Numbers*10**-3

| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 22305, | 5911, | 26157, | 15918, | 657, | 1520, | 23004, | 1979, | 230229, | 70204, |
| 4, | 49162, | 46161, | 22469, | 41373, | 67632, | 1963, | 2408, | 24359, | 22246, | 258773, |
| 5, | 30592, | 40032, | 62724, | 13505, | 41267, | 44526, | 1870, | 1258, | 42849, | 24018, |
| 6, | 5800, | 12578, | 28840, | 25736, | 7748, | 18956, | 21995, | 918, | 3196, | 6872, |
| 7, | 3519, | 1672, | 5711, | 8878, | 15599, | 3611, | 7948, | 9279, | 1606, | 418, |
| 8, | 2709, | 970, | 578, | 1617, | 5292, | 4925, | 1974, | 3056, | 6736, | 422, |
| 9, | 832, | 893, | 435, | 218, | 655, | 1624, | 1978, | 826, | 2630, | 1680, |
| 10, | 104, | 122, | 188, | 176, | 182, | 315, | 726, | 1043, | 896, | 525, |
| 11, | 206, | 204, | 186, | 155, | 101, | 43, | 166, | 369, | 988, | 146, |
| 12, | 234, | 123, | 25, | 76, | 115, | 43, | 26, | 130, | 538, | 340, |
| 13, | 121, | 14, | 8, | 27, | 18, | 14, | 52, | 27, | 53, | 68, |
| +gp, | 67, | 205, | 7, | 7, | 19, | 2, | 19, | 4, | 42, | 13, |
| TOTALNUM, | 115651, | 108885, | 147328, | 107686, | 139285, | 77542, | 62166, | 43248, | 312009, | 363479, |
| TONSLAND, | 98900, | 118079, | 160621, | 136486, | 181726, | 130509, | 86601, | 78302, | 265317, | 320065, |
| SOPCOF %, | 62, | 70, | 66, | 79, | 79, | 80, | 75, | 100, | 86, | 83, |

Table 1 Catch numbers at age Numbers*10**-3

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 9684, | 10037, | 13989, | 55967, | 47311, | 17540, | 627, | 486, | 883, | 704, |
| 4, | 41701, | 14089, | 13449, | 22043, | 18812, | 35290, | 22878, | 2561, | 900, | 1930, |
| 5, | 88111, | 33871, | 6808, | 7368, | 4076, | 10645, | 21794, | 22124, | 3372, | 884, |
| 6, | 5827, | 49712, | 20789, | 2586, | 1389, | 1429, | 2971, | 10685, | 12203, | 1374, |
| 7, | 4138, | 2135, | 40044, | 7781, | 1626, | 812, | 250, | 1034, | 2625, | 3282, |
| 8, | 382, | 1236, | 1247, | 11043, | 2596, | 546, | 504, | 162, | 344, | 906, |
| 9, | 617, | 92, | 1349, | 311, | 6215, | 1466, | 230, | 162, | 75, | 52, |
| 10, | 2043, | 131, | 193, | 388, | 162, | 2310, | 842, | 72, | 80, | 37, |
| 11, | 935, | 500, | 279, | 96, | 258, | 181, | 1299, | 330, | 91, | 29, |
| 12, | 276, | 147, | 652, | 101, | 3, | 87, | 111, | 564, | 320, | 21, |
| 13, | 458, | 53, | 331, | 84, | 74, | 2, | 35, | 27, | 204, | 21, |
| +gp, | 143, | 92, | 46, | 98, | 65, | 53, | 15, | 42, | 34, | 91, |
| TOTALNUM, | 154315, | 112095, | 99176, | 107866, | 82587, | 70361, | 51556, | 38249, | 21131, | 9331, |
| TONSLAND, | 221138, | 175742, | 137279, | 110158, | 95422, | 103623, | 87889, | 77153, | 46955, | 21607, |
| SOPCOF %, | 86, | 81, | 63, | 77, | 95, | 112, | 103, | 98, | 93, | 91, |

Table 1 Catch numbers at age Numbers*10**-3

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 456, | 29548, | 25596, | 3928, | 794, | 1050, | 518, | 3968, | 12342, | 12790, |
| 4, | 841, | 1153, | 61470, | 88297, | 9031, | 3951, | 1174, | 1967, | 12652, | 25684, |
| 5, | 836, | 546, | 1013, | 52611, | 50868, | 12305, | 1871, | 1886, | 2411, | 12756, |
| 6, | 307, | 715, | 376, | 586, | 19465, | 23032, | 4138, | 2876, | 1740, | 2610, |
| 7, | 765, | 316, | 346, | 207, | 382, | 3423, | 6754, | 4442, | 2070, | 1032, |
| 8, | 2250, | 634, | 144, | 123, | 65, | 247, | 851, | 4422, | 2619, | 1207, |
| 9, | 499, | 1312, | 295, | 74, | 35, | 11, | 389, | 398, | 2737, | 2148, |
| 10, | 70, | 416, | 484, | 119, | 44, | 36, | 50, | 21, | 241, | 1813, |
| 11, | 25, | 50, | 112, | 175, | 142, | 12, | 3, | 1, | 12, | 266, |
| 12, | 36, | 5, | 35, | 87, | 135, | 22, | 3, | 7, | 4, | 49, |
| 13, | 44, | 1, | 3, | 4, | 22, | 17, | 9, | 2, | 1, | 11, |
| +gp, | 185, | 57, | 7, | 19, | 11, | 15, | 15, | 7, | 1, | 5, |
| TOTALNUM, | 6314, | 34753, | 89881, | 146230, | 80994, | 44121, | 15775, | 19997, | 36830, | 60371, |
| TONSLAND, | 17661, | 41270, | 96585, | 150659, | 91744, | 55122, | 25816, | 33605, | 53886, | 75916, |
| SOPCOF %, | 91, | 97, | 90, | 98, | 99, | 96, | 96, | 96, | 101, | 100, |

**Table 4.15** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HAD94)

At 31-Aug-94 13:12:13

Traditional vpa using file input for terminal F

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .0798, | .0672, | .1277, | .0623, | .0371, | .1024, | .1677, | .0231, | .2856, | .3370, |
| 4, | .3158, | .2351, | .3868, | .3043, | .4029, | .1479, | .2334, | .2689, | .3846, | .6005, |
| 5, | .6898, | .4597, | .5753, | .4254, | .5646, | .5080, | .2049, | .1838, | 1.0627, | .9493, |
| 6, | .8556, | .6909, | .7160, | .4946, | .4642, | .5547, | .5098, | .1468, | .9627, | .4694, |
| 7, | .7551, | .6499, | .8009, | .5022, | .6398, | .4103, | .4784, | .4203, | .4100, | .3030, |
| 8, | .8427, | .4803, | .4902, | .5554, | .6421, | .4258, | .4135, | .3407, | .6192, | .1783, |
| 9, | .8199, | .7619, | .4126, | .3455, | .4589, | .4137, | .3024, | .3041, | .5538, | .3046, |
| 10, | .2307, | .2609, | .3506, | .2916, | .5438, | .4190, | .3287, | .2582, | .6317, | .2002, |
| 11, | .7626, | .9531, | .7988, | .5472, | .2710, | .2352, | .4080, | .2768, | .4154, | .1943, |
| 12, | 2.1615, | 1.7264, | .2760, | .9390, | 1.0633, | .1769, | .2180, | .6539, | .8276, | .2447, |
| 13, | .9767, | .8496, | .4688, | .5404, | .6032, | .3358, | .3355, | .3684, | .6161, | .2241, |
| +gp, | .9767, | .8496, | .4688, | .5404, | .6032, | .3358, | .3355, | .3684, | .6161, | .2241, |
| FBAR 4- 7, | .6541, | .5089, | .6197, | .4316, | .5179, | .4052, | .3566, | .2549, | .7050, | .5805, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .2218, | .2574, | .3214, | .7657, | .3601, | .1542, | .0376, | .0964, | .1274, | .1702, |
| 4, | .3435, | .5776, | .6488, | 1.2676, | .6412, | .5010, | .3079, | .2115, | .2591, | .4477, |
| 5, | .4205, | .5200, | .6182, | .9372, | .8676, | .9622, | .6718, | .5518, | .4735, | .4367, |
| 6, | .6380, | .4463, | .7126, | .5069, | .4469, | .8946, | .8046, | .8484, | .6833, | .3595, |
| 7, | .5794, | .5114, | .7993, | .6456, | .7040, | .5140, | .3735, | .7461, | .5158, | .3910, |
| 8, | .5004, | .3390, | .6448, | .5345, | .4632, | .5450, | .7089, | .4431, | .6008, | .3360, |
| 9, | .4263, | .2131, | .7639, | .3248, | .6629, | .5209, | .4673, | .5214, | .3792, | .1662, |
| 10, | .7446, | .1490, | .9203, | .5182, | .2801, | .5581, | .6510, | .2595, | .5322, | .3259, |
| 11, | .6512, | .4039, | .5369, | 2.2958, | .7964, | .5782, | .7173, | .5793, | .6065, | .3738, |
| 12, | .6758, | .1955, | 1.5099, | .3784, | .4316, | .6977, | .8759, | .8106, | 2.3588, | .2697, |
| 13, | .6042, | .2588, | .8846, | .8227, | .5286, | .5770, | .6850, | .5421, | .8030, | 1.5000, |
| +gp, | .6042, | .2588, | .8846, | .8227, | .5286, | .5770, | .6850, | .5421, | .8030, | 1.5000, |
| FBAR 4- 7, | .4953, | .5138, | .6947, | .8393, | .6649, | .7179, | .5394, | .5895, | .4829, | .4087, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 3, | .0608, | .1360, | .0861, | .0489, | .0288, | .0785, | .0349, | .0683, | .0889, | .0532, | .0701, |
| 4, | .3147, | .2146, | .4594, | .4723, | .1513, | .1952, | .1181, | .1798, | .3203, | .2688, | .2563, |
| 5, | .3556, | .3469, | .2964, | .9288, | .5521, | .3162, | .1333, | .2816, | .3482, | .6212, | .4170, |
| 6, | .2652, | .5876, | .4283, | .2794, | 1.1696, | .5238, | .1662, | .3105, | .4548, | .7913, | .5189, |
| 7, | .3485, | .4787, | .6391, | .4453, | .2966, | .6556, | .2844, | .2701, | .3853, | .5388, | .3981, |
| 8, | .5106, | .5459, | .4187, | .4934, | .2432, | .3182, | .3324, | .3052, | .2528, | .4074, | .3218, |
| 9, | .3130, | .6415, | .5323, | .3952, | .2518, | .0588, | 1.2383, | .2555, | .3143, | .3393, | .3031, |
| 10, | .3516, | .4673, | .5209, | .4261, | .4335, | .4440, | .4066, | .1795, | .2425, | .3547, | .2589, |
| 11, | .3822, | .4573, | .2190, | .3605, | 1.4357, | .2002, | .0590, | .0124, | .1477, | .4600, | .2067, |
| 12, | 1.1362, | .1213, | .6809, | .2641, | .5240, | .9432, | .0703, | .1896, | .0629, | 1.5000, | .5842, |
| 13, | 1.5000, | .0758, | .0993, | .1478, | .0983, | .1128, | 1.5000, | .0611, | .0372, | .2452, | .1145, |
| +gp, | 1.5000, | .0758, | .0993, | .1478, | .0983, | .1128, | 1.5000, | .0611, | .0372, | .2452, | |
| FBAR 4- 7, | .3210, | .4069, | .4558, | .5315, | .5424, | .4227, | .1755, | .2605, | .3771, | .5550, | |

**Table 4.16** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HAD94)

At 31-Aug-94 13:12:13

Traditional vpa using file input for terminal F

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 3, | 320325, | 100299, | 240255, | 290547, | 19917, | 17203, | 163905, | 95473, | 1017670, | 269228, |
| 4, | 199248, | 242138, | 76784, | 173126, | 223515, | 15714, | 12714, | 113472, | 76379, | 626209, |
| 5, | 66966, | 118953, | 156710, | 42698, | 104558, | 122311, | 11096, | 8243, | 70997, | 42566, |
| 6, | 10975, | 27505, | 61502, | 72178, | 22845, | 48673, | 60255, | 7402, | 5616, | 20084, |
| 7, | 7235, | 3819, | 11285, | 24607, | 36036, | 11758, | 22883, | 29630, | 5233, | 1756, |
| 8, | 5177, | 2784, | 1632, | 4148, | 12193, | 15560, | 6387, | 11612, | 15936, | 2843, |
| 9, | 1619, | 1825, | 1410, | 819, | 1949, | 5253, | 8322, | 3458, | 6762, | 7024, |
| 10, | 555, | 584, | 697, | 764, | 474, | 1008, | 2844, | 5036, | 2089, | 3182, |
| 11, | 421, | 361, | 368, | 402, | 467, | 226, | 543, | 1676, | 3185, | 909, |
| 12, | 282, | 161, | 114, | 136, | 190, | 292, | 146, | 296, | 1040, | 1721, |
| 13, | 211, | 27, | 23, | 71, | 43, | 54, | 200, | 96, | 126, | 372, |
| +gp, | 117, | 390, | 20, | 18, | 46, | 8, | 73, | 14, | 100, | 71, |
| TOTAL, | 613129, | 498843, | 550802, | 609514, | 422235, | 238060, | 289368, | 276407, | 1205131, | 975966, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 3, | 53508, | 48592, | 55860, | 113975, | 171575, | 135061, | 18730, | 5826, | 8126, | 4950, |
| 4, | 157362, | 35093, | 30756, | 33164, | 43391, | 97990, | 94775, | 14769, | 4331, | 5857, |
| 5, | 281243, | 91381, | 16126, | 13161, | 7644, | 18710, | 48612, | 57034, | 9787, | 2737, |
| 6, | 13488, | 151222, | 44482, | 7115, | 4221, | 2628, | 5853, | 20330, | 26892, | 4990, |
| 7, | 10283, | 5834, | 79234, | 17858, | 3509, | 2210, | 880, | 2143, | 7126, | 11117, |
| 8, | 1062, | 4717, | 2864, | 29170, | 7667, | 1421, | 1082, | 496, | 832, | 3483, |
| 9, | 1948, | 527, | 2752, | 1231, | 13995, | 3950, | 675, | 436, | 261, | 374, |
| 10, | 4241, | 1041, | 349, | 1049, | 728, | 5905, | 1921, | 346, | 212, | 146, |
| 11, | 2133, | 1649, | 734, | 114, | 512, | 451, | 2767, | 820, | 219, | 102, |
| 12, | 613, | 910, | 901, | 352, | 9, | 189, | 207, | 1106, | 376, | 98, |
| 13, | 1103, | 255, | 613, | 163, | 197, | 5, | 77, | 71, | 402, | 29, |
| +gp, | 344, | 443, | 85, | 190, | 173, | 132, | 33, | 110, | 67, | 126, |
| TOTAL, | 527328, | 341666, | 234756, | 217543, | 253619, | 268653, | 175611, | 103486, | 58630, | 34009, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 3, | 8520, | 255719, | 341816, | 90788, | 30804, | 15327, | 16633, | 66247, | 159788, | 272133, | 0, | 849 |
| 4, | 3419, | 6564, | 182733, | 256767, | 70785, | 24503, | 11602, | 13150, | 50658, | 119691, | 211260, | 614 |
| 5, | 3065, | 2043, | 4336, | 94502, | 131083, | 49816, | 16504, | 8440, | 8995, | 30107, | 74897, | 364 |
| 6, | 1448, | 1758, | 1182, | 2640, | 30563, | 61788, | 29729, | 11826, | 5214, | 5199, | 13244, | 179 |
| 7, | 2852, | 909, | 800, | 631, | 1634, | 7770, | 29962, | 20612, | 7098, | 2709, | 1929, | 83 |
| 8, | 6156, | 1648, | 461, | 346, | 331, | 995, | 3302, | 18458, | 12881, | 3953, | 1294, | 37 |
| 9, | 2038, | 3025, | 782, | 248, | 173, | 212, | 592, | 1939, | 11138, | 8190, | 2153, | 17 |
| 10, | 259, | 1220, | 1304, | 376, | 137, | 110, | 164, | 141, | 1230, | 6659, | 4776, | 8 |
| 11, | 86, | 149, | 626, | 634, | 201, | 73, | 58, | 89, | 96, | 790, | 3824, | 4 |
| 12, | 57, | 48, | 77, | 412, | 362, | 39, | 49, | 45, | 72, | 68, | 408, | 2 |
| 13, | 61, | 15, | 35, | 32, | 259, | 176, | 12, | 37, | 30, | 56, | 12, | |
| +gp, | 257, | 860, | 82, | 152, | 129, | 155, | 21, | 130, | 30, | 25, | 52, | |
| TOTAL, | 28217, | 273959, | 534235, | 447527, | 266461, | 160963, | 108627, | 141115, | 257231, | 449581, | 313851, | |

**Table 4.17** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HAD94BIS)

At 31-Aug-94 21:05:10

Traditional vpa using file input for terminal F

| Table 12 Stock biomass at age (start of year) Tonnes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 3, | 211414, | 66197, | 158568, | 191761, | 13145, | 11354, | 108177, | 63012, | 671662, | 177691, |
| 4, | 205225, | 249402, | 79088, | 178320, | 230221, | 16185, | 13096, | 116876, | 78671, | 644994, |
| 5, | 119869, | 212926, | 280510, | 76430, | 187159, | 218937, | 19863, | 14754, | 127084, | 76194, |
| 6, | 26120, | 65461, | 146376, | 171784, | 54371, | 115842, | 143406, | 17616, | 13365, | 47799, |
| 7, | 20692, | 10922, | 32276, | 70376, | 103062, | 33629, | 65445, | 84743, | 14965, | 5021, |
| 8, | 17239, | 9270, | 5436, | 13813, | 40603, | 51816, | 21269, | 38668, | 53065, | 9468, |
| 9, | 5989, | 6752, | 5217, | 3029, | 7211, | 19435, | 30792, | 12796, | 25020, | 25988, |
| 10, | 2447, | 2574, | 3075, | 3370, | 2092, | 4447, | 12540, | 22208, | 9212, | 14033, |
| 11, | 2272, | 1947, | 1988, | 2172, | 2524, | 1218, | 2932, | 9050, | 17198, | 4910, |
| 12, | 1891, | 1076, | 763, | 909, | 1276, | 1955, | 978, | 1981, | 6970, | 11532, |
| 13, | 1560, | 197, | 173, | 523, | 321, | 399, | 1481, | 711, | 931, | 2755, |
| +gp, | 934, | 3117, | 164, | 147, | 367, | 62, | 585, | 114, | 798, | 569, |
| TOTALBIO, | 615651, | 629843, | 713634, | 712632, | 642352, | 475279, | 420565, | 382528, | 1018942, | 1020955, |

| Table 12 Stock biomass at age (start of year) Tonnes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 3, | 35315, | 32071, | 36867, | 75224, | 113239, | 89140, | 12362, | 3845, | 5363, | 3267, |
| 4, | 162083, | 36146, | 31679, | 34159, | 44692, | 100930, | 97618, | 15212, | 4461, | 6032, |
| 5, | 503425, | 163572, | 28865, | 23559, | 13682, | 33492, | 87016, | 102091, | 17518, | 4899, |
| 6, | 32102, | 359908, | 105866, | 16934, | 10046, | 6255, | 13930, | 48385, | 64002, | 11877, |
| 7, | 29411, | 16686, | 226610, | 51074, | 10035, | 6321, | 2515, | 6130, | 20380, | 31795, |
| 8, | 3536, | 15707, | 9539, | 97136, | 25530, | 4732, | 3604, | 1651, | 2771, | 11599, |
| 9, | 7207, | 1950, | 10181, | 4553, | 51780, | 14614, | 2496, | 1614, | 964, | 1382, |
| 10, | 18702, | 4592, | 1538, | 4628, | 3211, | 26039, | 8471, | 1526, | 935, | 644, |
| 11, | 11516, | 8905, | 3966, | 614, | 2763, | 2433, | 14940, | 4429, | 1180, | 551, |
| 12, | 4107, | 6100, | 6040, | 2355, | 63, | 1266, | 1386, | 7407, | 2521, | 654, |
| 13, | 8164, | 1890, | 4537, | 1207, | 1459, | 37, | 570, | 522, | 2978, | 215, |
| +gp, | 2756, | 3546, | 682, | 1522, | 1385, | 1057, | 264, | 878, | 537, | 1009, |
| TOTALBIO, | 818323, | 651073, | 466369, | 312966, | 277886, | 286316, | 245173, | 193690, | 123610, | 73924, |

| Table 12 Stock biomass at age (start of year) Tonnes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
| AGE | | | | | | | | | | |
| 3, | 5623, | 112516, | 95709, | 21789, | 8317, | 4292, | 4657, | 25836, | 59122, | 82728, |
| 4, | 3521, | 5382, | 149841, | 123248, | 27606, | 10781, | 8353, | 9863, | 45592, | 98027, |
| 5, | 5486, | 3637, | 6635, | 87887, | 79960, | 34872, | 15679, | 12491, | 13762, | 43264, |
| 6, | 3446, | 4220, | 2672, | 5860, | 33619, | 63024, | 37756, | 19158, | 11680, | 10996, |
| 7, | 8157, | 2446, | 1808, | 1804, | 2550, | 11110, | 45242, | 34835, | 17318, | 6350, |
| 8, | 20501, | 5488, | 1536, | 1151, | 1102, | 3312, | 6274, | 38393, | 39288, | 10673, |
| 9, | 7540, | 11192, | 2892, | 919, | 639, | 786, | 2192, | 4576, | 37758, | 25390, |
| 10, | 1142, | 5380, | 5750, | 1657, | 604, | 485, | 723, | 620, | 4181, | 22509, |
| 11, | 466, | 806, | 3380, | 3424, | 1085, | 393, | 312, | 483, | 519, | 4266, |
| 12, | 385, | 323, | 518, | 2759, | 2426, | 262, | 327, | 299, | 484, | 455, |
| 13, | 451, | 112, | 259, | 237, | 1915, | 1299, | 92, | 275, | 223, | 411, |
| +gp, | 2052, | 6884, | 653, | 1218, | 1035, | 1239, | 166, | 1041, | 242, | 202, |
| TOTALBIO, | 58770, | 158386, | 271653, | 251954, | 160859, | 131855, | 121774, | 147871, | 230170, | 305272, |

**Table 4.18** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HAD94BIS)

At 31-Aug-94 20:56:20

Traditional vpa using file input for terminal F

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 4, | 10261, | 12470, | 3954, | 8916, | 11511, | 809, | 655, | 5844, | 3934, | 32250, |
| 5, | 27570, | 48973, | 64517, | 17579, | 43047, | 50356, | 4568, | 3394, | 29229, | 17525, |
| 6, | 13844, | 34694, | 77579, | 91046, | 28816, | 61396, | 76005, | 9336, | 7084, | 25333, |
| 7, | 18209, | 9612, | 28403, | 61931, | 90695, | 29593, | 57592, | 74574, | 13170, | 4419, |
| 8, | 16894, | 9085, | 5327, | 13537, | 39791, | 50780, | 20843, | 37894, | 52004, | 9279, |
| 9, | 5989, | 6752, | 5217, | 3029, | 7211, | 19435, | 30792, | 12796, | 25020, | 25988, |
| 10, | 2447, | 2574, | 3075, | 3370, | 2092, | 4447, | 12540, | 22208, | 9212, | 14033, |
| 11, | 2272, | 1947, | 1988, | 2172, | 2524, | 1218, | 2932, | 9050, | 17198, | 4910, |
| 12, | 1891, | 1076, | 763, | 909, | 1276, | 1955, | 978, | 1981, | 6970, | 11532, |
| 13, | 1560, | 197, | 173, | 523, | 321, | 399, | 1481, | 711, | 931, | 2755, |
| +gp, | 934, | 3117, | 164, | 147, | 367, | 62, | 585, | 114, | 798, | 569, |
| TOTSPBIO, | 101869, | 130498, | 191161, | 203157, | 227651, | 220449, | 208973, | 177901, | 165549, | 148593, |

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 38, | 483, | 555, |
| 4, | 8104, | 1807, | 1584, | 1708, | 2235, | 5047, | 4881, | 1825, | 2454, | 4223, |
| 5, | 115788, | 37622, | 6639, | 5418, | 3147, | 7703, | 20014, | 65338, | 12788, | 4899, |
| 6, | 17014, | 190751, | 56109, | 8975, | 5324, | 3315, | 7383, | 35321, | 59522, | 11877, |
| 7, | 25881, | 14684, | 199416, | 44945, | 8831, | 5563, | 2214, | 5884, | 19565, | 31795, |
| 8, | 3465, | 15393, | 9348, | 95193, | 25019, | 4637, | 3532, | 1651, | 2771, | 11599, |
| 9, | 7207, | 1950, | 10181, | 4553, | 51780, | 14614, | 2496, | 1614, | 964, | 1382, |
| 10, | 18702, | 4592, | 1538, | 4628, | 3211, | 26039, | 8471, | 1526, | 935, | 644, |
| 11, | 11516, | 8905, | 3966, | 614, | 2763, | 2433, | 14940, | 4429, | 1180, | 551, |
| 12, | 4107, | 6100, | 6040, | 2355, | 63, | 1266, | 1386, | 7407, | 2521, | 654, |
| 13, | 8164, | 1890, | 4537, | 1207, | 1459, | 37, | 570, | 522, | 2978, | 215, |
| +gp, | 2756, | 3546, | 682, | 1522, | 1385, | 1057, | 264, | 878, | 537, | 1009, |
| TOTSPBIO, | 222704, | 287239, | 300039, | 171120, | 105217, | 71710, | 66150, | 126435, | 106697, | 69403, |

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 394, | 2250, | 0, | 0, | 0, | 0, | 0, | 0, | 1182, | 1655, |
| 4, | 493, | 431, | 32965, | 1232, | 828, | 431, | 167, | 690, | 5927, | 23527, |
| 5, | 1920, | 2910, | 3516, | 18456, | 26387, | 10461, | 4704, | 3747, | 6881, | 21632, |
| 6, | 1620, | 3924, | 2298, | 3106, | 17146, | 39705, | 20388, | 9579, | 7242, | 8687, |
| 7, | 6036, | 2348, | 1555, | 1804, | 2550, | 9111, | 34836, | 27868, | 13335, | 5080, |
| 8, | 20501, | 5488, | 1536, | 1151, | 1102, | 3312, | 5459, | 35322, | 31430, | 9499, |
| 9, | 7540, | 11192, | 2892, | 919, | 639, | 786, | 1754, | 4576, | 35492, | 22090, |
| 10, | 1142, | 5380, | 5750, | 1657, | 604, | 485, | 723, | 620, | 4181, | 19583, |
| 11, | 466, | 806, | 3380, | 3424, | 1085, | 393, | 312, | 483, | 519, | 4266, |
| 12, | 385, | 323, | 518, | 2759, | 2426, | 262, | 327, | 299, | 484, | 455, |
| 13, | 451, | 112, | 259, | 237, | 1915, | 1299, | 92, | 275, | 223, | 411, |
| +gp, | 2052, | 6884, | 653, | 1218, | 1035, | 1239, | 166, | 1041, | 242, | 202, |
| TOTSPBIO, | 42999, | 42047, | 55322, | 35964, | 55717, | 67484, | 68928, | 84501, | 107140, | 117086, |

**Table 4.19** Haddock in the North-East Arctic (Fishing Areas I and II)

Run title : Haddock in the North-East Arctic (Fishing Areas I and II) (run name: HAD94)

At 31-Aug-94 13:12:13

Table 16 Summary (without SOP correction)

Traditional vpa using file input for terminal F

| | RECRUITS, Age 3 | TOTALBIO, | TOTSPBIO, | LANDINGS, | YIELD/SSB, | FBAR 4- 7, |
|---|---|---|---|---|---|---|
| 1950, | 66490, | 601230, | 313087, | 131733, | .4208, | .8355, |
| 1951, | 552842, | 676845, | 170074, | 120057, | .7059, | .6268, |
| 1952, | 62351, | 622827, | 126335, | 127660, | 1.0105, | .7231, |
| 1953, | 1030207, | 1143302, | 142534, | 123447, | .8661, | .5322, |
| 1954, | 122543, | 1190290, | 203266, | 156448, | .7697, | .3853, |
| 1955, | 52293, | 1228425, | 372908, | 202745, | .5437, | .5153, |
| 1956, | 169092, | 963854, | 430066, | 213279, | .4959, | .4429, |
| 1957, | 53252, | 621547, | 345954, | 122705, | .3547, | .4446, |
| 1958, | 68981, | 475845, | 251815, | 112672, | .4474, | .5334, |
| 1959, | 324525, | 518262, | 166360, | 88179, | .5300, | .3938, |
| 1960, | 242528, | 633143, | 153423, | 155454, | 1.0132, | .4988, |
| 1961, | 109128, | 612821, | 166727, | 193234, | 1.1590, | .6494, |
| 1962, | 240726, | 577416, | 165234, | 187888, | 1.1371, | .8255, |
| 1963, | 274817, | 541301, | 122684, | 146744, | 1.1961, | .8877, |
| 1964, | 320325, | 615651, | 101869, | 98900, | .9709, | .6541, |
| 1965, | 100299, | 629843, | 130498, | 118079, | .9048, | .5089, |
| 1966, | 240255, | 713634, | 191161, | 160621, | .8402, | .6197, |
| 1967, | 290547, | 712632, | 203157, | 136486, | .6718, | .4316, |
| 1968, | 19917, | 642352, | 227651, | 181726, | .7983, | .5179, |
| 1969, | 17203, | 475279, | 220449, | 130509, | .5920, | .4052, |
| 1970, | 163905, | 420565, | 208973, | 86601, | .4144, | .3566, |
| 1971, | 95473, | 382528, | 177901, | 78302, | .4401, | .2549, |
| 1972, | 1017669, | 1018942, | 165549, | 265317, | 1.6026, | .7050, |
| 1973, | 269228, | 1020955, | 148593, | 320065, | 2.1540, | .5805, |
| 1974, | 53508, | 818323, | 222704, | 221138, | .9930, | .4953, |
| 1975, | 48592, | 651073, | 287240, | 175742, | .6118, | .5138, |
| 1976, | 55860, | 466368, | 300039, | 137279, | .4575, | .6947, |
| 1977, | 113975, | 312966, | 171120, | 110158, | .6437, | .8393, |
| 1978, | 171575, | 277886, | 105217, | 95422, | .9069, | .6649, |
| 1979, | 135061, | 286316, | 71710, | 103623, | 1.4450, | .7179, |
| 1980, | 18730, | 245173, | 66150, | 87889, | 1.3286, | .5394, |
| 1981, | 5826, | 193690, | 126435, | 77153, | .6102, | .5895, |
| 1982, | 8126, | 123610, | 106697, | 46955, | .4401, | .4829, |
| 1983, | 4950, | 73924, | 69403, | 21607, | .3113, | .4087, |
| 1984, | 8520, | 58770, | 42999, | 17661, | .4107, | .3210, |
| 1985, | 255719, | 158386, | 42047, | 41270, | .9815, | .4069, |
| 1986, | 341816, | 271653, | 55322, | 96585, | 1.7459, | .4558, |
| 1987, | 90787, | 251954, | 35964, | 150659, | 4.1892, | .5315, |
| 1988, | 30804, | 160859, | 55717, | 91744, | 1.6466, | .5424, |
| 1989, | 15327, | 131855, | 67484, | 55122, | .8168, | .4227, |
| 1990, | 16633, | 121774, | 68928, | 25816, | .3745, | .1755, |
| 1991, | 66247, | 147871, | 84501, | 33605, | .3977, | .2605, |
| 1992, | 159788, | 230170, | 107140, | 53886, | .5030, | .3771, |
| 1993, | 272133, | 305272, | 117086, | 75916, | .6484, | .5550, |
| Arith. Mean | 176786, | 507440, | 161595, | 122229, | .8978, | .5301, |
| Units, | (Thousands), | (Tonnes), | (Tonnes), | (Tonnes), | | |

**Table 4.20** Input data to short-term prediction.

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: 1994 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 152795.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.234 | 0.0979 | 0.486 |
| 4 | 211260.00 | 0.2000 | 0.0200 | 0.0000 | 0.0000 | 0.545 | 0.3578 | 0.823 |
| 5 | 74897.000 | 0.2000 | 0.1300 | 0.0000 | 0.0000 | 1.052 | 0.5821 | 1.145 |
| 6 | 13244.000 | 0.2000 | 0.4100 | 0.0000 | 0.0000 | 1.536 | 0.7243 | 1.604 |
| 7 | 1929.000 | 0.2000 | 0.9000 | 0.0000 | 0.0000 | 1.954 | 0.5557 | 2.087 |
| 8 | 1294.000 | 0.2000 | 0.8800 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.464 |
| 9 | 2153.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.606 |
| 10 | 4776.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.800 |
| 11 | 3824.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | 408.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | 12.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | 52.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| 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 | 69000.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.268 | 0.0979 | 0.728 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.508 | 0.3578 | 0.953 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 0.798 | 0.5821 | 1.237 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.403 | 0.7243 | 1.713 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 1.840 | 0.5557 | 2.108 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.374 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.415 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.780 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1996 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 80000.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.268 | 0.0979 | 0.728 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.508 | 0.3578 | 0.953 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 0.798 | 0.5821 | 1.237 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.403 | 0.7243 | 1.713 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 1.840 | 0.5557 | 2.108 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.374 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.415 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.780 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : H94PRED
Date and time: 01SEP94:13:53

**Table 4.21** Input data to short-term prediction. Low growth.

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: Input data

(cont.)

| Year: 1997 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 84900.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.234 | 0.0979 | 0.728 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.545 | 0.3578 | 0.953 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 1.052 | 0.5821 | 1.237 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.536 | 0.7243 | 1.713 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 1.954 | 0.5557 | 2.108 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.374 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.606 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.800 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1998 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 84900.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.268 | 0.0979 | 0.728 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.508 | 0.3578 | 0.953 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 0.798 | 0.5821 | 1.237 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.403 | 0.7243 | 1.713 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 1.840 | 0.5557 | 2.108 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.374 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.415 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.780 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1999 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 84900.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.268 | 0.0979 | 0.728 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.508 | 0.3578 | 0.953 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 0.798 | 0.5821 | 1.237 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.403 | 0.7243 | 1.713 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 1.840 | 0.5557 | 2.108 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.374 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.415 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.780 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : H94PRED4
Date and time: 01SEP94:10:36

**continued...**

**Table 4.21 (continued)** Input data to medium-term prediction. Medium growth.

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: Input data

(cont.)

| Year: 1997 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 84900.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.379 | 0.0979 | 0.908 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.745 | 0.3578 | 1.300 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 1.321 | 0.5821 | 1.689 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.910 | 0.7243 | 2.066 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 2.228 | 0.5557 | 2.396 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.464 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.606 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.800 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1998 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 84900.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.379 | 0.0979 | 0.908 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.745 | 0.3578 | 1.300 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 1.321 | 0.5821 | 1.689 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.910 | 0.7243 | 2.066 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 2.228 | 0.5557 | 2.396 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.464 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.606 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.800 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1999 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 84900.000 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.379 | 0.0979 | 0.908 |
| 4 | . | 0.2000 | 0.0340 | 0.0000 | 0.0000 | 0.745 | 0.3578 | 1.300 |
| 5 | . | 0.2000 | 0.2880 | 0.0000 | 0.0000 | 1.321 | 0.5821 | 1.689 |
| 6 | . | 0.2000 | 0.5420 | 0.0000 | 0.0000 | 1.910 | 0.7243 | 2.066 |
| 7 | . | 0.2000 | 0.8780 | 0.0000 | 0.0000 | 2.228 | 0.5557 | 2.396 |
| 8 | . | 0.2000 | 0.9580 | 0.0000 | 0.0000 | 2.374 | 0.4492 | 2.464 |
| 9 | . | 0.2000 | 0.9600 | 0.0000 | 0.0000 | 2.415 | 0.3898 | 2.606 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.780 | 0.2493 | 2.800 |
| 11 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.245 | 0.2209 | 3.245 |
| 12 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.425 | 0.7507 | 3.425 |
| 13 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.600 | 0.1467 | 3.600 |
| 14+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.870 | 0.1467 | 3.870 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : H94PRED4
Date and time: 01SEP94:10:36

**Table 4.22** Short-term prediction

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: 1994 | | | | | Year: 1995 | | | | | Year: 1996 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 1.1354 | 0.6301 | 289394 | 59509 | 120000 | 0.0000 | 0.0000 | 245763 | 85313 | 0 | 334738 | 166612 |
| . | . | . | . | . | 0.0500 | 0.0277 | . | 85313 | 8125 | 327093 | 161983 |
| . | . | . | . | . | 0.1000 | 0.0555 | . | 85313 | 16036 | 319660 | 157492 |
| . | . | . | . | . | 0.1500 | 0.0832 | . | 85313 | 23742 | 312433 | 153135 |
| . | . | . | . | . | 0.2000 | 0.1110 | . | 85313 | 31246 | 305406 | 148907 |
| . | . | . | . | . | 0.2500 | 0.1387 | . | 85313 | 38555 | 298573 | 144804 |
| . | . | . | . | . | 0.3000 | 0.1665 | . | 85313 | 45675 | 291929 | 140823 |
| . | . | . | . | . | 0.3500 | 0.1942 | . | 85313 | 52611 | 285468 | 136960 |
| . | . | . | . | . | 0.4000 | 0.2220 | . | 85313 | 59368 | 279185 | 133211 |
| . | . | . | . | . | 0.4500 | 0.2497 | . | 85313 | 65952 | 273074 | 129573 |
| . | . | . | . | . | 0.5000 | 0.2775 | . | 85313 | 72366 | 267130 | 126041 |
| . | . | . | . | . | 0.5500 | 0.3052 | . | 85313 | 78617 | 261349 | 122614 |
| . | . | . | . | . | 0.6000 | 0.3330 | . | 85313 | 84708 | 255725 | 119287 |
| . | . | . | . | . | 0.6500 | 0.3607 | . | 85313 | 90644 | 250254 | 116058 |
| . | . | . | . | . | 0.7000 | 0.3885 | . | 85313 | 96430 | 244932 | 112924 |
| . | . | . | . | . | 0.7500 | 0.4162 | . | 85313 | 102070 | 239755 | 109881 |
| . | . | . | . | . | 0.8000 | 0.4440 | . | 85313 | 107567 | 234717 | 106927 |
| . | . | . | . | . | 0.8500 | 0.4717 | . | 85313 | 112926 | 229816 | 104060 |
| . | . | . | . | . | 0.9000 | 0.4995 | . | 85313 | 118151 | 225046 | 101276 |
| . | . | . | . | . | 0.9500 | 0.5272 | . | 85313 | 123245 | 220405 | 98573 |
| . | . | . | . | . | 1.0000 | 0.5550 | . | 85313 | 128212 | 215888 | 95948 |
| . | . | . | . | . | 1.0500 | 0.5827 | . | 85313 | 133056 | 211492 | 93399 |
| . | . | . | . | . | 1.1000 | 0.6105 | . | 85313 | 137780 | 207214 | 90925 |
| . | . | . | . | . | 1.1500 | 0.6382 | . | 85313 | 142387 | 203050 | 88521 |
| . | . | . | . | . | 1.2000 | 0.6660 | . | 85313 | 146881 | 198996 | 86188 |
| . | . | . | . | . | 1.2500 | 0.6937 | . | 85313 | 151265 | 195051 | 83921 |
| . | . | . | . | . | 1.3000 | 0.7215 | . | 85313 | 155541 | 191209 | 81720 |
| . | . | . | . | . | 1.3500 | 0.7492 | . | 85313 | 159713 | 187470 | 79581 |
| . | . | . | . | . | 1.4000 | 0.7770 | . | 85313 | 163784 | 183828 | 77505 |
| . | . | . | . | . | 1.4500 | 0.8047 | . | 85313 | 167756 | 180283 | 75487 |
| . | . | . | . | . | 1.5000 | 0.8325 | . | 85313 | 171632 | 176831 | 73527 |
| . | . | . | . | . | 1.5500 | 0.8602 | . | 85313 | 175415 | 173469 | 71624 |
| . | . | . | . | . | 1.6000 | 0.8880 | . | 85313 | 179107 | 170195 | 69774 |
| . | . | . | . | . | 1.6500 | 0.9157 | . | 85313 | 182711 | 167006 | 67977 |
| . | . | . | . | . | 1.7000 | 0.9435 | . | 85313 | 186229 | 163900 | 66231 |
| . | . | . | . | . | 1.7500 | 0.9712 | . | 85313 | 189663 | 160875 | 64535 |
| . | . | . | . | . | 1.8000 | 0.9990 | . | 85313 | 193016 | 157928 | 62886 |
| . | . | . | . | . | 1.8500 | 1.0267 | . | 85313 | 196290 | 155057 | 61284 |
| . | . | . | . | . | 1.9000 | 1.0545 | . | 85313 | 199488 | 152260 | 59728 |
| . | . | . | . | . | 1.9500 | 1.0822 | . | 85313 | 202610 | 149535 | 58215 |
| . | . | . | . | . | 2.0000 | 1.1100 | . | 85313 | 205659 | 146880 | 56744 |
| - | - | Tonnes | Tonnes | Tonnes | - | - | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name : H94PRED
Date and time : 01SEP94:13:53
Computation of ref. F: Simple mean, age 4 - 7
Basis for 1994 : TAC constraints

**Table 4.23** Low growth, $F_{93}$

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.1354 | 0.6301 | 123032 | 120000 | 466644 | 289394 | 33492 | 59509 | 33492 | 59509 |
| 1995 | 1.0000 | 0.5550 | 102319 | 128209 | 340765 | 245599 | 66452 | 85286 | 66452 | 85286 |
| 1996 | 1.0000 | 0.5550 | 78650 | 109700 | 267336 | 215764 | 66444 | 95923 | 66444 | 95923 |
| 1997 | 1.0000 | 0.5550 | 60128 | 83526 | 233362 | 181325 | 53941 | 88623 | 53941 | 88623 |
| 1998 | 1.0000 | 0.5550 | 53617 | 70289 | 222079 | 160388 | 43988 | 74968 | 43988 | 74968 |
| 1999 | 1.0000 | 0.5550 | 52370 | 66437 | 218645 | 150508 | 38963 | 64185 | 38963 | 64185 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : H94PRED3
Date and time : 01SEP94:00:15
Computation of ref. F: Simple mean, age 4 - 7
Prediction basis : F factors

Medium growth, $F_{93}$

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.1354 | 0.6301 | 123032 | 120000 | 466644 | 289394 | 33492 | 59509 | 33492 | 59509 |
| 1995 | 1.0000 | 0.5550 | 102319 | 128209 | 340765 | 245599 | 66452 | 85286 | 66452 | 85286 |
| 1996 | 1.0000 | 0.5550 | 78650 | 109700 | 267336 | 215764 | 66444 | 95923 | 66444 | 95923 |
| 1997 | 1.0000 | 0.5550 | 60128 | 103323 | 233362 | 243239 | 53941 | 108711 | 53941 | 108711 |
| 1998 | 1.0000 | 0.5550 | 53617 | 87810 | 222079 | 213942 | 43988 | 88255 | 43988 | 88255 |
| 1999 | 1.0000 | 0.5550 | 52370 | 83975 | 218645 | 203790 | 38963 | 76225 | 38963 | 76225 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : H94PRED4
Date and time : 01SEP94:10:36
Computation of ref. F: Simple mean, age 4 - 7
Prediction basis : F factors

Low growth, $F_{med}$

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.1354 | 0.6301 | 123032 | 120000 | 466644 | 289394 | 33492 | 59509 | 33492 | 59509 |
| 1995 | 0.6306 | 0.3500 | 70152 | 88357 | 340765 | 245599 | 66452 | 85286 | 66452 | 85286 |
| 1996 | 0.6306 | 0.3500 | 62603 | 89657 | 295962 | 252223 | 80515 | 117270 | 80515 | 117270 |
| 1997 | 0.6306 | 0.3500 | 51574 | 76583 | 270992 | 240360 | 78304 | 132398 | 78304 | 132398 |
| 1998 | 0.6306 | 0.3500 | 46216 | 66760 | 260431 | 227211 | 71067 | 129636 | 71067 | 129636 |
| 1999 | 0.6306 | 0.3500 | 44910 | 63185 | 256580 | 218425 | 65455 | 120084 | 65455 | 120084 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : H94PRED3
Date and time : 01SEP94:00:15
Computation of ref. F: Simple mean, age 4 - 7
Prediction basis : F factors

Medium growth, $F_{med}$

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.1354 | 0.6301 | 123032 | 120000 | 466644 | 289394 | 33492 | 59509 | 33492 | 59509 |
| 1995 | 0.6306 | 0.3500 | 70152 | 88357 | 340765 | 245599 | 66452 | 85286 | 66452 | 85286 |
| 1996 | 0.6306 | 0.3500 | 62603 | 89657 | 295962 | 252223 | 80515 | 117270 | 80515 | 117270 |
| 1997 | 0.6306 | 0.3500 | 51574 | 93538 | 270992 | 316816 | 78304 | 161081 | 78304 | 161081 |
| 1998 | 0.6306 | 0.3500 | 46216 | 81475 | 260431 | 291593 | 71067 | 148970 | 71067 | 148970 |
| 1999 | 0.6306 | 0.3500 | 44910 | 77803 | 256580 | 281304 | 65455 | 136802 | 65455 | 136802 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : H94PRED4
Date and time : 01SEP94:10:36
Computation of ref. F: Simple mean, age 4 - 7
Prediction basis : F factors

**Table 4.24** Medium-term prediction, detailed output. $F_{93}$, low growth

Year: 1994 F-factor: 1.1354 Reference F: 0.6301

| | | | | | | 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 | 0.1112 | 14596 | 7094 | 152795 | 35754 | 0 | 0 | 0 | 0 |
| 4 | 0.4062 | 64356 | 52965 | 211260 | 115137 | 4225 | 2303 | 4225 | 2303 |
| 5 | 0.6609 | 33189 | 38002 | 74897 | 78792 | 9737 | 10243 | 9737 | 10243 |
| 6 | 0.8224 | 6821 | 10941 | 13244 | 20343 | 5430 | 8341 | 5430 | 8341 |
| 7 | 0.6309 | 827 | 1725 | 1929 | 3769 | 1736 | 3392 | 1736 | 3392 |
| 8 | 0.5100 | 473 | 1164 | 1294 | 3072 | 1139 | 2703 | 1139 | 2703 |
| 9 | 0.4426 | 703 | 1832 | 2153 | 5199 | 2153 | 5199 | 2153 | 5199 |
| 10 | 0.2831 | 1072 | 3002 | 4776 | 13277 | 4776 | 13277 | 4776 | 13277 |
| 11 | 0.2508 | 772 | 2505 | 3824 | 12409 | 3824 | 12409 | 3824 | 12409 |
| 12 | 0.8523 | 215 | 737 | 408 | 1397 | 408 | 1397 | 408 | 1397 |
| 13 | 0.1666 | 2 | 6 | 12 | 43 | 12 | 43 | 12 | 43 |
| 14+ | 0.1666 | 7 | 28 | 52 | 201 | 52 | 201 | 52 | 201 |
| Total | | 123032 | 120000 | 466644 | 289394 | 33492 | 59509 | 33492 | 59509 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1995 F-factor: 1.0000 Reference F: 0.5550

| | | | | | | 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 | 0.0979 | 5842 | 4250 | 69000 | 18458 | 0 | 0 | 0 | 0 |
| 4 | 0.3578 | 30698 | 29240 | 111938 | 56808 | 3806 | 1931 | 3806 | 1931 |
| 5 | 0.5821 | 46527 | 57577 | 115220 | 91888 | 33183 | 26464 | 33183 | 26464 |
| 6 | 0.7243 | 14967 | 25631 | 31665 | 44410 | 17162 | 24070 | 17162 | 24070 |
| 7 | 0.5557 | 1858 | 3916 | 4764 | 8767 | 4183 | 7697 | 4183 | 7697 |
| 8 | 0.4492 | 278 | 659 | 840 | 1995 | 805 | 1911 | 805 | 1911 |
| 9 | 0.3898 | 187 | 452 | 636 | 1536 | 611 | 1475 | 611 | 1475 |
| 10 | 0.2493 | 227 | 632 | 1132 | 3148 | 1132 | 3148 | 1132 | 3148 |
| 11 | 0.2209 | 531 | 1724 | 2946 | 9561 | 2946 | 9561 | 2946 | 9561 |
| 12 | 0.7507 | 1180 | 4043 | 2436 | 8344 | 2436 | 8344 | 2436 | 8344 |
| 13 | 0.1467 | 18 | 64 | 142 | 513 | 142 | 513 | 142 | 513 |
| 14+ | 0.1467 | 5 | 21 | 44 | 172 | 44 | 172 | 44 | 172 |
| Total | | 102319 | 128209 | 340765 | 245599 | 66452 | 85286 | 66452 | 85286 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1996 F-factor: 1.0000 Reference F: 0.5550

| | | | | | | 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 | 0.0979 | 6773 | 4927 | 80000 | 21400 | 0 | 0 | 0 | 0 |
| 4 | 0.3578 | 14048 | 13380 | 51224 | 25996 | 1742 | 884 | 1742 | 884 |
| 5 | 0.5821 | 25877 | 32022 | 64081 | 51104 | 18455 | 14718 | 18455 | 14718 |
| 6 | 0.7243 | 24913 | 42664 | 52707 | 73921 | 28567 | 40065 | 28567 | 40065 |
| 7 | 0.5557 | 4900 | 10326 | 12565 | 23119 | 11032 | 20299 | 11032 | 20299 |
| 8 | 0.4492 | 739 | 1755 | 2238 | 5312 | 2144 | 5089 | 2144 | 5089 |
| 9 | 0.3898 | 129 | 312 | 439 | 1060 | 421 | 1018 | 421 | 1018 |
| 10 | 0.2493 | 71 | 197 | 353 | 981 | 353 | 981 | 353 | 981 |
| 11 | 0.2209 | 130 | 423 | 723 | 2345 | 723 | 2345 | 723 | 2345 |
| 12 | 0.7507 | 937 | 3209 | 1934 | 6624 | 1934 | 6624 | 1934 | 6624 |
| 13 | 0.1467 | 117 | 420 | 942 | 3390 | 942 | 3390 | 942 | 3390 |
| 14+ | 0.1467 | 16 | 63 | 132 | 511 | 132 | 511 | 132 | 511 |
| Total | | 78650 | 109700 | 267336 | 215764 | 66444 | 95923 | 66444 | 95923 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

**continued...**

(cont.)

**Table 4.24 (continued)**

(cont.)

Year: 1997 F-factor: 1.0000 Reference F: 0.5550

| | | | | | | 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 | 0.0979 | 7188 | 6527 | 84900 | 32177 | 0 | 0 | 0 | 0 |
| 4 | 0.3578 | 16287 | 21173 | 59390 | 44246 | 2019 | 1504 | 2019 | 1504 |
| 5 | 0.5821 | 11841 | 20000 | 29324 | 38737 | 8445 | 11156 | 8445 | 11156 |
| 6 | 0.7243 | 13856 | 28626 | 29313 | 55988 | 15888 | 30346 | 15888 | 30346 |
| 7 | 0.5557 | 8156 | 19542 | 20915 | 46598 | 18363 | 40913 | 18363 | 40913 |
| 8 | 0.4492 | 1950 | 4805 | 5901 | 14010 | 5654 | 13422 | 5654 | 13422 |
| 9 | 0.3898 | 344 | 897 | 1169 | 2823 | 1122 | 2711 | 1122 | 2711 |
| 10 | 0.2493 | 49 | 137 | 243 | 677 | 243 | 677 | 243 | 677 |
| 11 | 0.2209 | 41 | 132 | 225 | 730 | 225 | 730 | 225 | 730 |
| 12 | 0.7507 | 230 | 787 | 474 | 1624 | 474 | 1624 | 474 | 1624 |
| 13 | 0.1467 | 93 | 334 | 747 | 2691 | 747 | 2691 | 747 | 2691 |
| 14+ | 0.1467 | 94 | 364 | 759 | 2938 | 759 | 2938 | 759 | 2938 |
| Total | | 60128 | 103323 | 233362 | 243239 | 53941 | 108711 | 53941 | 108711 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1998 F-factor: 1.0000 Reference F: 0.5550

| | | | | | | 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 | 0.0979 | 7188 | 6527 | 84900 | 32177 | 0 | 0 | 0 | 0 |
| 4 | 0.3578 | 17285 | 22470 | 63028 | 46956 | 2143 | 1596 | 2143 | 1596 |
| 5 | 0.5821 | 13729 | 23189 | 33999 | 44912 | 9792 | 12935 | 9792 | 12935 |
| 6 | 0.7243 | 6340 | 13099 | 13414 | 25621 | 7270 | 13887 | 7270 | 13887 |
| 7 | 0.5557 | 4536 | 10868 | 11632 | 25916 | 10213 | 22754 | 10213 | 22754 |
| 8 | 0.4492 | 3246 | 7998 | 9823 | 23320 | 9411 | 22341 | 9411 | 22341 |
| 9 | 0.3898 | 908 | 2366 | 3083 | 7446 | 2960 | 7148 | 2960 | 7148 |
| 10 | 0.2493 | 130 | 364 | 648 | 1802 | 648 | 1802 | 648 | 1802 |
| 11 | 0.2209 | 28 | 91 | 155 | 504 | 155 | 504 | 155 | 504 |
| 12 | 0.7507 | 72 | 245 | 148 | 506 | 148 | 506 | 148 | 506 |
| 13 | 0.1467 | 23 | 82 | 183 | 660 | 183 | 660 | 183 | 660 |
| 14+ | 0.1467 | 132 | 511 | 1065 | 4122 | 1065 | 4122 | 1065 | 4122 |
| Total | | 53617 | 87810 | 222079 | 213942 | 43988 | 88255 | 43988 | 88255 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1999 F-factor: 1.0000 Reference F: 0.5550

| | | | | | | 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 | 0.0979 | 7188 | 6527 | 84900 | 32177 | 0 | 0 | 0 | 0 |
| 4 | 0.3578 | 17285 | 22470 | 63028 | 46956 | 2143 | 1596 | 2143 | 1596 |
| 5 | 0.5821 | 14570 | 24609 | 36081 | 47663 | 10391 | 13727 | 10391 | 13727 |
| 6 | 0.7243 | 7351 | 15188 | 15553 | 29705 | 8429 | 16100 | 8429 | 16100 |
| 7 | 0.5557 | 2076 | 4973 | 5323 | 11859 | 4673 | 10412 | 4673 | 10412 |
| 8 | 0.4492 | 1805 | 4448 | 5463 | 12970 | 5234 | 12425 | 5234 | 12425 |
| 9 | 0.3898 | 1511 | 3938 | 5132 | 12394 | 4927 | 11899 | 4927 | 11899 |
| 10 | 0.2493 | 343 | 961 | 1709 | 4752 | 1709 | 4752 | 1709 | 4752 |
| 11 | 0.2209 | 75 | 242 | 414 | 1342 | 414 | 1342 | 414 | 1342 |
| 12 | 0.7507 | 49 | 169 | 102 | 349 | 102 | 349 | 102 | 349 |
| 13 | 0.1467 | 7 | 25 | 57 | 206 | 57 | 206 | 57 | 206 |
| 14+ | 0.1467 | 109 | 423 | 883 | 3416 | 883 | 3416 | 883 | 3416 |
| Total | | 52370 | 83975 | 218645 | 203790 | 38963 | 76225 | 38963 | 76225 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

**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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Denmark | - | - | - | 1 | - |
| Faroe Islands | 503 | 490 | 426 | 712 | 441 |
| France | 431 | 657 | 308 | 576 | 411 |
| German Dem.Rep. | 6 | 11 | - | - | 17 |
| Germany, Fed.Rep. | 4,532 | 1,837 | 3,470 | 4,909 | 4,557 |
| Greenland | - | - | - | - | - |
| Iceland | - | - | - | - | - |
| Norway | 152,818 | 103,899 | 63,090 | 85,710 | 108,244 |
| Spain | - | - | - | - | - |
| UK (Engl.& Wales) | 335 | 202 | 54 | 54 | 436 |
| UK (Scotland) | - | + | 21 | 3 | 6 |
| USSR | 161 | 51 | 27 | 426 | 130 |
| Total | 158,786 | 107,147 | 67,396 | 92,391 | 114,242 |

| Country | 1989 | 1990 | 1991 | 1992 | 1993[1] |
|---|---|---|---|---|---|
| Denmark | - | - | 5 | - | 1 |
| Faroe Islands | 388 | 1,207 | 963 | 165 | 31 |
| France | 460[2] | 340[2] | 77[2] | 1,980 | 307[2] |
| German Dem.Rep. | - | 14 | - | - | - |
| Germany, Fed.Rep | 606 | 1,129 | 2,003 | 3,451 | 3,686 |
| Greenland | - | - | - | 734 | 78 |
| Iceland | - | - | - | - | 3 |
| Norway | 119,625 | 92,397 | 103,283 | 116,722[1] | 137,323 |
| Russia[3] | 506 | 52 | 504[4] | 964 | 2,209 |
| Spain | - | - | - | 6 | 4 |
| UK (Engl.& Wales) | 702 | 681 | 449 | 515 | 407 |
| UK (Scotland) | 23 | 28 | 42 | 25 | 7 |
| Total | 122,310 | 95,848 | 107,326 | 124,562 | 144,056 |

[1]Provisional figures.
[2]As reported to Norwegian authorities.
[3]USSR prior to 1991.
[4]Includes Estonia.

**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 | 38.9 | 40.1 | 18.9 | 9.4 | 107.3 |
| 1992[1] | 27.1 | 64.0 | 22.3 | 11.2 | 124.6 |
| 1993[1] | 33.1 | 74.4 | 21.2 | 15.3 | 144.1 |

[1]Preliminary.
[2]Unresolved 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 |
| 1993 | 48 | 6,110 | 127 | 45 | 19,502 | 433 | 18 | 7,432 | 413 |

**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 | 42,785 | 43,885 | 975 |
| 1993[2] | 46,411 | 44,612 | 1,040 |

[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 | 57.6 | 248 |
| 1993 | 76 | 65.1 | 255 |

[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

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

Norway Ac Survey (code: FLT06) (Catch: Thousands)

| Year | Effort | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 |
|---|---|---|---|---|---|
| 1988 | 1 | 40.0 | 56.7 | 46.3 | 17.3 |
| 1989 | 1 | 61.0 | 69.8 | 41.6 | 24.6 |
| 1990 | 1 | 256.0 | 80.3 | 37.0 | 13.0 |
| 1991 | 1 | 220.3 | 260.3 | 11.6 | 9.9 |
| 1992 | 1 | 411.4 | 687.9 | 144.4 | 15.6 |
| 1993 | 1 | 146.3 | 348.7 | 234.5 | 35.5 |

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

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 | 57.6 | 10361 | 13228 | 3067 | 2269 | 2660 | 2029 |
| 1993 | 65.1 | 11838 | 27029 | 23222 | 969 | 361 | 245 |

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

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 | 29527 | 5214 | 89 | 45 | 38 |
| 1993 | 76 | 1714 | 20801 | 4813 | 147 | 83 |

**Table 5.7**

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Lowestoft VPA Version 3.1

  28-Aug-94  18:02:33

Extended Survivors Analysis

Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

CPUE data from file /users/ifad/ifapwork/wg_108/sai_arct/FLEET.V01

Catch data for  34 years. 1960 to 1993. Ages  2 to  11.

     Fleet,           First, Last, First, Last, Alpha,  Beta
                ,      year, year,  age ,  age
FLT01: Norw Purse Se,   1977, 1993,   3,     7,   .000,  1.000
FLT02: Norw Trawl    ,   1976, 1993,   3,     8,   .000,  1.000
FLT06: Norway Ac Sur,   1988, 1993,   2,     5,   .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   17 iterations
```

**continued...**

**Table 5.7 (continued)**

Log catchability residuals.

Fleet : FLT01: Norw Purse Se

| Age | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|---|
| 2 | No data for this fleet at this age | | | | | | | |
| 3 | 99.99 | .98 | .63 | .26 | .16 | .35 | .28 | -.20 |
| 4 | 99.99 | -.40 | -.46 | -.23 | -.21 | 1.81 | .51 | .10 |
| 5 | 99.99 | -.10 | -.27 | .80 | .58 | -.56 | -2.03 | 1.18 |
| 6 | 99.99 | -.72 | -.03 | 1.01 | 1.08 | -.65 | -1.58 | .75 |
| 7 | 99.99 | -2.82 | .51 | 1.63 | 1.98 | -.94 | -4.01 | .75 |
| 8 | No data for this fleet at this age | | | | | | | |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | No data for this fleet at this age | | | | | | | | | |
| 3 | .99 | 1.39 | -.77 | -.24 | -.91 | -.31 | .44 | .58 | .06 | -1.47 |
| 4 | -.49 | -.08 | -1.68 | .83 | .84 | .25 | .07 | -.31 | -.90 | .27 |
| 5 | .34 | .07 | -1.31 | -.75 | 1.26 | 1.70 | .76 | -.63 | -1.69 | .48 |
| 6 | 1.24 | .46 | -.62 | -1.86 | -.94 | 1.25 | 1.54 | -.53 | -.97 | .71 |
| 7 | -.35 | .85 | .45 | -2.64 | -1.05 | -.44 | 2.07 | .15 | .17 | 1.97 |
| 8 | No data for this fleet at this age | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|
| Mean Log q | -6.7594 | -6.7017 | -7.4424 | -8.3986 | -9.4726 |
| S.E(Log q) | .7860 | .7898 | 1.1414 | 1.1315 | 1.6535 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 3 | .93 | .175 | 7.11 | .39 | 17 | .77 | -6.76 |
| 4 | .73 | 1.075 | 7.92 | .61 | 17 | .57 | -6.70 |
| 5 | .44 | 3.805 | 9.11 | .82 | 17 | .33 | -7.44 |
| 6 | .50 | 1.747 | 8.97 | .55 | 17 | .51 | -8.40 |
| 7 | .52 | .923 | 9.16 | .27 | 17 | .87 | -9.47 |

continued...

**Table 5.7 (continued)**

Fleet : FLT02: Norw Trawl

| Age | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|---|
| 2 | No data for this fleet at this age | | | | | | | |
| 3 | .81 | -.35 | -2.10 | .25 | .85 | -.91 | -1.04 | -.30 |
| 4 | -2.16 | .09 | -.99 | .36 | -.20 | .38 | -.55 | .23 |
| 5 | -.63 | -.37 | -.41 | -.74 | -.79 | .04 | .90 | .37 |
| 6 | -1.12 | -2.05 | -.60 | -1.15 | -.18 | -.21 | .28 | .21 |
| 7 | -.39 | -1.38 | -.99 | -.21 | -.19 | -.73 | -.89 | -.18 |
| 8 | -.63 | -.86 | -.65 | .40 | -.19 | .67 | -.95 | .24 |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | No data for this fleet at this age | | | | | | | | | |
| 3 | 1.17 | .95 | -.64 | -2.18 | -.75 | .37 | 1.30 | .77 | -.36 | .81 |
| 4 | .87 | .27 | .78 | -.35 | -1.85 | .17 | .49 | .82 | -.44 | -.23 |
| 5 | -.15 | -.29 | .51 | .19 | -.01 | -.24 | -.40 | -.16 | .25 | .16 |
| 6 | .15 | .21 | .40 | .28 | .40 | .02 | -.42 | -.19 | .28 | -.37 |
| 7 | -.75 | .31 | .68 | .83 | .93 | .00 | .09 | -.57 | .65 | -.62 |
| 8 | -.54 | -.05 | .58 | -.39 | .83 | -.10 | .10 | -.15 | .46 | -.52 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|
| Mean Log q | -6.9462 | -5.7835 | -5.3935 | -5.2819 | -5.2577 | -5.4527 |
| S.E(Log q) | 1.0647 | .7683 | .3929 | .4210 | .6513 | .5080 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 3 | 3.06 | -1.255 | -2.97 | .04 | 18 | 3.18 | -6.95 |
| 4 | 3.99 | -2.864 | -10.43 | .08 | 18 | 2.39 | -5.78 |
| 5 | 1.05 | -.257 | 5.15 | .73 | 18 | .43 | -5.39 |
| 6 | 1.04 | -.158 | 5.11 | .60 | 18 | .46 | -5.28 |
| 7 | .93 | .183 | 5.50 | .41 | 18 | .63 | -5.26 |
| 8 | 1.07 | -.223 | 5.28 | .52 | 18 | .57 | -5.45 |

**continued...**

**Table 5.7 (continued)**

Fleet : FLT06: Norway Ac Sur

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 99.99 | 99.99 | 99.99 | 99.99 | -1.06 | -.49 | -.06 | -.49 | 1.48 | .56 |
| 3 | 99.99 | 99.99 | 99.99 | 99.99 | -.83 | -.21 | .14 | -.27 | .32 | .80 |
| 4 | 99.99 | 99.99 | 99.99 | 99.99 | -.65 | .08 | .42 | -.42 | .20 | .34 |
| 5 | 99.99 | 99.99 | 99.99 | 99.99 | -.82 | -.02 | -.09 | .10 | .98 | -.18 |
| 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 log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 3 | 4 | 5 |
|---|---|---|---|
| Mean Log q | -6.1560 | -6.7537 | -7.1182 |
| S.E(Log q) | .5574 | .4315 | .5812 |

Regression statistics :

Ages with q dependent on year class strength

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Log q |
|---|---|---|---|---|---|---|---|
| 2 | 1.33 | -.534 | 4.98 | .40 | 6 | 1.02 | -6.71 |

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 3 | .88 | .355 | 6.80 | .70 | 6 | .54 | -6.16 |
| 4 | .92 | .326 | 7.11 | .81 | 6 | .44 | -6.75 |
| 5 | 2.18 | -2.597 | 3.05 | .55 | 6 | .86 | -7.12 |

**continued...**

## Table 5.7 (continued)

Terminal year survivor and F summaries :

Age 2 Catchability dependent on age and year class strength

Year class = 1991

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 1., | .000, | .000, | .00, | 0, | .000, | .000 |
| FLT02: Norw Trawl , | 1., | .000, | .000, | .00, | 0, | .000, | .000 |
| FLT06: Norway Ac Sur, | 113938., | 1.101, | .000, | .00, | 1, | .102, | .026 |
| P shrinkage mean , | 127005., | .58,,,, | | | | .382, | .023 |
| F shrinkage mean , | 35201., | .50,,,, | | | | .516, | .082 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 64761., | .36, | .60, | 3, | 1.670, | .045 |

Age 3 Catchability constant w.r.t. time and dependent on age

Year class = 1990

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 15607., | .818, | .000, | .00, | 1, | .140, | .737 |
| FLT02: Norw Trawl , | 151698., | 1.108, | .000, | .00, | 1, | .076, | .106 |
| FLT06: Norway Ac Sur, | 169904., | .542, | .256, | .47, | 2, | .313, | .095 |
| F shrinkage mean , | 49728., | .50,,,, | | | | .470, | .294 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 67622., | .32, | .43, | 5, | 1.346, | .224 |

Age 4 Catchability constant w.r.t. time and dependent on age

Year class = 1989

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 152178., | .582, | .108, | .19, | 2, | .150, | .292 |
| FLT02: Norw Trawl , | 97849., | .651, | .059, | .09, | 2, | .124, | .424 |
| FLT06: Norway Ac Sur, | 166293., | .352, | .165, | .47, | 3, | .416, | .271 |
| F shrinkage mean , | 91745., | .50,,,, | | | | .310, | .447 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 127792., | .24, | .13, | 8, | .544, | .340 |

Age 5 Catchability constant w.r.t. time and dependent on age

Year class = 1988

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 41573., | .536, | .506, | .94, | 3, | .107, | .554 |
| FLT02: Norw Trawl , | 50397., | .350, | .196, | .56, | 3, | .305, | .477 |
| FLT06: Norway Ac Sur, | 44692., | .315, | .117, | .37, | 4, | .322, | .524 |
| F shrinkage mean , | 43467., | .50,,,, | | | | .266, | .535 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 45662., | .21, | .10, | 11, | .476, | .515 |

continued...

**Table 5.7 (continued)**

Age 6 Catchability constant w.r.t. time and dependent on age

Year class = 1987

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 2431., | .569, | .534, | .94, | 4, | .085, | .682 |
| FLT02: Norw Trawl , | 2601., | .291, | .232, | .80, | 4, | .419, | .649 |
| FLT06: Norway Ac Sur, | 3454., | .336, | .376, | 1.12, | 4, | .162, | .524 |
| F shrinkage mean , | 2648., | .50,,,, | | | | .334, | .641 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 2724., | .22, | .14, | 13, | .618, | .627 |

Age 7 Catchability constant w.r.t. time and dependent on age

Year class = 1986

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 1452., | .620, | .580, | .94, | 5, | .068, | .658 |
| FLT02: Norw Trawl , | 1019., | .305, | .202, | .66, | 5, | .344, | .844 |
| FLT06: Norway Ac Sur, | 1345., | .327, | .189, | .58, | 4, | .098, | .695 |
| F shrinkage mean , | 1238., | .50,,,, | | | | .490, | .738 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 1180., | .27, | .11, | 15, | .410, | .763 |

continued...

## Table 5.7 (continued)

Age 8 Catchability constant w.r.t. time and dependent on age

Year class = 1985

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 797., | .538, | .285, | .53, | 5, | .037, | .824 |
| FLT02: Norw Trawl , | 648., | .314, | .169, | .54, | 6, | .390, | .946 |
| FLT06: Norway Ac Sur, | 731., | .333, | .244, | .73, | 3, | .058, | .874 |
| F shrinkage mean , | 1125., | .50,,,, | | | | .515, | .645 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 874., | .29, | .12, | 15, | .434, | .773 |

Age 9 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1984

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 3521., | .590, | .366, | .62, | 5, | .044, | .287 |
| FLT02: Norw Trawl , | 1357., | .274, | .248, | .91, | 6, | .366, | .621 |
| FLT06: Norway Ac Sur, | 1066., | .389, | .311, | .80, | 2, | .046, | .740 |
| F shrinkage mean , | 1604., | .50,,,, | | | | .545, | .548 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 1533., | .29, | .12, | 14, | .410, | .567 |

Age 10 Catchability constant w.r.t. time and age (fixed at the value for age) 8

Year class = 1983

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT01: Norw Purse Se, | 2429., | .589, | .452, | .77, | 5, | .027, | .284 |
| FLT02: Norw Trawl , | 800., | .305, | .052, | .17, | 6, | .265, | .692 |
| FLT06: Norway Ac Sur, | 378., | .643, | .000, | .00, | 1, | .014, | 1.136 |
| F shrinkage mean , | 863., | .50,,,, | | | | .694, | .655 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 860., | .36, | .07, | 13, | .205, | .657 |

## Table 5.8

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

| Table 1 | Catch numbers at age | Numbers*10**-3 | | |
|---|---|---|---|---|
| YEAR, | 1960, | 1961, | 1962, | 1963, |
| AGE | | | | |
| 2, | 7381, | 4936, | 1246, | 2815, |
| 3, | 10509, | 17824, | 37266, | 42050, |
| 4, | 13083, | 9131, | 11131, | 28925, |
| 5, | 13545, | 12506, | 4421, | 5888, |
| 6, | 5064, | 3799, | 8290, | 4650, |
| 7, | 4883, | 1332, | 2427, | 3861, |
| 8, | 2401, | 968, | 1024, | 1099, |
| 9, | 1315, | 520, | 938, | 1075, |
| 10, | 743, | 405, | 451, | 697, |
| +gp, | 1525, | 1229, | 1728, | 1777, |
| TOTALNUM, | 60449, | 52650, | 68922, | 92837, |
| TONSLAND, | 136006, | 109821, | 122841, | 148036, |
| SOPCOF %, | 128, | 144, | 125, | 120, |

| Table 1 | Catch numbers at age | Numbers*10**-3 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 2, | 20308, | 30430, | 7450, | 6952, | 5297, | 4090, | 25952, | 19842, | 11608, | 13829, |
| 3, | 9001, | 37115, | 22392, | 29664, | 25196, | 77333, | 43540, | 77019, | 65178, | 76296, |
| 4, | 59601, | 5001, | 54537, | 24836, | 18384, | 11949, | 62846, | 59280, | 52389, | 25206, |
| 5, | 13154, | 26300, | 13124, | 35956, | 5101, | 16939, | 13987, | 26961, | 29146, | 26911, |
| 6, | 2718, | 10142, | 12899, | 4125, | 8282, | 4747, | 16189, | 9556, | 10186, | 16031, |
| 7, | 3472, | 2861, | 4652, | 5616, | 787, | 4798, | 5122, | 9592, | 5616, | 7114, |
| 8, | 2655, | 2110, | 1374, | 2916, | 1913, | 1126, | 7950, | 2901, | 3547, | 3935, |
| 9, | 1251, | 2733, | 933, | 1413, | 900, | 1711, | 2504, | 4352, | 1865, | 2871, |
| 10, | 1221, | 699, | 965, | 1397, | 577, | 675, | 3697, | 2195, | 2140, | 2610, |
| +gp, | 3559, | 3593, | 2900, | 3493, | 1166, | 511, | 2799, | 5490, | 3149, | 3924, |
| TOTALNUM, | 116940, | 120984, | 121226, | 116368, | 67603, | 123879, | 184586, | 217188, | 184824, | 178727, |
| TONSLAND, | 198110, | 184548, | 201860, | 191191, | 107181, | 140379, | 260404, | 244732, | 210508, | 215659, |
| SOPCOF %, | 117, | 107, | 110, | 100, | 113, | 98, | 96, | 80, | 82, | 82, |

**continued...**

**Table 5.8 (continued)**

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

Table 1 Catch numbers at age Numbers*10**-3

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | 21159, | 81601, | 54151, | 31662, | 45758, | 28334, | 18226, | 10467, | 17225, | 11638, |
| 3, | 36782, | 60832, | 125030, | 99049, | 48969, | 61963, | 40796, | 83954, | 34733, | 17244, |
| 4, | 44027, | 11691, | 30576, | 34317, | 27685, | 23328, | 36644, | 21822, | 65052, | 23768, |
| 5, | 15671, | 16366, | 7947, | 10140, | 12476, | 14122, | 9211, | 21528, | 13060, | 32700, |
| 6, | 20419, | 4436, | 8712, | 2062, | 4534, | 4400, | 6379, | 3619, | 8212, | 3226, |
| 7, | 12148, | 7808, | 3435, | 4332, | 1468, | 2901, | 3200, | 2550, | 1054, | 3008, |
| 8, | 4802, | 6789, | 3212, | 1456, | 1848, | 963, | 1338, | 2008, | 1251, | 1177, |
| 9, | 3258, | 2914, | 2679, | 1606, | 938, | 1356, | 147, | 369, | 461, | 760, |
| 10, | 2505, | 2350, | 1724, | 963, | 976, | 438, | 730, | 279, | 263, | 247, |
| +gp, | 3821, | 4140, | 2880, | 1134, | 2150, | 1192, | 1629, | 629, | 448, | 760, |
| TOTALNUM, | 164592, | 198927, | 240346, | 186721, | 146802, | 138997, | 118300, | 147225, | 141759, | 94528, |
| TONSLAND, | 262301, | 233453, | 242486, | 182808, | 154465, | 164234, | 154379, | 175516, | 170903, | 155405, |
| SOPCOF %, | 97, | 102, | 100, | 101, | 103, | 114, | 100, | 100, | 100, | 100, |

Table 1 Catch numbers at age Numbers*10**-3

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | 14624, | 2216, | 3311, | 3867, | 5017, | 11157, | 11543, | 6135, | 14059, | 3316, |
| 3, | 41466, | 48917, | 22115, | 17869, | 8126, | 12378, | 21002, | 73878, | 48798, | 18808, |
| 4, | 33233, | 11974, | 12895, | 49829, | 35847, | 19915, | 13463, | 11619, | 26130, | 57133, |
| 5, | 12064, | 7189, | 6062, | 4339, | 32827, | 32643, | 8996, | 5395, | 4772, | 34019, |
| 6, | 11204, | 5279, | 4525, | 3118, | 4560, | 18751, | 9152, | 5066, | 5487, | 2627, |
| 7, | 1135, | 3740, | 2805, | 3490, | 2328, | 1939, | 7735, | 2988, | 4757, | 1493, |
| 8, | 1772, | 775, | 1399, | 755, | 1219, | 377, | 1126, | 2009, | 3289, | 1127, |
| 9, | 560, | 878, | 351, | 620, | 966, | 191, | 154, | 272, | 1452, | 1292, |
| 10, | 557, | 134, | 454, | 257, | 320, | 179, | 121, | 81, | 285, | 883, |
| +gp, | 897, | 701, | 285, | 797, | 102, | 149, | 253, | 132, | 262, | 148, |
| TOTALNUM, | 117512, | 81803, | 54202, | 84941, | 91312, | 97679, | 73545, | 107575, | 109291, | 120846, |
| TONSLAND, | 158796, | 107147, | 70458, | 91679, | 114508, | 122664, | 95393, | 107326, | 124562, | 144056, |
| SOPCOF %, | 100, | 99, | 99, | 102, | 99, | 100, | 100, | 99, | 100, | 99, |

## Table 5.9

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

Table 2 Catch weights at age (kg)

| YEAR, | 1960, | 1961, | 1962, | 1963, |
|---|---|---|---|---|
| AGE | | | | |
| 2, | .3400, | .3400, | .3400, | .3400, |
| 3, | .7100, | .7100, | .7100, | .7100, |
| 4, | 1.1100, | 1.1100, | 1.1100, | 1.1100, |
| 5, | 1.6300, | 1.6300, | 1.6300, | 1.6300, |
| 6, | 2.3300, | 2.3300, | 2.3300, | 2.3300, |
| 7, | 3.1600, | 3.1600, | 3.1600, | 3.1600, |
| 8, | 4.0300, | 4.0300, | 4.0300, | 4.0300, |
| 9, | 4.8700, | 4.8700, | 4.8700, | 4.8700, |
| 10, | 5.6300, | 5.6300, | 5.6300, | 5.6300, |
| +gp, | 8.0300, | 8.0390, | 7.9240, | 7.8510, |
| SOPCOFAC, | 1.2793, | 1.4354, | 1.2489, | 1.2026, |

Table 2 Catch weights at age (kg)

| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | .3400, | .3400, | .3400, | .3400, | .3400, | .3400, | .3400, | .3400, | .3400, | .3400, |
| 3, | .7100, | .7100, | .7100, | .7100, | .7100, | .7100, | .7100, | .7100, | .7100, | .7100, |
| 4, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, |
| 5, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, |
| 6, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, |
| 7, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, |
| 8, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, |
| 9, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, |
| 10, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, |
| +gp, | 7.7810, | 7.9590, | 8.1060, | 7.9940, | 7.7160, | 7.4790, | 7.4040, | 7.0520, | 7.4770, | 7.3850, |
| SOPCOFAC, | 1.1684, | 1.0721, | 1.0963, | .9990, | 1.1338, | .9756, | .9575, | .7953, | .8212, | .8167, |

continued...

## Table 5.9 (continued)

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

| Table 2 | Catch weights at age (kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 2, | .3400, | .3400, | .3400, | .3400, | .3400, | .3400, | .4500, | .4300, | .5100, | .6000, |
| 3, | .7100, | .7100, | .7100, | .7100, | .7100, | .7100, | .7900, | .7300, | .7700, | 1.0500, |
| 4, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.1100, | 1.2700, | 1.4000, | 1.1200, | 1.3300, |
| 5, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 1.6300, | 2.0300, | 2.0500, | 2.0200, | 1.8600, |
| 6, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.3300, | 2.5500, | 2.7600, | 2.6100, | 2.8000, |
| 7, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.1600, | 3.2900, | 3.3000, | 3.2700, | 4.0000, |
| 8, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.0300, | 4.3400, | 4.3800, | 3.9100, | 4.1800, |
| 9, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 4.8700, | 5.1500, | 5.9500, | 4.6900, | 5.3300, |
| 10, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.6300, | 5.7500, | 6.3900, | 5.6300, | 5.6800, |
| +gp, | 7.2170, | 7.1270, | 7.3200, | 7.3940, | 7.5270, | 7.8090, | 6.9370, | 6.8410, | 7.5580, | 8.6650, |
| SOPCOFAC, | .9694, | 1.0155, | 1.0020, | 1.0061, | 1.0278, | 1.1388, | .9991, | .9975, | .9961, | .9991, |

| Table 2 | Catch weights at age (kg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
| AGE | | | | | | | | | | |
| 2, | .5300, | .3800, | .3200, | .3400, | .3300, | .4500, | .5400, | .4000, | .4500, | .5000, |
| 3, | .7100, | .7500, | .5900, | .5300, | .6200, | .7400, | .7600, | .7200, | .7000, | .6900, |
| 4, | 1.2600, | 1.3300, | 1.2200, | .8400, | .8700, | .9700, | 1.0800, | 1.1900, | 1.1000, | 1.0200, |
| 5, | 2.0200, | 2.0700, | 1.9700, | 1.6600, | 1.3100, | 1.3900, | 1.5600, | 1.7800, | 1.9800, | 1.3900, |
| 6, | 2.7000, | 2.6300, | 2.3000, | 2.3200, | 2.4300, | 1.8100, | 2.1200, | 2.2400, | 2.3400, | 2.5900, |
| 7, | 3.8800, | 3.2800, | 2.8700, | 2.9700, | 3.8700, | 3.0200, | 2.4000, | 2.8600, | 2.8100, | 3.0100, |
| 8, | 4.4700, | 3.9600, | 3.7200, | 4.0000, | 5.3800, | 3.7600, | 3.6500, | 3.3200, | 3.2500, | 3.1900, |
| 9, | 5.3600, | 4.5400, | 4.3000, | 4.7200, | 5.8300, | 4.6400, | 3.6000, | 4.5300, | 4.0600, | 3.7500, |
| 10, | 6.0600, | 5.5500, | 4.6900, | 5.4400, | 5.3600, | 4.7500, | 6.3700, | 5.7000, | 6.1900, | 4.5100, |
| +gp, | 7.1900, | 8.0120, | 6.5970, | 6.9040, | 7.4480, | 7.5000, | 4.7950, | 7.1250, | 7.3760, | 6.4340, |
| SOPCOFAC, | .9997, | .9930, | .9929, | 1.0154, | .9902, | .9978, | 1.0001, | .9912, | .9952, | .9944, |

## Table 5.10

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

Terminal Fs derived using XSA (With F shrinkage)

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1960, | 1961, | 1962, | 1963, |
|---|---|---|---|---|
| AGE | | | | |
| 2, | .0694, | .0259, | .0039, | .0259, |
| 3, | .1413, | .2383, | .2772, | .1747, |
| 4, | .1843, | .1756, | .2297, | .3607, |
| 5, | .5008, | .2695, | .1205, | .1825, |
| 6, | .2407, | .2519, | .2883, | .1797, |
| 7, | .3848, | .0915, | .2530, | .2108, |
| 8, | .4185, | .1206, | .0943, | .1734, |
| 9, | .3586, | .1479, | .1646, | .1355, |
| 10, | .3832, | .1770, | .1849, | .1771, |
| +gp, | .3832, | .1770, | .1849, | .1771, |
| FBAR 3- 6, | .2667, | .2338, | .2289, | .2244, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | .0628, | .1743, | .0347, | .0409, | .0160, | .0131, | .0786, | .1053, | .0472, | .1397, |
| 3, | .1080, | .1562, | .1876, | .1886, | .2043, | .3403, | .1881, | .3513, | .5897, | .4914, |
| 4, | .4012, | .0806, | .3616, | .3280, | .1710, | .1407, | .5148, | .4217, | .4303, | .4773, |
| 5, | .2761, | .3093, | .3132, | .4320, | .1024, | .2355, | .2434, | .4351, | .3784, | .4115, |
| 6, | .1198, | .3558, | .2448, | .1522, | .1649, | .1308, | .3710, | .2613, | .2897, | .3696, |
| 7, | .1979, | .1787, | .2737, | .1596, | .0391, | .1357, | .2036, | .3932, | .2412, | .3378, |
| 8, | .2195, | .1772, | .1219, | .2757, | .0747, | .0722, | .3482, | .1698, | .2454, | .2659, |
| 9, | .3055, | .3691, | .1106, | .1777, | .1275, | .0886, | .2272, | .3264, | .1570, | .3215, |
| 10, | .2248, | .2796, | .2138, | .2407, | .1021, | .1330, | .2802, | .3190, | .2637, | .3434, |
| +gp, | .2248, | .2796, | .2138, | .2407, | .1021, | .1330, | .2802, | .3190, | .2637, | .3434, |
| FBAR 3- 6, | .2263, | .2255, | .2768, | .2752, | .1606, | .2118, | .3293, | .3673, | .4220, | .4374, |

**continued...**

**Table 5.10 (continued)**

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

Terminal Fs derived using XSA (With F shrinkage)

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | .1204, | .2763, | .2185, | .2179, | .1966, | .2067, | .0582, | .0788, | .1459, | .1144, |
| 3, | .6675, | .5965, | .9053, | .7885, | .6159, | .4451, | .5170, | .4110, | .4039, | .2133, |
| 4, | .5929, | .4598, | .6949, | .6807, | .5271, | .6840, | .5192, | .5840, | .6560, | .5378, |
| 5, | .6245, | .4579, | .6629, | .5216, | .5675, | .5663, | .6414, | .6703, | .8669, | .8422, |
| 6, | .6384, | .3565, | .4742, | .3539, | .4684, | .3990, | .5452, | .5648, | .5886, | .5382, |
| 7, | .5341, | .5400, | .5194, | .4596, | .4608, | .6289, | .5719, | .4369, | .3147, | .4440, |
| 8, | .4025, | .6576, | .4459, | .4348, | .3624, | .6330, | .6798, | .8951, | .3979, | .7022, |
| 9, | .3682, | .4578, | .5947, | .4203, | .5595, | .4967, | .1800, | .3973, | .5208, | .4505, |
| 10, | .5176, | .4978, | .5439, | .4412, | .4907, | .5580, | .5500, | .6107, | .5529, | .5927, |
| +gp, | .5176, | .4978, | .5439, | .4412, | .4907, | .5580, | .5500, | .6107, | .5529, | .5927, |
| FBAR 3- 6, | .6308, | .4677, | .6843, | .5862, | .5447, | .5236, | .5557, | .5575, | .6289, | .5329, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 2, | .1249, | .0090, | .0176, | .0434, | .0745, | .1602, | .0400, | .0171, | .1161, | .0453, | .0595, |
| 3, | .7497, | .7846, | .1165, | .1246, | .1209, | .2654, | .5098, | .3837, | .1835, | .2245, | .2639, |
| 4, | .8199, | .5004, | .4839, | .4157, | .3932, | .4854, | .5173, | .5967, | .2257, | .3397, | .3874, |
| 5, | .5826, | .4089, | .5134, | .2954, | .5358, | .7676, | .4228, | .4029, | .5265, | .5153, | .4816, |
| 6, | .8053, | .5492, | .4917, | .5474, | .5820, | .6821, | .5031, | .4493, | .9579, | .6274, | .6782, |
| 7, | .3658, | .7021, | .6444, | .9119, | 1.0926, | .5278, | .6789, | .3021, | 1.0513, | .7631, | .7055, |
| 8, | .5144, | .4595, | .6257, | .3530, | 1.0087, | .4976, | .6794, | .3685, | .6428, | .7735, | .5949, |
| 9, | .8957, | .5228, | .3896, | .6362, | 1.0836, | .4055, | .3881, | .3383, | .4998, | .5668, | .4683, |
| 10, | .7121, | .5508, | .5686, | .5551, | .8223, | .5844, | .4893, | .3634, | .7238, | .6571, | .5814, |
| +gp, | .7121, | .5508, | .5686, | .5551, | .8223, | .5844, | .4893, | .3634, | .7238, | .6571, | |
| FBAR 3- 6, | .7394, | .5608, | .4014, | .3458, | .4080, | .5501, | .4882, | .4581, | .4734, | .4267, | |

## Table 5.11

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

Terminal Fs derived using XSA (With F shrinkage)

| Table 10 Stock number at age (start of year) | | | | | Numbers*10**-3 |
|---|---|---|---|---|---|
| YEAR, | 1960, | 1961, | 1962, | 1963, | |
| AGE | | | | | |
| 2, | 121637, | 213256, | 355461, | 121785, | |
| 3, | 88165, | 92909, | 170133, | 289900, | |
| 4, | 85915, | 62674, | 59940, | 105573, | |
| 5, | 38000, | 58504, | 43051, | 39003, | |
| 6, | 26163, | 18855, | 36583, | 31247, | |
| 7, | 16896, | 16838, | 12000, | 22450, | |
| 8, | 7760, | 9415, | 12581, | 7629, | |
| 9, | 4823, | 4181, | 6832, | 9374, | |
| 10, | 2580, | 2759, | 2953, | 4745, | |
| +gp, | 5252, | 8334, | 11259, | 12042, | |
| TOTAL, | 397190, | 487724, | 710792, | 643748, | |

| Table 10 Stock number at age (start of year) | | | | | | Numbers*10**-3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 2, | 368857, | 210300, | 241148, | 191781, | 367752, | 347340, | 379653, | 219408, | 278109, | 117228, |
| 3, | 97162, | 283619, | 144645, | 190695, | 150727, | 296297, | 280677, | 287351, | 161682, | 217193, |
| 4, | 199301, | 71405, | 198624, | 98164, | 129286, | 100606, | 172614, | 190403, | 165574, | 73399, |
| 5, | 60264, | 109245, | 53937, | 113273, | 57898, | 89216, | 71558, | 84459, | 102250, | 88157, |
| 6, | 26605, | 37438, | 65645, | 32284, | 60206, | 42787, | 57717, | 45930, | 44754, | 57343, |
| 7, | 21375, | 19323, | 21474, | 42074, | 22700, | 41798, | 30736, | 32606, | 28958, | 27424, |
| 8, | 14887, | 14359, | 13232, | 13372, | 29366, | 17873, | 29880, | 20530, | 18017, | 18627, |
| 9, | 5251, | 9786, | 9847, | 9590, | 8310, | 22312, | 13614, | 17270, | 14183, | 11541, |
| 10, | 6702, | 3168, | 5539, | 7218, | 6573, | 5989, | 16719, | 8881, | 10202, | 9925, |
| +gp, | 19429, | 16180, | 16560, | 17945, | 13238, | 4517, | 12578, | 22058, | 14922, | 14812, |
| TOTAL, | 819834, | 774823, | 770652, | 716396, | 846055, | 968735, | 1065746, | 928896, | 838650, | 635649, |

**continued...**

**Table 5.11 (continued)**

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:44

Terminal Fs derived using XSA (With F shrinkage)

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 2, | 206150, | 373552, | 304964, | 178731, | 283382, | 167724, | 356401, | 152658, | 140237, | 118976, |
| 3, | 83465, | 149636, | 232003, | 200686, | 117684, | 190610, | 111684, | 275305, | 115515, | 99231, |
| 4, | 108787, | 35054, | 67468, | 76816, | 74684, | 52042, | 99992, | 54525, | 149436, | 63148, |
| 5, | 37286, | 49230, | 18121, | 27572, | 31840, | 36096, | 21501, | 48709, | 24896, | 63486, |
| 6, | 47827, | 16348, | 25498, | 7646, | 13399, | 14780, | 16775, | 9269, | 20401, | 8566, |
| 7, | 32443, | 20681, | 9371, | 12993, | 4394, | 6868, | 8119, | 7962, | 4314, | 9272, |
| 8, | 16016, | 15570, | 9867, | 4564, | 6718, | 2269, | 2998, | 3752, | 4211, | 2578, |
| 9, | 11690, | 8768, | 6605, | 5172, | 2419, | 3828, | 986, | 1244, | 1255, | 2316, |
| 10, | 6851, | 6623, | 4542, | 2983, | 2782, | 1132, | 1907, | 675, | 684, | 610, |
| +gp, | 10344, | 11553, | 7507, | 3482, | 6068, | 3047, | 4210, | 1503, | 1153, | 1857, |
| TOTAL, | 560860, | 687014, | 685945, | 520645, | 543369, | 478396, | 624572, | 555601, | 462102, | 370040, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 2, | 137611, | 273833, | 209554, | 100622, | 77213, | 83312, | 325691, | 399697, | 141800, | 82762, | 0, | 2087 |
| 3, | 86879, | 99434, | 222190, | 168572, | 78883, | 58677, | 58115, | 256209, | 321693, | 103375, | 64761, | 1496 |
| 4, | 65640, | 33610, | 37148, | 161904, | 121847, | 57231, | 36840, | 28577, | 142919, | 219226, | 67622, | 822 |
| 5, | 30195, | 23671, | 16683, | 18746, | 87468, | 67324, | 28837, | 17981, | 12884, | 93368, | 127792, | 443 |
| 6, | 22390, | 13805, | 12875, | 8174, | 11422, | 41910, | 25584, | 15470, | 9840, | 6230, | 45662, | 237 |
| 7, | 4094, | 8194, | 6526, | 6447, | 3871, | 5225, | 17346, | 12665, | 8082, | 3091, | 2724, | 132 |
| 8, | 4870, | 2325, | 3324, | 2805, | 2121, | 1063, | 2524, | 7203, | 7666, | 2313, | 1180, | 71 |
| 9, | 1046, | 2383, | 1202, | 1456, | 1614, | 633, | 529, | 1047, | 4080, | 3300, | 874, | 39 |
| 10, | 1209, | 350, | 1157, | 667, | 631, | 447, | 346, | 294, | 611, | 2026, | 1533, | 23 |
| +gp, | 1920, | 1810, | 718, | 2046, | 198, | 368, | 716, | 475, | 555, | 335, | 1002, | |
| TOTAL, | 355853, | 459415, | 511379, | 471438, | 385267, | 316190, | 496528, | 739617, | 650127, | 516026, | 313149, | |

## Table 5.12 (continued)

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:45

Terminal Fs derived using XSA (With F shrinkage)

| Table 12 Stock biomass at age (start of year) | | | | | Tonnes |
|---|---|---|---|---|---|
| YEAR, | 1960, | 1961, | 1962, | 1963, | |
| AGE | | | | | |
| 2, | 41356, | 72507, | 120857, | 41407, | |
| 3, | 62597, | 65965, | 120794, | 205829, | |
| 4, | 95366, | 69568, | 66533, | 117186, | |
| 5, | 61939, | 95361, | 70173, | 63574, | |
| 6, | 60959, | 43933, | 85238, | 72806, | |
| 7, | 53391, | 53208, | 37920, | 70943, | |
| 8, | 31273, | 37942, | 50700, | 30744, | |
| 9, | 23488, | 20361, | 33274, | 45649, | |
| 10, | 14523, | 15533, | 16623, | 26715, | |
| +gp, | 42177, | 66993, | 89217, | 94542, | |
| TOTALBIO, | 487070, | 541372, | 691328, | 769395, | |

| Table 12 Stock biomass at age (start of year) | | | | | | | Tonnes | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1964, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | | |
| 2, | 125411, | 71502, | 81990, | 65206, | 125036, | 118096, | 129082, | 74599, | 94557, | 39858, |
| 3, | 68985, | 201369, | 102698, | 135393, | 107016, | 210371, | 199281, | 204020, | 114794, | 154207, |
| 4, | 221224, | 79260, | 220473, | 108962, | 143508, | 111673, | 191601, | 211347, | 183787, | 81472, |
| 5, | 98230, | 178069, | 87917, | 184635, | 94373, | 145423, | 116639, | 137668, | 166667, | 143696, |
| 6, | 61990, | 87229, | 152953, | 75223, | 140279, | 99694, | 134481, | 107018, | 104276, | 133608, |
| 7, | 67546, | 61061, | 67859, | 132954, | 71731, | 132083, | 97125, | 103036, | 91507, | 86661, |
| 8, | 59996, | 57867, | 53323, | 53891, | 118344, | 72028, | 120417, | 82735, | 72607, | 75068, |
| 9, | 25575, | 47659, | 47955, | 46703, | 40469, | 108658, | 66301, | 84107, | 69073, | 56206, |
| 10, | 37731, | 17833, | 31187, | 40637, | 37006, | 33719, | 94128, | 49998, | 57437, | 55877, |
| +gp, | 151177, | 128773, | 134237, | 143455, | 102144, | 33779, | 93129, | 155551, | 111568, | 109387, |
| TOTALBIO, | 917864, | 930624, | 980593, | 987058, | 979907, | 1065523, | 1242184, | 1210078, | 1066274, | 936040, |

continued...

## Table 5.12 (continued)

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA01)

At 28-Aug-94 18:07:45

Terminal Fs derived using XSA (With F shrinkage)

| Table 12 Stock biomass at age (start of year) Tonnes<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | 70091, | 127008, | 103688, | 60769, | 96350, | 57026, | 160380, | 65643, | 71521, | 71386, |
| 3, | 59260, | 106241, | 164722, | 142487, | 83555, | 135333, | 88230, | 200972, | 88946, | 104192, |
| 4, | 120754, | 38910, | 74890, | 85266, | 82899, | 57767, | 126989, | 76335, | 167368, | 83987, |
| 5, | 60777, | 80245, | 29538, | 44942, | 51900, | 58836, | 43646, | 99854, | 50290, | 118084, |
| 6, | 111436, | 38090, | 59410, | 17814, | 31220, | 34437, | 42775, | 25582, | 53245, | 23985, |
| 7, | 102519, | 65353, | 29611, | 41057, | 13885, | 21702, | 26713, | 26274, | 14107, | 37088, |
| 8, | 64545, | 62746, | 39766, | 18392, | 27073, | 9145, | 13011, | 16434, | 16466, | 10777, |
| 9, | 56931, | 42700, | 32164, | 25190, | 11781, | 18642, | 5080, | 7400, | 5886, | 12344, |
| 10, | 38573, | 37288, | 25571, | 16796, | 15661, | 6373, | 10966, | 4311, | 3853, | 3467, |
| +gp, | 74656, | 82338, | 54951, | 25743, | 45673, | 23794, | 29206, | 10283, | 8717, | 16090, |
| TOTALBIO, | 759542, | 680920, | 614309, | 478456, | 459997, | 423055, | 546997, | 533090, | 480400, | 481400, |

| Table 12 Stock biomass at age (start of year) Tonnes<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 2, | 72934, | 104057, | 67057, | 34211, | 25480, | 37490, | 175873, | 159879, | 63810, | 41381, |
| 3, | 61684, | 74576, | 131092, | 89343, | 48908, | 43421, | 44167, | 184471, | 225185, | 71329, |
| 4, | 82707, | 45710, | 45320, | 135999, | 106007, | 55514, | 39788, | 34007, | 157210, | 223610, |
| 5, | 60993, | 49473, | 32866, | 31119, | 114583, | 93580, | 44986, | 32005, | 25509, | 129782, |
| 6, | 60453, | 36308, | 29614, | 18964, | 27755, | 75857, | 54237, | 34653, | 23025, | 16136, |
| 7, | 15885, | 26875, | 18731, | 19148, | 14981, | 15781, | 41631, | 36222, | 22710, | 9304, |
| 8, | 21767, | 9230, | 12366, | 11221, | 11409, | 3975, | 9212, | 23914, | 24913, | 7377, |
| 9, | 5606, | 10797, | 5170, | 6871, | 9407, | 2938, | 1905, | 4745, | 16563, | 12375, |
| 10, | 7324, | 1937, | 5426, | 3627, | 3381, | 2123, | 2201, | 1675, | 3785, | 9138, |
| +gp, | 13807, | 14820, | 4739, | 14122, | 1475, | 2759, | 3431, | 3385, | 4090, | 2158, |
| TOTALBIO, | 403160, | 373783, | 352381, | 364625, | 363387, | 333439, | 417431, | 514955, | 566801, | 522591, |

## Table 5.13

Run title : Saithe in the North-East Arctic (Fishing Areas I and II) (run name: VPA04)

At 30-Aug-94 10:51:17

Table 16 Summary (without SOP correction)

Traditional vpa using file input for terminal F

| | RECRUITS, Age 2 | TOTALBIO, | TOTSPBIO, | LANDINGS, | YIELD/SSB, | FBAR 3- 6, |
|---|---|---|---|---|---|---|
| 1960, | 121087, | 484543, | 224785, | 136006, | .6050, | .2664, |
| 1961, | 211936, | 538870, | 237130, | 109821, | .4631, | .2338, |
| 1962, | 353212, | 687958, | 311769, | 122841, | .3940, | .2288, |
| 1963, | 121111, | 765561, | 340101, | 148036, | .4353, | .2243, |
| 1964, | 366463, | 913329, | 402723, | 198110, | .4919, | .2261, |
| 1965, | 209110, | 925891, | 398968, | 184548, | .4626, | .2254, |
| 1966, | 239558, | 975553, | 485734, | 201860, | .4156, | .2768, |
| 1967, | 190591, | 981951, | 491020, | 191191, | .3894, | .2750, |
| 1968, | 364628, | 974301, | 507678, | 107181, | .2111, | .1610, |
| 1969, | 344477, | 1058242, | 477320, | 140379, | .2941, | .2123, |
| 1970, | 376417, | 1233333, | 602063, | 260404, | .4325, | .3295, |
| 1971, | 217224, | 1201378, | 579399, | 244732, | .4224, | .3676, |
| 1972, | 275408, | 1057813, | 503465, | 210508, | .4181, | .4223, |
| 1973, | 116001, | 928130, | 513139, | 215659, | .4203, | .4380, |
| 1974, | 203937, | 752381, | 444808, | 262301, | .5897, | .6298, |
| 1975, | 368866, | 674439, | 326019, | 233453, | .7161, | .4681, |
| 1976, | 301545, | 607716, | 239644, | 242486, | 1.0119, | .6830, |
| 1977, | 176814, | 473378, | 143863, | 182808, | 1.2707, | .5857, |
| 1978, | 280736, | 455619, | 144267, | 154465, | 1.0707, | .5450, |
| 1979, | 166002, | 418741, | 113088, | 164234, | 1.4523, | .5239, |
| 1980, | 352350, | 541154, | 126653, | 154379, | 1.2189, | .5559, |
| 1981, | 151178, | 527062, | 89377, | 175516, | 1.9638, | .5580, |
| 1982, | 138710, | 474758, | 101266, | 170903, | 1.6877, | .6283, |
| 1983, | 117588, | 475709, | 102821, | 155405, | 1.5114, | .5331, |
| 1984, | 136049, | 398325, | 123449, | 158796, | 1.2863, | .7384, |
| 1985, | 271193, | 369749, | 98957, | 107147, | 1.0828, | .5611, |
| 1986, | 207467, | 348678, | 75133, | 70458, | .9378, | .4026, |
| 1987, | 99608, | 360794, | 73107, | 91679, | 1.2540, | .3471, |
| 1988, | 76428, | 359224, | 67487, | 114508, | 1.6967, | .4087, |
| 1989, | 82489, | 329640, | 102245, | 122664, | 1.1997, | .5501, |
| 1990, | 322902, | 413234, | 111440, | 95393, | .8560, | .4892, |
| 1991, | 397000, | 510255, | 103416, | 107326, | 1.0378, | .4596, |
| 1992, | 209051, | 592509, | 93803, | 124562, | 1.3279, | .4735, |
| 1993, | 208476, | 619846, | 55810, | 144056, | 2.5812, | .4056, |
| Arith. Mean , | 228694, | 659708, | 259175, | 161877, | .9297, | .4245, |
| Units, | (Thousands), | (Tonnes), | (Tonnes), | (Tonnes), | | |

## Table 5.14



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

Prediction with management option table: Input data

| Year: 1994 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 |
| 2 | 209000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.450 | 0.0561 | 0.450 |
| 3 | 168120.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.703 | 0.2487 | 0.703 |
| 4 | 112762.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 1.103 | 0.3651 | 1.103 |
| 5 | 127792.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 1.717 | 0.4539 | 1.717 |
| 6 | 45662.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.390 | 0.6391 | 2.390 |
| 7 | 2724.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.893 | 0.6649 | 2.893 |
| 8 | 1180.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.253 | 0.5606 | 3.253 |
| 9 | 874.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 4.113 | 0.4413 | 4.113 |
| 10 | 1533.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 5.467 | 0.5479 | 5.467 |
| 11+ | 1002.000 | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.490 | 0.5479 | 6.490 |
| 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 |
| 2 | 209000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.450 | 0.0561 | 0.450 |
| 3 | . | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.703 | 0.2487 | 0.703 |
| 4 | . | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 1.103 | 0.3651 | 1.103 |
| 5 | . | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 1.717 | 0.4539 | 1.717 |
| 6 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.390 | 0.6391 | 2.390 |
| 7 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.893 | 0.6649 | 2.893 |
| 8 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.253 | 0.5606 | 3.253 |
| 9 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 4.113 | 0.4413 | 4.113 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 5.467 | 0.5479 | 5.467 |
| 11+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.490 | 0.5479 | 6.490 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1996 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 |
| 2 | 209000.00 | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.450 | 0.0561 | 0.450 |
| 3 | . | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 0.703 | 0.2487 | 0.703 |
| 4 | . | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 1.103 | 0.3651 | 1.103 |
| 5 | . | 0.2000 | 0.0000 | 0.0000 | 0.0000 | 1.717 | 0.4539 | 1.717 |
| 6 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.390 | 0.6391 | 2.390 |
| 7 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 2.893 | 0.6649 | 2.893 |
| 8 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 3.253 | 0.5606 | 3.253 |
| 9 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 4.113 | 0.4413 | 4.113 |
| 10 | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 5.467 | 0.5479 | 5.467 |
| 11+ | . | 0.2000 | 1.0000 | 0.0000 | 0.0000 | 6.490 | 0.5479 | 6.490 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : PRED2
Date and time: 28AUG94:22:32

## Table 5.15

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

Prediction with management option table

| Year: 1994 | | | | | Year: 1995 | | | | | Year: 1996 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 0.6980 | 0.2978 | 695416 | 139331 | 145000 | 0.0000 | 0.0000 | 730992 | 270713 | 0 | 927936 | 402268 |
| . | . | . | . | . | 0.0500 | 0.0213 | . | 270713 | 13840 | 911443 | 390891 |
| . | . | . | . | . | 0.1000 | 0.0427 | . | 270713 | 27337 | 895356 | 379843 |
| . | . | . | . | . | 0.1500 | 0.0640 | . | 270713 | 40503 | 879665 | 369115 |
| . | . | . | . | . | 0.2000 | 0.0853 | . | 270713 | 53345 | 864359 | 358698 |
| . | . | . | . | . | 0.2500 | 0.1067 | . | 270713 | 65873 | 849427 | 348582 |
| . | . | . | . | . | 0.3000 | 0.1280 | . | 270713 | 78094 | 834860 | 338759 |
| . | . | . | . | . | 0.3500 | 0.1493 | . | 270713 | 90018 | 820648 | 329220 |
| . | . | . | . | . | 0.4000 | 0.1707 | . | 270713 | 101652 | 806780 | 319955 |
| . | . | . | . | . | 0.4500 | 0.1920 | . | 270713 | 113005 | 793249 | 310959 |
| . | . | . | . | . | 0.5000 | 0.2134 | . | 270713 | 124083 | 780044 | 302221 |
| . | . | . | . | . | 0.5500 | 0.2347 | . | 270713 | 134894 | 767158 | 293736 |
| . | . | . | . | . | 0.6000 | 0.2560 | . | 270713 | 145446 | 754581 | 285495 |
| . | . | . | . | . | 0.6500 | 0.2774 | . | 270713 | 155745 | 742306 | 277491 |
| . | . | . | . | . | 0.7000 | 0.2987 | . | 270713 | 165798 | 730324 | 269717 |
| . | . | . | . | . | 0.7500 | 0.3200 | . | 270713 | 175611 | 718628 | 262166 |
| . | . | . | . | . | 0.8000 | 0.3414 | . | 270713 | 185192 | 707209 | 254833 |
| . | . | . | . | . | 0.8500 | 0.3627 | . | 270713 | 194546 | 696062 | 247710 |
| . | . | . | . | . | 0.9000 | 0.3840 | . | 270713 | 203679 | 685178 | 240791 |
| . | . | . | . | . | 0.9500 | 0.4054 | . | 270713 | 212597 | 674550 | 234071 |
| . | . | . | . | . | 1.0000 | 0.4267 | . | 270713 | 221306 | 664173 | 227543 |
| . | . | . | . | . | 1.0500 | 0.4480 | . | 270713 | 229811 | 654039 | 221202 |
| . | . | . | . | . | 1.1000 | 0.4694 | . | 270713 | 238118 | 644141 | 215042 |
| . | . | . | . | . | 1.1500 | 0.4907 | . | 270713 | 246232 | 634475 | 209058 |
| . | . | . | . | . | 1.2000 | 0.5120 | . | 270713 | 254158 | 625033 | 203246 |
| . | . | . | . | . | 1.2500 | 0.5334 | . | 270713 | 261902 | 615810 | 197599 |
| . | . | . | . | . | 1.3000 | 0.5547 | . | 270713 | 269466 | 606800 | 192113 |
| . | . | . | . | . | 1.3500 | 0.5760 | . | 270713 | 276858 | 597998 | 186784 |
| . | . | . | . | . | 1.4000 | 0.5974 | . | 270713 | 284080 | 589398 | 181607 |
| . | . | . | . | . | 1.4500 | 0.6187 | . | 270713 | 291137 | 580995 | 176577 |
| . | . | . | . | . | 1.5000 | 0.6401 | . | 270713 | 298034 | 572784 | 171690 |
| - | - | Tonnes | Tonnes | Tonnes | - | - | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name : PRED2
Date and time : 28AUG94:22:32
Computation of ref. F: Simple mean, age 3 - 6
Basis for 1994 : TAC constraints

Table 5.16



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

Single option prediction: Summary table

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 0.6980 | 0.2978 | 103559 | 145002 | 670649 | 695416 | 52975 | 139331 | 52975 | 139331 |
| 1995 | 0.2945 | 0.1257 | 48780 | 76764 | 664952 | 730989 | 104145 | 270711 | 104145 | 270711 |
| 1996 | 0.2945 | 0.1257 | 54087 | 90892 | 709444 | 836442 | 121852 | 339824 | 121852 | 339824 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : PRS01

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 0.6980 | 0.2978 | 103559 | 145002 | 670649 | 695416 | 52975 | 139331 | 52975 | 139331 |
| 1995 | 0.5612 | 0.2395 | 88172 | 137279 | 664952 | 730989 | 104145 | 270711 | 104145 | 270711 |
| 1996 | 0.5612 | 0.2395 | 89763 | 144854 | 674082 | 764312 | 104919 | 291867 | 104919 | 291867 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : PRS01

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 0.6980 | 0.2978 | 103559 | 145002 | 670649 | 695416 | 52975 | 139331 | 52975 | 139331 |
| 1995 | 0.7968 | 0.3400 | 119647 | 184585 | 664952 | 730989 | 104145 | 270711 | 104145 | 270711 |
| 1996 | 0.7968 | 0.3400 | 113466 | 176560 | 645933 | 707930 | 91977 | 255294 | 91977 | 255294 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : PRS01

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 0.6980 | 0.2978 | 103559 | 145002 | 670649 | 695416 | 52975 | 139331 | 52975 | 139331 |
| 1995 | 1.0000 | 0.4267 | 144559 | 221305 | 664952 | 730989 | 104145 | 270711 | 104145 | 270711 |
| 1996 | 1.0000 | 0.4267 | 129381 | 195042 | 623729 | 664171 | 82137 | 227541 | 82137 | 227541 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : PRS01

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 0.6980 | 0.2978 | 103559 | 145002 | 670649 | 695416 | 52975 | 139331 | 52975 | 139331 |
| 1995 | 1.1717 | 0.5000 | 164145 | 249694 | 664952 | 730989 | 104145 | 270711 | 104145 | 270711 |
| 1996 | 1.1717 | 0.5000 | 140221 | 205768 | 606324 | 630348 | 74670 | 206514 | 74670 | 206514 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : PRS01
Date and time : 30AUG94:12:39
Computation of ref. F: Simple mean, age 3 - 6
Prediction basis : F factors

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

Single option prediction: Detailed tables

Year: 1994 F-factor: 0.6980 Reference F: 0.2978

| | | | | | | 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 |
| 2 | 0.0392 | 7279 | 3276 | 209000 | 94050 | 0 | 0 | 0 | 0 |
| 3 | 0.1736 | 24353 | 17128 | 168120 | 118244 | 0 | 0 | 0 | 0 |
| 4 | 0.2548 | 23089 | 25475 | 112762 | 124414 | 0 | 0 | 0 | 0 |
| 5 | 0.3168 | 31617 | 54275 | 127792 | 219376 | 0 | 0 | 0 | 0 |
| 6 | 0.4461 | 15004 | 35860 | 45662 | 109132 | 45662 | 109132 | 45662 | 109132 |
| 7 | 0.4641 | 924 | 2673 | 2724 | 7881 | 2724 | 7881 | 2724 | 7881 |
| 8 | 0.3913 | 349 | 1134 | 1180 | 3839 | 1180 | 3839 | 1180 | 3839 |
| 9 | 0.3080 | 211 | 868 | 874 | 3595 | 874 | 3595 | 874 | 3595 |
| 10 | 0.3824 | 444 | 2429 | 1533 | 8380 | 1533 | 8380 | 1533 | 8380 |
| 11+ | 0.3824 | 290 | 1885 | 1002 | 6503 | 1002 | 6503 | 1002 | 6503 |
| Total | | 103559 | 145002 | 670649 | 695416 | 52975 | 139331 | 52975 | 139331 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1995 F-factor: 1.0000 Reference F: 0.4267

| | | | | | | 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 |
| 2 | 0.0561 | 10344 | 4655 | 209000 | 94050 | 0 | 0 | 0 | 0 |
| 3 | 0.2487 | 32973 | 23191 | 164544 | 115729 | 0 | 0 | 0 | 0 |
| 4 | 0.3651 | 32273 | 35608 | 115710 | 127666 | 0 | 0 | 0 | 0 |
| 5 | 0.4539 | 23840 | 40925 | 71553 | 122833 | 0 | 0 | 0 | 0 |
| 6 | 0.6391 | 32967 | 78791 | 76217 | 182158 | 76217 | 182158 | 76217 | 182158 |
| 7 | 0.6649 | 10650 | 30815 | 23931 | 69240 | 23931 | 69240 | 23931 | 69240 |
| 8 | 0.5606 | 550 | 1791 | 1402 | 4562 | 1402 | 4562 | 1402 | 4562 |
| 9 | 0.4413 | 213 | 875 | 653 | 2687 | 653 | 2687 | 653 | 2687 |
| 10 | 0.5479 | 203 | 1109 | 526 | 2875 | 526 | 2875 | 526 | 2875 |
| 11+ | 0.5479 | 546 | 3545 | 1416 | 9189 | 1416 | 9189 | 1416 | 9189 |
| Total | | 144559 | 221305 | 664952 | 730989 | 104145 | 270711 | 104145 | 270711 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Year: 1996 F-factor: 1.0000 Reference F: 0.4267

| | | | | | | 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 |
| 2 | 0.0561 | 10344 | 4655 | 209000 | 94050 | 0 | 0 | 0 | 0 |
| 3 | 0.2487 | 32419 | 22802 | 161779 | 113785 | 0 | 0 | 0 | 0 |
| 4 | 0.3651 | 29301 | 32328 | 105054 | 115910 | 0 | 0 | 0 | 0 |
| 5 | 0.4539 | 21909 | 37611 | 65758 | 112885 | 0 | 0 | 0 | 0 |
| 6 | 0.6391 | 16094 | 38465 | 37209 | 88929 | 37209 | 88929 | 37209 | 88929 |
| 7 | 0.6649 | 14657 | 42406 | 32933 | 95287 | 32933 | 95287 | 32933 | 95287 |
| 8 | 0.5606 | 3956 | 12870 | 10077 | 32784 | 10077 | 32784 | 10077 | 32784 |
| 9 | 0.4413 | 213 | 878 | 655 | 2696 | 655 | 2696 | 655 | 2696 |
| 10 | 0.5479 | 133 | 726 | 344 | 1881 | 344 | 1881 | 344 | 1881 |
| 11+ | 0.5479 | 355 | 2301 | 919 | 5965 | 919 | 5965 | 919 | 5965 |
| Total | | 129381 | 195042 | 623729 | 664171 | 82137 | 227541 | 82137 | 227541 |
| Unit | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : PRSO1
Date and time : 30AUG94:12:39
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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Denmark | - | - | - | + | - |
| Faroe Islands | - | - | 29 | 450[3] | 973 |
| France | 2,970 | 3,326 | 2,719 | 1,611 | 3,369 |
| German Dem. Rep. | 4,168 | 3,260 | 1,323 | 417 | 994 |
| Germany, Fed. Rep. | 3,289 | 3,306 | 3,561 | 5,412 | 1,361 |
| Norway | 18,650 | 20,456 | 23,255 | 18,051 | 24,662 |
| Portugal | 1,806 | 2,056 | 1,591 | 1,175 | 500 |
| Spain | 25 | 38 | - | 25 | 26 |
| UK (England & Wales) | 716 | 167 | 129 | 230 | 468 |
| UK (Scotland) | - | - | 14 | 9 | 2 |
| USSR | 69,689 | 59,943 | 20,694 | 7,215 | 9,139 |
| Total | 101,313 | 92,552 | 53,315 | 34,595 | 41,494 |

| Country | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|
| Canada | - | - | - | - | 8[3] |
| Denmark | - | 37[3] | 23 | 623 | 19 |
| Faroe Islands | 338 | 386 | 644 | 58 | 152 |
| France | 1,877[1] | 1,826[1] | 804 | 1,306 | 278[3] |
| German Dem. Rep. | 1,978 | 5,351 | - | - | - |
| Germany, Fed. Rep. | 2,267 | 1,390 | 981 | 530 | 680 |
| Norway | 25,295 | 34,090 | 49,464 | 24,895[2] | 20,289[2] |
| Portugal | 340 | 830 | 166 | 977 | 1,069[3] |
| Spain | 5[2] | - | 1 | 16 | 65 |
| UK (England & Wales) | 259 | 332 | 285 | 447 | 734 |
| UK (Scotland) | 13 | 1 | 64 | 34 | 1 |
| Russia[4] | 14,344 | 18,918 | 15,354 | 4,335 | 5,309[2] |
| Total | 46,716 | 63,161 | 67,786 | 33,221 | 28,604 |

[1]Provisional figures.
[2]Working Group figure.
[3]As reported to Norwegian authorities.
[4]USSR prior to 1991.

**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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Faroe Islands | - | - | - | - | 1 |
| Germany, Fed. Rep. | 1 | 143 | 50 | 10 | 6 |
| Norway | 1,472 | 2,378 | 4,260 | 2,331 | 2,232 |
| UK (England & Wales) | 22 | 43 | 32 | 14 | 20 |
| UK (Scotland) | - | - | 3 | - | - |
| USSR | 532 | 368 | 1,066 | 769 | 199 |
| Total | 2,027 | 2,932 | 5,411 | 3,124 | 2,458 |

| Country | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|
| Faroe Islands | 13 | 7 | - | - | 26 |
| Germany, Fed. Rep. | + | - | - | - | - |
| Norway | 1,823[2] | 1,263[2] | 2,001[2] | 2,891[2] | 1,353[2] |
| UK (England & Wales) | 12 | + | - | - | - |
| UK (Scotland) | 2 | - | - | - | - |
| Russia[3] | 594 | 114 | 512 | 582 | 659[2] |
| Total | 2,444 | 1,384 | 2,513 | 3,473 | 2,038 |

[1]Provisional figures.
[2]Working Group figure.
[3]USSR prior to 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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Faroe Islands | - | - | 29 | 450[2] | 970 |
| France | 2,970 | 3,326 | 2,719 | 1,611 | 3,349 |
| German Dem. Rep. | 2,570 | 2,800 | 1,252 | 375 | 879 |
| Germany, Fed. Rep. | 3,288 | 2,972 | 3,319 | 3,562 | 1,320 |
| Norway | 17,111 | 18,062 | 18,693 | 15,409 | 22,288 |
| Portugal | 1,134 | 1,327 | 1,273 | 1,156 | 467 |
| UK (England & Wales) | 672 | 120 | 94 | 205 | 412 |
| UK (Scotland) | - | - | 11 | 8 | 2 |
| USSR | 63,342 | 59,047 | 19,099 | 4,953 | 7,598 |
| Total | 91,087 | 87,654 | 46,489 | 27,729 | 37,285 |

| Country | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|
| Faroe Islands | 315 | 371 | 639 | 58 | 126 |
| France | 1,849[1] | 1,821[1] | 791[1] | 1,301 | 243[3] |
| German Dem. Rep. | 1,468 | 722 | - | - | - |
| Germany, Fed. Rep. | 2,144 | 1,338 | 678 | 211 | 503 |
| Greenland | - | - | - | 614[5] | 15[5] |
| Norway | 23,406[2] | 31,286[2] | 46,645[2] | 21,605[2] | 18,772[2] |
| Portugal | 251 | 824 | 159 | 824 | 586[3] |
| UK (England & Wales) | 240 | 269 | 247 | 217 | 433 |
| UK (Scotland) | 9 | 1 | 51 | 18 | 1 |
| Russia[4] | 10,661 | 6,884 | 8,130 | 1,500 | 4,359[2] |
| Total | 40,343 | 43,516 | 57,340 | 26,348 | 25,038 |

[1]Provisional figures.
[2]Working Group figure.
[3]As reported to Norwegian authorities.
[4]USSR prior to 1991.
[5]Includes 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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Denmark | - | - | - | + | - |
| Faroe Islands | - | - | - | - | 2 |
| France | - | - | - | - | 20[3] |
| German Dem. Rep. | 1,598 | 460 | 71 | 42 | 115 |
| Germany, Fed. Rep. | - | 190 | 192 | 1,840 | 35 |
| Norway | 67 | 16 | 302 | 311 | 142 |
| Portugal | 672 | 729 | 318 | 19 | 33 |
| Spain | 25 | 38 | - | 25[2] | 26[2] |
| UK (England & Wales) | 22 | 4 | 3 | 11 | 36 |
| UK (Scotland) | - | - | + | 1 | - |
| USSR | 5,815 | 528 | 529 | 1,493 | 1,342 |
| Total | 8,199 | 1,965 | 1,415 | 3,742 | 1,751 |

| Country | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|
| Canada | - | - | - | - | 8[3] |
| Denmark | - | 37[3] | 23 | 9 | 4 |
| Faroe Islands | 10 | 8 | 5[3] | - | - |
| France | 28[3] | 5[3] | 13[3] | 5[3] | 35[3] |
| German Dem. Rep. | 510 | 4,629 | - | - | - |
| Germany, Fed. Rep. | 123 | 52 | 303 | 319 | 177 |
| Norway | 66[2] | 1,541[2] | 818[2] | 399[2] | 164[2] |
| Portugal | 89 | 6 | 7 | 153 | 483[3] |
| Spain | 5[2] | - | 1 | 16 | 65 |
| UK (England & Wales) | 7 | 63 | 38 | 230 | 301 |
| UK (Scotland) | 2 | - | 13 | 16 | - |
| Russia[4] | 3,089 | 11,920 | 6,712 | 2,253 | 291[2] |
| Total | 3,929 | 18,261 | 7,933 | 3,400 | 1,528 |

[1]Provisional figures.
[2]Working Group figure.
[3]As reported to Norwegian authorities.
[4]USSR prior to 1991.

**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 |
|---|---|---|---|---|---|
| *S. marinus* | 16,366 | 19,260 | 28,379 | 29,484 | 30,203 |
| *S. mentella* | 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 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|---|---|
| *S. marinus* | 24,077 | 25,908 | 23,222 | 28,091 | 19,051 | 16,972 | 15,274 |
| *S. mentella* | 10,518 | 15,586 | 23,494 | 35,070 | 48,735 | 16,249 | 13,330 |
| Total | 34,595 | 41,494 | 46,716 | 63,161 | 67,786 | 33,221 | 28,604 |

[1]Provisional 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 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|---|---|---|
| Belgium | - | - | - | 1 | + | 5 | 4 | 28 |
| Denmark | 24 | 16 | 32 | 23 | 41 | 29 | 22 | 13 |
| Faroe Islands | - | 3 | 90 | 13 | 25 | 144 | 23 | n/a |
| France | 578 | 833 | 915 | 554[1] | 554[1] | 914[1] | 1,960 | n/a |
| Germany, Fed.Rep. | 183 | 70 | 188 | 111 | 47 | 213 | 170 | 33 |
| Netherlands | - | - | - | - | - | 2 | 1 | 1 |
| Norway | 1,048 | 411 | 696 | 500[2] | 483[2] | 415[2] | 232[2] | 307[2] |
| UK (England & Wales) | 35 | 16 | 125 | 134 | 369 | 43 | 65 | 126 |
| UK (Scotland) | 1 | 55 | 9 | 6 | 6 | 38 | 122 | 69 |
| Total | 1,869 | 1,404 | 2,055 | 1,342 | 1,525 | 1,803 | 2,599 | 577 |

[1]Provisional figures.
[2]Working 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.

| | USSR/Russia | | German Dem.Rep. | | Total effort | |
|---|---|---|---|---|---|---|
| | catch/hour trawling (t/hr) | | catch/day (t/day) | | (USSR units) | |
| Year | 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 | - | - | - | 60,919 |
| 1992 | - | 0.60 | - | - | - | 27,082 |
| 1993[3] | - | 0.98 | - | - | - | 13,602 |
| 1994[3] | - | 0.50 | - | - | - | - |

[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 (tonnes), and effort (trawl-hours) 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 | | Average CPUE |
|---|---|---|---|---|---|
| | CPUE | Effort | CPUE | Effort | |
| 1989 | - | - | 1.19 | 1,088 | 1.19 |
| 1990 | 1.36 | 770 | 0.83 | 1,317 | 1.09 |
| 1991 | 1.28 | 1,360 | 0.74 | 554 | 1.01 |
| 1992 | 1.29 | 964 | 0.81 | 428 | 1.05 |
| 1993 | 0.57 | 438 | 1.05 | 269 | 0.81 |

**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 | 0.30 | 69,420 |
| 1982 | 2,014 | 12.3 | 0.35 | 46,760 |
| 1983 | 1,590 | 8.3 | 0.42 | 45,857 |
| 1984 | 3,963 | 14.0 | 0.40 | 70,948 |
| 1985 | 3,080 | 10.5 | 0.32 | 92,138 |
| 1986 | 4,500 | 14.9 | 0.42 | 71,912 |
| 1987 | 2,168 | 9.0 | 0.34 | 70,814 |
| 1988 | 4,349 | 16.8 | 0.54 | 47,978 |
| 1989 | 3,044 | 13.1 | 0.23 | 100,965 |
| 1990 | 3,826 | 13.6 | 0.60 | 46,819 |
| 1991[2] | 10,693 | 56.1 | 0.71 | 26,832 |
| 1992[2] | 4,094 | 24.1 | 0.43 | 39,470 |
| 1993[2] | 1,904 | 12.5 | 0.43 | 35,520 |

[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** *Sebastes mentella*. Catch numbers at age.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: TU

At 30-Aug-94 16:40:41

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 6, | 48, | 0, | 0, | 7, | 31, | 0, | 0, | 466, | 172, |
| 7, | 285, | 0, | 0, | 0, | 94, | 0, | 0, | 792, | 1660, |
| 8, | 1592, | 27, | 7, | 15, | 409, | 33, | 114, | 5728, | 4865, |
| 9, | 2163, | 279, | 15, | 89, | 524, | 131, | 284, | 3586, | 9729, |
| 10, | 1141, | 532, | 182, | 192, | 838, | 620, | 681, | 2049, | 4636, |
| 11, | 1545, | 465, | 285, | 355, | 933, | 2122, | 1590, | 1770, | 2633, |
| 12, | 1972, | 731, | 343, | 436, | 954, | 3428, | 4429, | 3865, | 3148, |
| 13, | 2471, | 1223, | 394, | 554, | 849, | 3983, | 4884, | 4564, | 5208, |
| 14, | 2804, | 1927, | 489, | 864, | 618, | 3526, | 5451, | 4704, | 5666, |
| 15, | 1996, | 2007, | 496, | 768, | 482, | 2808, | 4940, | 4098, | 4578, |
| 16, | 2067, | 1741, | 628, | 931, | 807, | 3983, | 7496, | 4704, | 5380, |
| 17, | 1592, | 1422, | 613, | 694, | 451, | 2743, | 4486, | 3632, | 3777, |
| 18, | 1473, | 944, | 540, | 665, | 849, | 3559, | 7382, | 3167, | 2747, |
| +gp, | 2589, | 1980, | 3254, | 1802, | 2536, | 5714, | 14934, | 3447, | 3053, |
| TOTALNUM, | 23738, | 13278, | 7246, | 7372, | 10375, | 32650, | 56671, | 46572, | 57252, |
| TONSLAND, | 15662, | 10143, | 6239, | 5413, | 6836, | 22916, | 45063, | 28862, | 38380, |
| SOPCOF %, | 104, | 102, | 100, | 94, | 95, | 94, | 98, | 101, | 118, |

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | 606, | 5834, | 18891, | 0, | 2905, | 3633, | 1065, | 932, | 5, | 20, |
| 7, | 4847, | 19417, | 29815, | 2418, | 30158, | 20497, | 7412, | 3000, | 854, | 86, |
| 8, | 15451, | 42425, | 59395, | 17175, | 65162, | 43553, | 26296, | 8620, | 4775, | 1987, |
| 9, | 28781, | 82480, | 78241, | 33454, | 53391, | 46996, | 44131, | 26716, | 12554, | 4576, |
| 10, | 30144, | 108462, | 110712, | 52102, | 33569, | 37469, | 40441, | 48290, | 47348, | 16695, |
| 11, | 19843, | 119075, | 112524, | 49617, | 19909, | 26298, | 27089, | 39206, | 57134, | 31310, |
| 12, | 10603, | 57231, | 93144, | 53938, | 17242, | 20717, | 19950, | 33394, | 46529, | 51099, |
| 13, | 8634, | 29651, | 49550, | 33287, | 9270, | 16341, | 11172, | 21178, | 37731, | 48307, |
| 14, | 8634, | 20894, | 26134, | 19095, | 7410, | 6059, | 6400, | 11853, | 15506, | 29973, |
| 15, | 6514, | 16499, | 13881, | 12605, | 5456, | 3589, | 5607, | 6038, | 9492, | 17132, |
| 16, | 5908, | 13465, | 9839, | 5796, | 4134, | 3465, | 6801, | 2697, | 5780, | 8347, |
| 17, | 3332, | 13668, | 6300, | 4874, | 2134, | 2465, | 3441, | 2172, | 3368, | 5238, |
| 18, | 2878, | 12207, | 7233, | 5499, | 1545, | 1964, | 3001, | 1344, | 2160, | 2055, |
| +gp, | 5300, | 22366, | 11439, | 13906, | 2917, | 6579, | 2546, | 1910, | 4184, | 673, |
| TOTALNUM, | 151475, | 563674, | 627098, | 303766, | 255202, | 239625, | 205352, | 207350, | 247420, | 217498, |
| TONSLAND, | 69372, | 239070, | 269022, | 146365, | 92611, | 87145, | 79354, | 81546, | 115383, | 105273, |
| SOPCOF %, | 99, | 91, | 98, | 95, | 101, | 100, | 97, | 95, | 100, | 99, |

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: TU

At 30-Aug-94 16:40:41

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | 0, | 98, | 29, | 0, | 0, | 48, | 1, | 1653, | 1875, | 121, |
| 7, | 34, | 571, | 117, | 0, | 0, | 475, | 748, | 5453, | 2499, | 203, |
| 8, | 525, | 2009, | 215, | 109, | 0, | 1933, | 4036, | 7994, | 1900, | 136, |
| 9, | 2106, | 4949, | 1049, | 1055, | 379, | 3972, | 6797, | 6781, | 1640, | 396, |
| 10, | 7969, | 17096, | 3079, | 3145, | 1838, | 4432, | 7297, | 8226, | 1819, | 1827, |
| 11, | 22092, | 31564, | 5921, | 2679, | 3512, | 4303, | 6038, | 5344, | 1571, | 2650, |
| 12, | 36763, | 41511, | 10701, | 3580, | 4084, | 4667, | 8568, | 6227, | 2188, | 2354, |
| 13, | 47096, | 33190, | 15930, | 6213, | 6958, | 7062, | 11600, | 9880, | 2378, | 2078, |
| 14, | 25468, | 10519, | 7051, | 3702, | 7313, | 6068, | 7499, | 10824, | 2349, | 3127, |
| 15, | 12002, | 4243, | 2495, | 1459, | 4022, | 4412, | 3174, | 4049, | 2620, | 1669, |
| 16, | 4336, | 1971, | 704, | 656, | 1960, | 3282, | 1698, | 2105, | 2243, | 1544, |
| 17, | 1499, | 658, | 390, | 210, | 983, | 2399, | 1419, | 9603, | 1589, | 1051, |
| 18, | 517, | 343, | 81, | 66, | 328, | 1733, | 1093, | 6522, | 712, | 537, |
| +gp, | 472, | 52, | 67, | 0, | 106, | 2220, | 15595, | 19299, | 9824, | 7795, |
| TOTALNUM, | 160879, | 148774, | 47829, | 22874, | 31483, | 47006, | 75563, | 103960, | 35207, | 25488, |
| TONSLAND, | 72934, | 63068, | 23112, | 10518, | 15586, | 23494, | 35070, | 48735, | 16249, | 13330, |
| SOPCOF %, | 104, | 101, | 100, | 100, | 100, | 99, | 97, | 100, | 103, | 101, |

**Table 6.11** *Sebastes mentella.* Catch weights at age.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: TU

At 30-Aug-94 16:40:41

| Table 2 Catch weights at age (kg) YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 6, | .1680, | .1680, | .1680, | .1680, | .1680, | .1680, | .1680, | .1680, | .1680, |
| 7, | .1830, | .1830, | .1830, | .1830, | .1830, | .1830, | .1830, | .1830, | .1830, |
| 8, | .2250, | .2250, | .2250, | .2250, | .2250, | .2250, | .2250, | .2250, | .2250, |
| 9, | .3110, | .3110, | .3110, | .3110, | .3110, | .3110, | .3110, | .3110, | .3110, |
| 10, | .3670, | .3670, | .3670, | .3670, | .3670, | .3670, | .3670, | .3670, | .3670, |
| 11, | .4320, | .4320, | .4320, | .4320, | .4320, | .4320, | .4320, | .4320, | .4320, |
| 12, | .5080, | .5080, | .5080, | .5080, | .5080, | .5080, | .5080, | .5080, | .5080, |
| 13, | .6110, | .6110, | .6110, | .6110, | .6110, | .6110, | .6110, | .6110, | .6110, |
| 14, | .6790, | .6790, | .6790, | .6790, | .6790, | .6790, | .6790, | .6790, | .6790, |
| 15, | .7530, | .7530, | .7530, | .7530, | .7530, | .7530, | .7530, | .7530, | .7530, |
| 16, | .8210, | .8210, | .8210, | .8210, | .8210, | .8210, | .8210, | .8210, | .8210, |
| 17, | .8720, | .8720, | .8720, | .8720, | .8720, | .8720, | .8720, | .8720, | .8720, |
| 18, | .9100, | .9100, | .9100, | .9100, | .9100, | .9100, | .9100, | .9100, | .9100, |
| +gp, | .9990, | .9930, | 1.0320, | 1.0100, | 1.0260, | 1.0000, | 1.0220, | .9770, | .9800, |
| SOPCOFAC, | 1.0367, | 1.0223, | 1.0037, | .9372, | .9489, | .9357, | .9849, | 1.0143, | 1.1784, |

| Table 2 Catch weights at age (kg) YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | .1680, | .1680, | .1680, | .1680, | .1680, | .1070, | .1070, | .1020, | .1020, | .1020, |
| 7, | .1830, | .1830, | .1830, | .1830, | .1830, | .1550, | .1550, | .1380, | .1380, | .1380, |
| 8, | .2250, | .2250, | .2250, | .2250, | .2250, | .2000, | .2000, | .1880, | .1880, | .1880, |
| 9, | .3110, | .3110, | .3110, | .3110, | .3110, | .2520, | .2520, | .2520, | .2520, | .2520, |
| 10, | .3670, | .3670, | .3670, | .3670, | .3670, | .3100, | .3100, | .3100, | .3100, | .3100, |
| 11, | .4320, | .4320, | .4320, | .4320, | .4320, | .3740, | .3740, | .3640, | .3640, | .3200, |
| 12, | .5080, | .5080, | .5080, | .5080, | .5080, | .4720, | .4720, | .4400, | .4400, | .4000, |
| 13, | .6110, | .6110, | .6110, | .6110, | .6110, | .5680, | .5680, | .5600, | .5600, | .4660, |
| 14, | .6790, | .6790, | .6790, | .6790, | .6790, | .7150, | .7150, | .6800, | .6800, | .5630, |
| 15, | .7530, | .7530, | .7530, | .7530, | .7530, | .8980, | .8980, | .8280, | .8280, | .7300, |
| 16, | .8210, | .8210, | .8210, | .8210, | .8210, | .9340, | .9340, | .9060, | .9060, | .9920, |
| 17, | .8720, | .8720, | .8720, | .8720, | .8720, | 1.0240, | 1.0240, | .9700, | .9700, | 1.1260, |
| 18, | .9100, | .9100, | .9100, | .9100, | .9100, | 1.0500, | 1.0500, | 1.0500, | 1.0500, | 1.1490, |
| +gp, | 1.0000, | 1.0070, | 1.0210, | 1.0320, | 1.0300, | 1.1300, | 1.1050, | 1.1180, | 1.1220, | 1.2280, |
| SOPCOFAC, | .9888, | .9146, | .9847, | .9515, | 1.0130, | .9966, | .9734, | .9503, | 1.0022, | .9891, |

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: TU

At 30-Aug-94 16:40:41

| Table 2 Catch weights at age (kg) YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | .1020, | .1020, | .1020, | .1440, | .1440, | .1980, | .1400, | .1300, | .1900, | .1600, |
| 7, | .1050, | .1350, | .1200, | .1800, | .1800, | .2020, | .1460, | .1800, | .2200, | .2400, |
| 8, | .1650, | .1670, | .1370, | .1950, | .1950, | .2420, | .1580, | .2100, | .2600, | .2500, |
| 9, | .2120, | .2150, | .2180, | .2190, | .2090, | .2820, | .2060, | .2700, | .2800, | .2800, |
| 10, | .2830, | .3030, | .3010, | .2880, | .2800, | .3310, | .2800, | .3400, | .3100, | .3400, |
| 11, | .3380, | .3520, | .3530, | .3300, | .3330, | .3780, | .3550, | .3500, | .3300, | .3700, |
| 12, | .3830, | .4200, | .4480, | .4390, | .3970, | .4560, | .4710, | .4200, | .3800, | .4300, |
| 13, | .4380, | .4810, | .5100, | .5110, | .4680, | .5140, | .5430, | .4600, | .4600, | .4700, |
| 14, | .5020, | .5640, | .5810, | .5640, | .5370, | .5680, | .6110, | .5100, | .4300, | .4900, |
| 15, | .5660, | .6730, | .6480, | .6360, | .5850, | .5890, | .6250, | .5800, | .4300, | .5500, |
| 16, | .7110, | .8090, | .8450, | .7720, | .7470, | .6720, | .7220, | .5900, | .4500, | .5400, |
| 17, | .8610, | 1.0140, | .9480, | .8090, | .8080, | .7080, | .5760, | .5800, | .5200, | .5900, |
| 18, | .9660, | 1.0690, | 1.0560, | .9540, | .9010, | .7740, | .6590, | .5900, | .5700, | .6100, |
| +gp, | 1.2910, | 1.1600, | 1.2610, | 1.1800, | 1.0470, | .8380, | .6590, | .7000, | .6700, | .6600, |
| SOPCOFAC, | 1.0415, | 1.0066, | 1.0023, | .9976, | 1.0000, | .9915, | .9668, | 1.0034, | 1.0267, | 1.0114, |

**Table 6.12** *Sebastes mentella.* Proportion mature at age.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: TU

At 30-Aug-94 16:40:41

| Table 5 Proportion mature at age<br>YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 6, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 7, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 8, | .0300, | .0300, | .0300, | .0300, | .0300, | .0300, | .0300, | .0300, | .0300, |
| 9, | .0600, | .0600, | .0600, | .0600, | .0600, | .0600, | .0600, | .0600, | .0600, |
| 10, | .0800, | .0800, | .0800, | .0800, | .0800, | .0800, | .0800, | .0800, | .0800, |
| 11, | .2200, | .2200, | .2200, | .2200, | .2200, | .2200, | .2200, | .2200, | .2200, |
| 12, | .3600, | .3600, | .3600, | .3600, | .3600, | .3600, | .3600, | .3600, | .3600, |
| 13, | .5500, | .5500, | .5500, | .5500, | .5500, | .5500, | .5500, | .5500, | .5500, |
| 14, | .7200, | .7200, | .7200, | .7200, | .7200, | .7200, | .7200, | .7200, | .7200, |
| 15, | .8500, | .8500, | .8500, | .8500, | .8500, | .8500, | .8500, | .8500, | .8500, |
| 16, | .8800, | .8800, | .8800, | .8800, | .8800, | .8800, | .8800, | .8800, | .8800, |
| 17, | .9500, | .9500, | .9500, | .9500, | .9500, | .9500, | .9500, | .9500, | .9500, |
| 18, | .9700, | .9700, | .9700, | .9700, | .9700, | .9700, | .9700, | .9700, | .9700, |
| +gp, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, |

| Table 5 Proportion mature at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 7, | .0000, | .0000, | .0090, | .0090, | .0090, | .0090, | .0090, | .0090, | .0090, | .0090, |
| 8, | .0300, | .0300, | .0160, | .0160, | .0160, | .0160, | .0160, | .0160, | .0160, | .0160, |
| 9, | .0600, | .0600, | .1010, | .1010, | .1010, | .1010, | .1010, | .1010, | .1010, | .1010, |
| 10, | .0800, | .0800, | .1950, | .1950, | .1950, | .1950, | .1950, | .1950, | .1950, | .1950, |
| 11, | .2200, | .2200, | .3000, | .3000, | .3000, | .3000, | .3000, | .3000, | .3000, | .3000, |
| 12, | .3600, | .3600, | .5400, | .5400, | .5400, | .5400, | .5400, | .5400, | .5400, | .5400, |
| 13, | .5500, | .5500, | .7020, | .7020, | .7020, | .7020, | .7020, | .7020, | .7020, | .7020, |
| 14, | .7200, | .7200, | .8620, | .8620, | .8620, | .8620, | .8620, | .8620, | .8620, | .8620, |
| 15, | .8500, | .8500, | .9660, | .9660, | .9660, | .9660, | .9660, | .9660, | .9660, | .9660, |
| 16, | .8800, | .8800, | .9940, | .9940, | .9940, | .9940, | .9940, | .9940, | .9940, | .9940, |
| 17, | .9500, | .9500, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, |
| 18, | .9700, | .9700, | 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 : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: TU

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| Table 5 Proportion mature at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 7, | .0050, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 8, | .0080, | .0000, | .0000, | .0000, | .0000, | .0000, | .0150, | .0150, | .0150, | .0000, |
| 9, | .0570, | .0100, | .0340, | .0450, | .0830, | .0040, | .0500, | .0550, | .0620, | .0230, |
| 10, | .1680, | .0790, | .1130, | .0760, | .0950, | .0780, | .1260, | .1320, | .1330, | .1130, |
| 11, | .3020, | .2180, | .2380, | .1780, | .1940, | .2010, | .2050, | .2020, | .2240, | .2670, |
| 12, | .5340, | .4530, | .5070, | .4300, | .4620, | .4860, | .5060, | .4810, | .4110, | .4380, |
| 13, | .7210, | .7810, | .7940, | .7350, | .6890, | .6530, | .6230, | .5450, | .5390, | .5740, |
| 14, | .8790, | .8460, | .8720, | .8270, | .8010, | .7670, | .7260, | .7410, | .7740, | .8430, |
| 15, | .9520, | .9000, | .9120, | .8850, | .8620, | .8320, | .8010, | .8500, | .8880, | .9510, |
| 16, | .9850, | .9250, | .9500, | .9580, | 1.0000, | 1.0000, | 1.0000, | .9620, | .9460, | .9200, |
| 17, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | .9920, | .9890, |
| 18, | 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 6.13** *Sebastes mentella.* CPUE data for tuning.

a.

10:15 Wednesday, August 31, 1994 1

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

RUSSIAN PST-TRAWLERS. S.mentella, effort and catch-in-numbers (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 |
| 1993 | 4476 | 301 | 1114 | 1756 | 1432 | 1110 | 1081 | 908 | 567 | 344 | 168 |

b.

10:15 Wednesday, August 31, 1994 2

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

RUSSIAN SURVEY. Effort and catch rates. S.mentella (code: FLT10) (Catch: Number)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 | Catch, age 9 | Catch, age 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978 | 1 | 2.0 | 81.0 | 17.0 | 49.0 | 43.0 | 67.0 | 195.0 | 198.0 | 87.0 | 15.0 |
| 1979 | 1 | 0.0 | 2.0 | 12.0 | 64.0 | 228.0 | 373.0 | 576.0 | 519.0 | 349.0 | 122.0 |
| 1980 | 1 | 19.0 | 9.0 | 2.0 | 25.0 | 24.0 | 48.0 | 86.0 | 123.0 | 180.0 | 119.0 |
| 1981 | 1 | 4.0 | 14.0 | 10.0 | 9.0 | 68.0 | 35.0 | 48.0 | 56.0 | 67.0 | 57.0 |
| 1982 | 1 | 22.0 | 20.0 | 36.0 | 50.0 | 51.0 | 49.0 | 50.0 | 0.0 | 0.0 | 0.0 |
| 1983 | 1 | 132.0 | 39.0 | 25.0 | 23.0 | 38.0 | 37.0 | 50.0 | 0.0 | 0.0 | 0.0 |
| 1984 | 1 | 30.0 | 130.0 | 200.0 | 160.0 | 90.0 | 20.0 | 10.0 | 10.0 | 0.0 | 0.0 |
| 1985 | 1 | 100.0 | 50.0 | 150.0 | 60.0 | 60.0 | 110.0 | 200.0 | 190.0 | 130.0 | 40.0 |
| 1986 | 1 | 70.0 | 20.0 | 60.0 | 340.0 | 120.0 | 110.0 | 160.0 | 60.0 | 20.0 | 0.0 |
| 1987 | 1 | 0.0 | 0.0 | 0.0 | 310.0 | 440.0 | 470.0 | 250.0 | 10.0 | 0.0 | 0.0 |
| 1988 | 1 | 30.0 | 10.0 | 10.0 | 50.0 | 340.0 | 390.0 | 180.0 | 20.0 | 0.0 | 0.0 |
| 1989 | 1 | 581.0 | 379.0 | 18.0 | 52.0 | 183.0 | 323.0 | 326.0 | 63.0 | 0.0 | 0.0 |
| 1990 | 1 | 90.0 | 43.0 | 13.0 | 84.0 | 162.0 | 190.0 | 133.0 | 43.0 | 16.0 | 15.0 |
| 1991 | 1 | 63.0 | 170.0 | 133.0 | 80.0 | 36.0 | 17.0 | 22.0 | 40.0 | 31.0 | 5.0 |
| 1992 | 1 | 10.0 | 61.0 | 234.0 | 258.0 | 41.0 | 21.0 | 17.0 | 24.0 | 42.0 | 49.0 |
| 1993 | 1 | 1.0 | 5.0 | 10.0 | 46.0 | 39.0 | 20.0 | 12.0 | 6.0 | 2.0 | 6.0 |

C.

10:15 Wednesday, August 31, 1994 3

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

NORWAY TRAWL (09). Effort and catch-in-numbers. S.mentella (code: FLT11) (Catch: Thousands)

| Year | Effort | Catch, age 8 | Catch, age 9 | Catch, age 10 | Catch, age 11 | Catch, age 12 | Catch, age 13 | Catch, age 14 | Catch, age 15 |
|---|---|---|---|---|---|---|---|---|---|
| 1989 | 3885 | 173 | 359 | 305 | 179 | 139 | 330 | 244 | 1166 |
| 1990 | 9333 | 0 | 0 | 0 | 0 | 86 | 142 | 76 | 506 |
| 1991 | 33259 | 142 | 2053 | 3333 | 1043 | 1905 | 3919 | 5151 | 1605 |
| 1992 | 10870 | 37 | 311 | 670 | 687 | 1382 | 1548 | 1576 | 1960 |
| 1993 | 9243 | 20 | 28 | 393 | 292 | 431 | 598 | 1686 | 452 |

| Year | Catch, age 16 | Catch, age 17 | Catch, age 18 | Catch, age 19 | Catch, age 20 | Catch, age 21 | Catch, age 22 | Catch, age 23 |
|---|---|---|---|---|---|---|---|---|
| 1989 | 963 | 839 | 903 | 767 | 675 | 361 | 0 | 0 |
| 1990 | 385 | 962 | 787 | 845 | 1004 | 1735 | 1287 | 1419 |
| 1991 | 1184 | 8714 | 5887 | 0 | 0 | 0 | 0 | 0 |
| 1992 | 1829 | 1327 | 604 | 0 | 0 | 0 | 0 | 0 |
| 1993 | 776 | 582 | 307 | 0 | 0 | 0 | 0 | 0 |

Ages 8-18 used for tuning

**Table 6.14** *Sebastes mentella.* Output diagnostics from the XSA.

```
Lowestoft VPA Version 3.1

  31-Aug-94  11:16:09

Extended Survivors Analysis

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

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

Catch data for  29 years. 1965 to 1993. Ages  1 to  19.

     Fleet,           First, Last, First, Last, Alpha,  Beta
                    ,  year, year,  age ,  age
FLT04: RUSSIAN PST-T,  1982, 1993,   9,    18,   .000,  1.000
FLT10: RUSSIAN SURVE,  1978, 1993,   1,    10,   .850,   .950
FLT11: NORWAY TRAWL ,  1989, 1993,   8,    18,   .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 =   2.000

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

     Prior weighting not applied


Tuning converged after   58 iterations
```

**continued...**

**Table 6.14 (continued)**

Regression weights

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

Fishing mortalities

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000 |
| 2, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000 |
| 3, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000 |
| 4, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .007, | .002 |
| 5, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .071, | .020, | .001 |
| 6, | .000, | .001, | .000, | .000, | .000, | .000, | .000, | .055, | .078, | .003 |
| 7, | .000, | .008, | .002, | .000, | .000, | .003, | .007, | .116, | .100, | .010 |
| 8, | .008, | .026, | .003, | .002, | .000, | .020, | .031, | .081, | .048, | .006 |
| 9, | .029, | .084, | .015, | .017, | .007, | .065, | .083, | .060, | .019, | .011 |
| 10, | .076, | .304, | .062, | .052, | .034, | .091, | .147, | .122, | .019, | .024 |
| 11, | .201, | .427, | .146, | .064, | .068, | .094, | .155, | .138, | .028, | .031 |
| 12, | .496, | .619, | .222, | .111, | .118, | .110, | .246, | .212, | .069, | .048 |
| 13, | 1.140, | 1.022, | .452, | .174, | .291, | .272, | .384, | .439, | .105, | .078 |
| 14, | 1.453, | .744, | .541, | .158, | .284, | .394, | .458, | .658, | .156, | .175 |
| 15, | 1.503, | .925, | .342, | .179, | .231, | .248, | .327, | .426, | .287, | .143 |
| 16, | 1.656, | 1.005, | .327, | .126, | .345, | .267, | .127, | .334, | .393, | .244 |
| 17, | 1.178, | 1.240, | .476, | .136, | .251, | .814, | .158, | 1.886, | .402, | .287 |
| 18, | 1.150, | .840, | .406, | .121, | .291, | .814, | 1.002, | 2.039, | .613, | .204 |

XSA population numbers (Thousands)

| YEAR , | AGE 1, | 2, | 3, | 4, | 5, | 6, | 7, | 8, |
|---|---|---|---|---|---|---|---|---|
| 1984 , | 2.19E+05, | 2.54E+05, | 1.68E+05, | 1.09E+05, | 8.93E+04, | 8.81E+04, | 9.15E+04, | 7.18E+04, 7.80E+04, 1.14E+05, |
| 1985 , | 9.57E+04, | 1.98E+05, | 2.30E+05, | 1.52E+05, | 9.86E+04, | 8.08E+04, | 7.97E+04, | 8.28E+04, 6.45E+04, 6.85E+04, |
| 1986 , | 5.33E+04, | 8.66E+04, | 1.79E+05, | 2.08E+05, | 1.37E+05, | 8.92E+04, | 7.30E+04, | 7.16E+04, 7.30E+04, 5.36E+04, |
| 1987 , | 4.66E+04, | 4.82E+04, | 7.84E+04, | 1.62E+05, | 1.88E+05, | 1.24E+05, | 8.07E+04, | 6.60E+04, 6.45E+04, 6.50E+04, |
| 1988 , | 7.76E+04, | 4.22E+04, | 4.36E+04, | 7.09E+04, | 1.47E+05, | 1.70E+05, | 1.12E+05, | 7.30E+04, 5.96E+04, 5.74E+04, |
| 1989 , | 2.22E+05, | 7.02E+04, | 3.82E+04, | 3.95E+04, | 6.42E+04, | 1.33E+05, | 1.54E+05, | 1.02E+05, 6.61E+04, 5.36E+04, |
| 1990 , | 2.81E+05, | 2.01E+05, | 6.35E+04, | 3.45E+04, | 3.57E+04, | 5.81E+04, | 1.20E+05, | 1.39E+05, 9.02E+04, 5.60E+04, |
| 1991 , | 9.35E+04, | 2.54E+05, | 1.81E+05, | 5.75E+04, | 3.12E+04, | 3.23E+04, | 5.25E+04, | 1.08E+05, 1.22E+05, 7.52E+04, |
| 1992 , | 1.97E+04, | 8.46E+04, | 2.30E+05, | 1.64E+05, | 5.20E+04, | 2.63E+04, | 2.77E+04, | 4.24E+04, 9.02E+04, 1.04E+05, |
| 1993 , | 2.41E+03, | 1.78E+04, | 7.66E+04, | 2.08E+05, | 1.48E+05, | 4.61E+04, | 2.20E+04, | 2.27E+04, 3.65E+04, 8.01E+04, |

Estimated population abundance at 1st Jan 1994

, .00E+00, 2.18E+03, 1.61E+04, 6.93E+04, 1.88E+05, 1.33E+05, 4.16E+04, 1.97E+04, 2.04E+04, 3.27E+04,

Taper weighted geometric mean of the VPA populations:

, 7.90E+04, 1.01E+05, 1.09E+05, 1.05E+05, 9.29E+04, 8.45E+04, 8.46E+04, 8.92E+04, 9.30E+04, 9.05E+04,

Standard error of the weighted Log(VPA populations) :

, 1.3510, .8109, .6234, .6420, .6489, .7036, .7586, .7131, .6103, .5557,

| YEAR , | AGE 11, | 12, | 13, | 14, | 15, | 16, | 17, | 18, |
|---|---|---|---|---|---|---|---|---|
| 1984 , | 1.28E+05, | 9.89E+04, | 7.28E+04, | 3.49E+04, | 1.62E+04, | 5.63E+03, | 2.28E+03, | 7.96E+02, |
| 1985 , | 9.55E+04, | 9.46E+04, | 5.45E+04, | 2.11E+04, | 7.39E+03, | 3.27E+03, | 9.74E+02, | 6.35E+02, |
| 1986 , | 4.58E+04, | 5.64E+04, | 4.61E+04, | 1.77E+04, | 9.06E+03, | 2.65E+03, | 1.08E+03, | 2.55E+02, |
| 1987 , | 4.56E+04, | 3.58E+04, | 4.09E+04, | 2.66E+04, | 9.34E+03, | 5.83E+03, | 1.73E+03, | 6.08E+02, |
| 1988 , | 5.59E+04, | 3.87E+04, | 2.90E+04, | 3.11E+04, | 2.05E+04, | 7.07E+03, | 4.65E+03, | 1.37E+03, |
| 1989 , | 5.02E+04, | 4.72E+04, | 3.11E+04, | 1.96E+04, | 2.11E+04, | 1.47E+04, | 4.53E+03, | 3.27E+03, |
| 1990 , | 4.42E+04, | 4.13E+04, | 3.83E+04, | 2.15E+04, | 1.20E+04, | 1.49E+04, | 1.02E+04, | 1.82E+03, |
| 1991 , | 4.37E+04, | 3.43E+04, | 2.92E+04, | 2.36E+04, | 1.23E+04, | 7.79E+03, | 1.19E+04, | 7.88E+03, |
| 1992 , | 6.02E+04, | 3.45E+04, | 2.51E+04, | 1.71E+04, | 1.10E+04, | 7.26E+03, | 5.05E+03, | 1.63E+03, |
| 1993 , | 9.23E+04, | 5.30E+04, | 2.91E+04, | 2.05E+04, | 1.32E+04, | 7.51E+03, | 4.43E+03, | 3.06E+03, |

Estimated population abundance at 1st Jan 1994

, 7.07E+04, 8.10E+04, 4.57E+04, 2.44E+04, 1.55E+04, 1.04E+04, 5.32E+03, 3.01E+03,

Taper weighted geometric mean of the VPA populations:

, 7.63E+04, 5.94E+04, 4.26E+04, 2.55E+04, 1.43E+04, 8.01E+03, 4.37E+03, 1.96E+03,

**continued...**

Standard error of the weighted Log(VPA populations) :

, .5659, .5295, .4303, .3300, .3942, .5613, .8358, 1.0618,

**Table 6.14 (continued)**

Log catchability residuals.

Fleet : FLT04: RUSSIAN PST-T

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| 1 | No data for this fleet at this age | | | | | |
| 2 | No data for this fleet at this age | | | | | |
| 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 | 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 | | | | | |
| 9 | 99.99 | 99.99 | 99.99 | 99.99 | -.51 | -1.04 |
| 10 | 99.99 | 99.99 | 99.99 | 99.99 | -.05 | -.78 |
| 11 | 99.99 | 99.99 | 99.99 | 99.99 | -.26 | -.38 |
| 12 | 99.99 | 99.99 | 99.99 | 99.99 | -.53 | -.16 |
| 13 | 99.99 | 99.99 | 99.99 | 99.99 | -.82 | -.27 |
| 14 | 99.99 | 99.99 | 99.99 | 99.99 | -1.11 | -.23 |
| 15 | 99.99 | 99.99 | 99.99 | 99.99 | -.79 | .17 |
| 16 | 99.99 | 99.99 | 99.99 | 99.99 | -.73 | .27 |
| 17 | 99.99 | 99.99 | 99.99 | 99.99 | -.55 | .55 |
| 18 | 99.99 | 99.99 | 99.99 | 99.99 | -.46 | .18 |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No data for this fleet at this age | | | | | | | | | |
| 2 | No data for this fleet at this age | | | | | | | | | |
| 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 | 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 | | | | | | | | | |
| 9 | -.81 | .01 | -1.24 | .05 | -1.29 | 1.07 | 1.08 | .60 | .57 | .58 |
| 10 | -.66 | .57 | -.42 | .27 | -.54 | .56 | .80 | .24 | -.59 | .23 |
| 11 | -.10 | .51 | .03 | .06 | -.26 | .09 | .45 | .28 | -.72 | .13 |
| 12 | .39 | .46 | .04 | .17 | -.16 | -.28 | .50 | .11 | -.68 | .05 |
| 13 | .59 | .38 | .20 | .02 | .15 | .22 | .37 | .08 | -.91 | -.19 |
| 14 | .70 | -.08 | .22 | -.22 | -.03 | .51 | .40 | .18 | -.72 | .03 |
| 15 | .84 | .26 | -.14 | .02 | -.12 | -.40 | -.03 | .02 | -.27 | .39 |
| 16 | .90 | .33 | -.27 | -.34 | .28 | -.52 | -1.21 | -.60 | -.27 | .53 |
| 17 | .59 | .55 | .18 | -.26 | -.04 | .37 | -2.40 | -1.80 | -.36 | .58 |
| 18 | .43 | .15 | -.19 | -.37 | .11 | -.13 | -2.57 | -1.51 | -.02 | .20 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean Log q | -13.7266 | -12.8462 | -12.4311 | -11.9909 | -11.3928 | -11.2434 | -11.3570 | -11.3570 | -11.3570 | -11.3570 |
| S.E(Log q) | .8921 | .5522 | .3632 | .3726 | .4510 | .4769 | .3798 | .6241 | 1.0510 | .9911 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 9 | 1.26 | -.278 | 14.36 | .12 | 12 | 1.18 | -13.73 |
| 10 | 2.91 | -1.621 | 15.87 | .08 | 12 | 1.49 | -12.85 |
| 11 | 1.24 | -.813 | 12.75 | .57 | 12 | .46 | -12.43 |
| 12 | .95 | .198 | 11.94 | .67 | 12 | .37 | -11.99 |
| 13 | .91 | .283 | 11.32 | .53 | 12 | .43 | -11.39 |
| 14 | 1.37 | -.552 | 11.67 | .20 | 12 | .68 | -11.24 |
| 15 | 1.28 | -.662 | 11.88 | .39 | 12 | .50 | -11.36 |
| 16 | 2.08 | -1.555 | 14.31 | .20 | 12 | 1.17 | -11.51 |
| 17 | 4.79 | -2.453 | 24.32 | .05 | 12 | 3.93 | -11.62 |
| 18 | 1.39 | -.928 | 13.44 | .40 | 12 | 1.26 | -11.75 |

continued...

**Table 6.14 (continued)**

Fleet : FLT10: RUSSIAN SURVE

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| 1 | -3.54 | 99.99 | -1.07 | -2.72 | -1.35 | .12 |
| 2 | .59 | -3.26 | -1.61 | -1.09 | -.83 | -.49 |
| 3 | -1.00 | -1.12 | -3.06 | -1.31 | .06 | -.40 |
| 4 | -1.28 | -.48 | -1.20 | -2.36 | -.51 | -1.20 |
| 5 | -1.97 | .10 | -1.62 | -.36 | -.79 | -.94 |
| 6 | -1.75 | .35 | -1.31 | -1.09 | -.54 | -.96 |
| 7 | -.81 | .62 | -.92 | -1.12 | -.55 | -.35 |
| 8 | .20 | 1.13 | .03 | -.45 | 99.99 | 99.99 |
| 9 | .01 | 1.30 | .59 | -.09 | 99.99 | 99.99 |
| 10 | -.89 | .91 | .78 | .02 | 99.99 | 99.99 |
| 11 | No data for this fleet at this age | | | | | |
| 12 | No data for this fleet at this age | | | | | |
| 13 | No data for this fleet at this age | | | | | |
| 14 | No data for this fleet at this age | | | | | |
| 15 | No data for this fleet at this age | | | | | |
| 16 | No data for this fleet at this age | | | | | |
| 17 | No data for this fleet at this age | | | | | |
| 18 | No data for this fleet at this age | | | | | |

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -1.11 | .92 | 1.15 | 99.99 | -.07 | 1.84 | -.26 | .49 | .20 | .00 |
| 2 | .40 | -.31 | -.40 | 99.99 | -.37 | 2.75 | -.47 | .66 | .74 | -.20 |
| 3 | 1.34 | .74 | .07 | 99.99 | -.31 | .42 | -.42 | .86 | 1.18 | -.87 |
| 4 | .64 | -.67 | .75 | .91 | -.09 | .54 | 1.15 | .59 | .72 | -1.25 |
| 5 | .01 | -.50 | -.14 | .85 | .84 | 1.05 | 1.51 | .20 | -.22 | -1.33 |
| 6 | -1.44 | .35 | .26 | 1.38 | .87 | .93 | 1.23 | -.55 | -.11 | -.79 |
| 7 | -2.10 | 1.04 | .90 | 1.25 | .59 | .87 | .22 | -.65 | -.28 | -.48 |
| 8 | -1.09 | 1.73 | .70 | -1.01 | -.42 | .41 | -.27 | -.05 | .35 | -.45 |
| 9 | 99.99 | 1.93 | -.13 | 99.99 | 99.99 | 99.99 | -.51 | -.17 | .40 | -1.75 |
| 10 | 99.99 | 1.17 | 99.99 | 99.99 | 99.99 | 99.99 | .25 | -1.17 | .70 | -1.13 |
| 11 | No data for this fleet at this age | | | | | | | | | |
| 12 | No data for this fleet at this age | | | | | | | | | |
| 13 | No data for this fleet at this age | | | | | | | | | |
| 14 | No data for this fleet at this age | | | | | | | | | |
| 15 | No data for this fleet at this age | | | | | | | | | |
| 16 | No data for this fleet at this age | | | | | | | | | |
| 17 | No data for this fleet at this age | | | | | | | | | |
| 18 | No data for this fleet at this age | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean Log q | -7.6983 | -7.8849 | -7.9849 | -7.0785 | -6.8169 | -6.8630 | -6.9327 | -7.6895 | -7.9662 | -8.2523 |
| S.E(Log q) | 1.2014 | 1.1992 | 1.0112 | .9901 | .9349 | .9639 | .9399 | .7842 | 1.0902 | .9792 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 1 | 1.11 | -.348 | 7.30 | .54 | 14 | 1.40 | -7.70 |
| 2 | 1.16 | -.287 | 7.28 | .26 | 15 | 1.46 | -7.88 |
| 3 | .65 | 1.093 | 9.27 | .51 | 15 | .65 | -7.98 |
| 4 | 2.32 | -1.198 | 1.19 | .08 | 16 | 2.25 | -7.08 |
| 5 | 2.42 | -1.307 | .29 | .08 | 16 | 2.19 | -6.82 |
| 6 | .82 | .475 | 7.66 | .42 | 16 | .82 | -6.86 |
| 7 | .87 | .369 | 7.51 | .45 | 16 | .85 | -6.93 |
| 8 | .84 | .534 | 8.28 | .56 | 14 | .68 | -7.69 |
| 9 | .63 | .922 | 9.26 | .56 | 10 | .70 | -7.97 |
| 10 | .77 | .371 | 9.00 | .38 | 9 | .83 | -8.25 |

**continued...**

**Table 6.14 (continued)**

Fleet : FLT11: NORWAY TRAWL

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No data for this fleet at this age | | | | | | | | | |
| 2 | No data for this fleet at this age | | | | | | | | | |
| 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 | No data for this fleet at this age | | | | | | | | | |
| 7 | No data for this fleet at this age | | | | | | | | | |
| 8 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 1.40 | 99.99 | -.97 | -.28 | -.13 |
| 9 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 1.35 | 99.99 | .33 | -.15 | -1.50 |
| 10 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .52 | 99.99 | .44 | -.42 | -.53 |
| 11 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .29 | 99.99 | .06 | .39 | -.73 |
| 12 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.28 | -1.43 | .56 | 1.29 | -.16 |
| 13 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .21 | -1.67 | .68 | .86 | -.09 |
| 14 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.11 | -2.21 | .73 | .76 | .81 |
| 15 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .71 | -.39 | -.49 | .87 | -.68 |
| 16 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .89 | -.98 | -.38 | 1.27 | .47 |
| 17 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 2.18 | .33 | 1.81 | 1.31 | .73 |
| 18 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 2.57 | 2.23 | 1.89 | 1.75 | .42 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Log q | -15.9865 | -14.7510 | -13.8595 | -14.0927 | -13.7132 | -12.8401 | -12.3060 | -11.7042 | -11.7042 | -11.7042 | -11.7042 |
| S.E(Log q) | .9977 | 1.1838 | .5541 | .5090 | 1.0178 | 1.0038 | 1.2920 | .7288 | .9673 | 1.6097 | 2.1412 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 8 | .82 | .238 | 15.07 | .47 | 4 | .99 | -15.99 |
| 9 | .43 | .983 | 12.73 | .60 | 4 | .52 | -14.75 |
| 10 | -1.82 | -1.652 | 6.48 | .15 | 4 | .80 | -13.86 |
| 11 | -4.70 | -1.734 | -3.59 | .04 | 4 | 1.85 | -14.09 |
| 12 | -.55 | -1.080 | 8.93 | .14 | 5 | .55 | -13.71 |
| 13 | -.20 | -4.117 | 9.82 | .80 | 5 | .09 | -12.84 |
| 14 | -.75 | -.383 | 8.13 | .02 | 5 | 1.09 | -12.31 |
| 15 | .51 | .608 | 10.64 | .35 | 5 | .41 | -11.70 |
| 16 | 7.80 | -.646 | 26.81 | .00 | 5 | 7.82 | -11.45 |
| 17 | 1.31 | -.263 | 10.95 | .19 | 5 | 1.14 | -10.43 |
| 18 | 1.04 | -.053 | 10.02 | .35 | 5 | .99 | -9.94 |

**continued...**

**Table 6.14 (continued)**

```
Age  2   Catchability constant w.r.t. time and dependent on age

Year class = 1991

FLT04: RUSSIAN PST-T
       Age,        2,         1,
  Survivors,       0.,        0.,
Raw Weights,     .000,      .000,



FLT10: RUSSIAN SURVE
       Age,        2,         1,
  Survivors,   13153.,     19749.,
Raw Weights,     .637,      .633,



FLT11: NORWAY TRAWL
       Age,        2,         1,
  Survivors,       0.,        0.,
Raw Weights,     .000,      .000,



Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
      ,               Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,       1.,    .000,      .000,    .00,    0,  .000,     .000
FLT10: RUSSIAN SURVE,   16107.,    .887,      .203,    .23,    2, 1.000,     .000
FLT11: NORWAY TRAWL ,       1.,    .000,      .000,    .00,    0,  .000,     .000

  F shrinkage mean  ,       0.,   2.00,,,,                        .000,     .000

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    16107.,       .89,      .20,    2,    .229,   .000
```

continued...

## Table 6.14 (continued)

```
Fleet disaggregated estimates of survivors :

Age  1   Catchability constant w.r.t. time and dependent on age

Year class = 1992

FLT04: RUSSIAN PST-T
       Age,        1,
 Survivors,       0.,
Raw Weights,     .000,




FLT10: RUSSIAN SURVE
       Age,        1,
 Survivors,    2183.,
Raw Weights,     .633,




FLT11: NORWAY TRAWL
       Age,        1,
 Survivors,       0.,
Raw Weights,     .000,




Fleet,              Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
    ,               Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,       1.,   .000,       .000,    .00,   0,  .000,     .000
FLT10: RUSSIAN SURVE,    2183.,  1.256,       .000,    .00,   1, 1.000,     .000
FLT11: NORWAY TRAWL ,       1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean  ,       0.,   2.00,,,,                        .000,     .000

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
     2183.,       1.26,      .00,    1,    .000,   .000

Age  3   Catchability constant w.r.t. time and dependent on age

Year class = 1990

FLT04: RUSSIAN PST-T
       Age,        3,          2,          1,
 Survivors,       0.,         0.,         0.,
Raw Weights,     .000,       .000,       .000,




FLT10: RUSSIAN SURVE
       Age,        3,          2,          1,
 Survivors,    29071.,     145192.,    112580.,
Raw Weights,     .896,       .637,       .632,




FLT11: NORWAY TRAWL
       Age,        3,          2,          1,
 Survivors,       0.,         0.,         0.,
Raw Weights,     .000,       .000,       .000,




Fleet,              Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
    ,               Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,       1.,   .000,       .000,    .00,   0,  .000,     .000
FLT10: RUSSIAN SURVE,    69271.,  .680,       .521,    .77,   3, 1.000,     .000
FLT11: NORWAY TRAWL ,       1.,   .000,       .000,    .00,   0,  .000,     .000

  F shrinkage mean  ,       0.,   2.00,,,,                        .000,     .000

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    69271.,       .68,      .52,    3,    .766,   .000
```



continued...

**Table 6.14 (continued)**

```
Age  4   Catchability constant w.r.t. time and dependent on age

Year class = 1989

FLT04: RUSSIAN PST-T
       Age,        4,         3,         2,         1,
  Survivors,       0.,        0.,        0.,        0.,
Raw Weights,     .000,      .000,      .000,      .000,



FLT10: RUSSIAN SURVE
       Age,        4,         3,         2,         1,
  Survivors,   54012.,    614316.,   365407.,   145238.,
Raw Weights,     .939,      .894,      .634,      .626,



FLT11: NORWAY TRAWL
       Age,        4,         3,         2,         1,
  Survivors,       0.,        0.,        0.,        0.,
Raw Weights,     .000,      .000,      .000,      .000,



Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,        1.,    .000,      .000,     .00,   0,  .000,     .000
FLT10: RUSSIAN SURVE,   197167.,    .568,      .571,    1.01,   4,  .925,     .002
FLT11: NORWAY TRAWL ,        1.,    .000,      .000,     .00,   0,  .000,     .000

  F shrinkage mean  ,   103896.,   2.00,,,,                        .075,     .004

Weighted prediction :

Survivors,       Int,      Ext,    N,    Var,     F
at end of year,  s.e,      s.e,     ,   Ratio,
   187943.,      .55,      .48,    5,    .886,   .002
```

continued...

**Table 6.14 (continued)**

```
Age  5   Catchability constant w.r.t. time and dependent on age

Year class = 1988

FLT04: RUSSIAN PST-T
       Age,        5,         4,         3,         2,         1,
  Survivors,       0.,        0.,        0.,        0.,        0.,
Raw Weights,     .000,      .000,      .000,      .000,      .000,



FLT10: RUSSIAN SURVE
       Age,        5,         4,         3,         2,         1,
  Survivors,   35253.,    273562.,    313848.,    83078.,   842759.,
Raw Weights,    1.054,      .932,      .886,      .625,      .613,



FLT11: NORWAY TRAWL
       Age,        5,         4,         3,         2,         1,
  Survivors,       0.,        0.,        0.,        0.,        0.,
Raw Weights,     .000,      .000,      .000,      .000,      .000,



Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
   ,                  Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,        1.,    .000,      .000,    .00,    0,  .000,     .000
FLT10: RUSSIAN SURVE,   164412.,    .492,      .554,   1.13,    5,  .943,     .001
FLT11: NORWAY TRAWL ,        1.,    .000,      .000,    .00,    0,  .000,     .000

  F shrinkage mean  ,     4235.,   2.00,,,,                          .057,     .045

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
   133299.,       .48,      .62,    6,   1.299,   .001
```

continued..

**Table 6.14 (continued)**

```
Age  6   Catchability constant w.r.t. time and dependent on age

Year class = 1987

FLT04: RUSSIAN PST-T
       Age,        6,        5,        4,        3,        2,        1,
  Survivors,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .000,     .000,     .000,     .000,     .000,     .000,



FLT10: RUSSIAN SURVE
       Age,        6,        5,        4,        3,        2,        1,
  Survivors,    18929.,   33381.,   75224.,   27379.,  653540.,   38839.,
Raw Weights,     .990,    1.032,     .917,     .867,     .608,     .591,



FLT11: NORWAY TRAWL
       Age,        6,        5,        4,        3,        2,        1,
  Survivors,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .000,     .000,     .000,     .000,     .000,     .000,



Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
    ,                 Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,        1.,    .000,      .000,     .00,   0,  .000,     .000
FLT10: RUSSIAN SURVE,    48896.,    .443,      .474,    1.07,   6,  .952,     .002
FLT11: NORWAY TRAWL ,        1.,    .000,      .000,     .00,   0,  .000,     .000

  F shrinkage mean  ,     1671.,   2.00,,,,                        .048,     .067

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    41642.,       .43,      .52,    7,   1.199,   .003
```

continued...

**Table 6.14 (continued)**

```
Age  7   Catchability constant w.r.t. time and dependent on age

Year class = 1986

FLT04: RUSSIAN PST-T
       Age,        7,        6,        5,        4,        3,        2,        1,
  Survivors,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



FLT10: RUSSIAN SURVE
       Age,        7,        6,        5,        4,        3,        2,        1,
  Survivors,   12169.,   17676.,   24239.,   62349.,   29926.,   13612.,       0.,
Raw Weights,    1.034,     .909,     .898,     .795,     .746,     .519,     .000,



FLT11: NORWAY TRAWL
       Age,        7,        6,        5,        4,        3,        2,        1,
  Survivors,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,        1.,    .000,      .000,    .00,    0,  .000,     .000
FLT10: RUSSIAN SURVE,    22381.,    .427,      .245,    .57,    6,  .951,     .009
FLT11: NORWAY TRAWL ,        1.,    .000,      .000,    .00,    0,  .000,     .000

  F shrinkage mean  ,     1697.,   2.00,,,,                        .049,     .108

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,   Ratio,
    19747.,       .42,      .32,    7,    .762,   .010
```

continued...

**Table 6.14 (continued)**

```
Age  8   Catchability constant w.r.t. time and dependent on age

Year class = 1985

FLT04: RUSSIAN PST-T
       Age,        8,        7,        6,        5,        4,        3,        2,        1,
  Survivors,       0.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .000,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



FLT10: RUSSIAN SURVE
       Age,        8,        7,        6,        5,        4,        3,        2,        1,
  Survivors,   12973.,   15361.,   11785.,   92338.,   34839.,   15006.,       0.,   64570.,
Raw Weights,    1.477,     .939,     .842,     .889,     .782,     .727,     .000,     .473,



FLT11: NORWAY TRAWL
       Age,        8,        7,        6,        5,        4,        3,        2,        1,
  Survivors,   17979.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .798,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                 Survivors,    s.e,       s.e,    Ratio,   , Weights,    F
FLT04: RUSSIAN PST-T,        1.,    .000,      .000,    .00,   0,  .000,     .000
FLT10: RUSSIAN SURVE,    22812.,    .382,      .309,    .81,   7,  .854,     .006
FLT11: NORWAY TRAWL ,    17979.,   1.116,      .000,    .00,   1,  .111,     .007

  F shrinkage mean  ,     1936.,   2.00,,,,                        .035,     .065

Weighted prediction :

Survivors,        Int,       Ext,    N,    Var,     F
at end of year,   s.e,       s.e,     ,   Ratio,
    20387.,        .36,       .30,    9,    .832,   .006
```

continued...

**Table 6.14 (continued)**

```
Age  9   Catchability constant w.r.t. time and dependent on age

Year class = 1984

FLT04: RUSSIAN PST-T
       Age,        9,        8,        7,        6,        5,        4,        3,        2,        1,
 Survivors,    58161.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,    1.135,     .000,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



FLT10: RUSSIAN SURVE
       Age,        9,        8,        7,        6,        5,        4,        3,        2,        1,
 Survivors,     5700.,    46223.,    17024.,   111824.,    93064.,    29888.,       0.,    21924.,    82300.,
Raw Weights,     .728,     1.399,     .874,     .825,     .864,     .753,     .000,     .469,     .436,



FLT11: NORWAY TRAWL
       Age,        9,        8,        7,        6,        5,        4,        3,        2,        1,
 Survivors,     7298.,    24763.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,     .564,     .756,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
     ,                Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,    58161.,    .933,      .000,    .00,   1,  .125,     .006
FLT10: RUSSIAN SURVE,    36554.,    .372,      .346,    .93,   8,  .701,     .010
FLT11: NORWAY TRAWL ,    14695.,    .854,      .604,    .71,   2,  .146,     .025

  F shrinkage mean  ,     9284.,   2.00,,,,                        .028,     .040

Weighted prediction :

Survivors,        Int,       Ext,    N,    Var,     F
at end of year,   s.e,       s.e,     ,    Ratio,
    32666.,       .32,       .27,   12,    .867,   .011
```

continued...

**Table 6.14 (continued)**

Age 10  Catchability constant w.r.t. time and dependent on age

Year class = 1983

FLT04: RUSSIAN PST-T

| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 88665., | 125433., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | 2.924, | 1.098, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

FLT10: RUSSIAN SURVE

| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 22734., | 105625., | 67284., | 88244., | 179786., | 163470., | 175192., | 75949., | 51819., |
| Raw Weights, | .876, | .705, | 1.308, | .907, | .850, | .883, | .760, | .689, | .458, |

FLT11: NORWAY TRAWL

| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 41726., | 60630., | 26765., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | 2.540, | .546, | .707, | .000, | .000, | .000, | .000, | .000, | .000, |

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT04: RUSSIAN PST-T, | 97476., | .491, | .155, | .31, | 2, | .253, | .018 |
| FLT10: RUSSIAN SURVE, | 81259., | .338, | .228, | .68, | 10, | .493, | .021 |
| FLT11: NORWAY TRAWL , | 40534., | .502, | .167, | .33, | 3, | .238, | .042 |
| F shrinkage mean , | 23801., | 2.00,,,, | | | | .016, | .070 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 70714., | .24, | .16, | 16, | .657, | .024 |

**continued...**

**Table 6.14 (continued)**

```
Age 11   Catchability constant w.r.t. time and dependent on age

Year class = 1982

FLT04: RUSSIAN PST-T
       Age,       11,
 Survivors,    91982.,
Raw Weights,    6.715,

       Age,       10,        9,        8,        7,        6,        5,        4,        3,        2,
 Survivors,   44701.,   147041.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,    2.851,    1.026,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



FLT10: RUSSIAN SURVE
       Age,       11,
 Survivors,       0.,
Raw Weights,     .000,

       Age,       10,        9,        8,        7,        6,        5,        4,        3,        2,
 Survivors,  163015.,    68525.,   61586.,  192700.,  193980.,  189104.,  171759.,  169727.,  120436.,
Raw Weights,     .854,     .658,    1.279,     .883,     .820,     .842,     .715,     .637,     .414,



FLT11: NORWAY TRAWL
       Age,       11,
 Survivors,   39018.,
Raw Weights,    2.991,

       Age,       10,        9,        8,        7,        6,        5,        4,        3,        2,
 Survivors,   53236.,   113057.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,    2.476,     .509,     .000,     .000,     .000,     .000,     .000,     .000,     .000,



Fleet,                Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
    ,                 Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,    79267.,   .301,       .264,    .88,   3,  .436,     .031
FLT10: RUSSIAN SURVE,   130299.,   .343,       .152,    .44,  10,  .308,     .019
FLT11: NORWAY TRAWL ,    48592.,   .400,       .210,    .53,   3,  .246,     .051

  F shrinkage mean  ,    29216.,  2.00,,,,                        .010,     .083

Weighted prediction :

Survivors,       Int,      Ext,    N,    Var,     F
at end of year,  s.e,      s.e,      ,   Ratio,
   81042.,       .20,      .13,   17,    .688,   .031
```

continued...

**Table 6.14 (continued)**

Age 12 Catchability constant w.r.t. time and dependent on age

Year class = 1981

FLT04: RUSSIAN PST-T

| Age, | 12, | 11, |
|---|---|---|
| Survivors, | 47876., | 22216., |
| Raw Weights, | 6.272, | 6.417, |

| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 58319., | 134056., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | 2.450, | .858, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

FLT10: RUSSIAN SURVE

| Age, | 12, | 11, |
|---|---|---|
| Survivors, | 0., | 0., |
| Raw Weights, | .000, | .000, |

| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 14239., | 27518., | 68880., | 82042., | 180783., | 39884., | 23440., | 175007., | 27941., |
| Raw Weights, | .734, | .551, | 1.074, | .737, | .677, | .685, | .571, | .498, | .316, |

FLT11: NORWAY TRAWL

| Age, | 12, | 11, |
|---|---|---|
| Survivors, | 39061., | 67427., |
| Raw Weights, | .766, | 2.858, |

| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 70980., | 0., | 186048., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | 2.128, | .000, | .580, | .000, | .000, | .000, | .000, | .000, | .000, |

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT04: RUSSIAN PST-T, | 38325., | .239, | .289, | 1.21, | 4, | .558, | .057 |
| FLT10: RUSSIAN SURVE, | 48310., | .351, | .288, | .82, | 10, | .213, | .045 |
| FLT11: NORWAY TRAWL , | 70475., | .372, | .208, | .56, | 4, | .221, | .031 |
| F shrinkage mean , | 14828., | 2.00,,,, | | | | .009, | .141 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 45677., | .17, | .15, | 19, | .853, | .048 |

continued...

**Table 6.14 (continued)**

```
Age 13   Catchability constant w.r.t. time and dependent on age

Year class = 1980

FLT04: RUSSIAN PST-T
       Age,        13,        12,        11,
  Survivors,    20093.,    12385.,    32406.,
Raw Weights,     4.153,     5.678,     5.194,

       Age,        10,         9,         8,         7,         6,         5,         4,         3,         2,
  Survivors,    54023.,    71235.,        0.,        0.,        0.,        0.,        0.,        0.,        0.,
Raw Weights,     1.925,      .681,      .000,      .000,      .000,      .000,      .000,      .000,      .000,



FLT10: RUSSIAN SURVE
       Age,        13,        12,        11,
  Survivors,        0.,        0.,        0.,
Raw Weights,      .000,      .000,      .000,

       Age,        10,         9,         8,         7,         6,         5,         4,         3,         2,
  Survivors,    31289.,        0.,    15963.,    84709.,    31453.,    14820.,    46452.,    16257.,    10648.,
Raw Weights,      .577,      .000,      .862,      .585,      .529,      .526,      .430,      .365,      .224,



FLT11: NORWAY TRAWL
       Age,        13,        12,        11,
  Survivors,    22286.,    88174.,    25909.,
Raw Weights,      .764,      .693,     2.313,

       Age,        10,         9,         8,         7,         6,         5,         4,         3,         2,
  Survivors,        0.,    94261.,        0.,        0.,        0.,        0.,        0.,        0.,        0.,
Raw Weights,      .000,      .338,      .000,      .000,      .000,      .000,      .000,      .000,      .000,



Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
    ,                  Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,    23156.,    .215,       .270,    1.26,   5,  .671,     .082
FLT10: RUSSIAN SURVE,    23364.,    .378,       .297,     .78,   9,  .163,     .081
FLT11: NORWAY TRAWL ,    34454.,    .439,       .323,     .74,   4,  .156,     .056

  F shrinkage mean  ,     6308.,   2.00,,,,                          .010,     .273

Weighted prediction :

Survivors,        Int,       Ext,    N,    Var,     F
at end of year,   s.e,       s.e,     ,   Ratio,
    24373.,       .17,       .15,   19,    .864,   .078
```

**continued...**

**Table 6.14 (continued)**

```
Age 14   Catchability constant w.r.t. time and dependent on age

Year class = 1979

FLT04: RUSSIAN PST-T
       Age,       14,       13,       12,       11,
 Survivors,    16023.,    6249.,   17375.,   24456.,
Raw Weights,    3.371,    3.391,    4.011,    3.590,

       Age,       10,       9,        8,        7,        6,        5,        4,        3,        2,
 Survivors,    27227.,   4272.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,    1.398,    .520,     .000,     .000,     .000,     .000,     .000,     .000,     .000,


FLT10: RUSSIAN SURVE
       Age,       14,       13,       12,       11,
 Survivors,        0.,       0.,       0.,       0.,
Raw Weights,     .000,     .000,     .000,     .000,

       Age,       10,       9,        8,        7,        6,        5,        4,        3,        2,
 Survivors,        0.,       0.,    5639.,   38233.,   22146.,   15639.,    4698.,   16469.,    5244.,
Raw Weights,     .000,     .000,     .649,     .433,     .385,     .375,     .298,     .245,     .145,


FLT11: NORWAY TRAWL
       Age,       14,       13,       12,       11,
 Survivors,    35023.,   36740.,   27264.,       0.,
Raw Weights,     .418,     .624,     .490,     .000,

       Age,       10,       9,        8,        7,        6,        5,        4,        3,        2,
 Survivors,    26137.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,       0.,
Raw Weights,    1.215,     .000,     .000,     .000,     .000,     .000,     .000,     .000,     .000,


Fleet,                 Estimated,    Int,       Ext,    Var,    N, Scaled,  Estimated
   ,                   Survivors,    s.e,       s.e,    Ratio,    , Weights,    F
FLT04: RUSSIAN PST-T,    14797.,    .200,      .245,    1.22,   6,  .743,     .183
FLT10: RUSSIAN SURVE,    11697.,    .423,      .292,     .69,   8,  .121,     .227
FLT11: NORWAY TRAWL ,    29749.,    .475,      .087,     .18,   4,  .125,     .095

  F shrinkage mean  ,     5891.,   2.00,,,,                        .011,     .409

Weighted prediction :

Survivors,        Int,      Ext,    N,    Var,     F
at end of year,   s.e,      s.e,     ,    Ratio,
    15534.,       .17,      .14,   19,    .848,   .175
```

**continued...**

**Table 6.14 (continued)**

Age 15 Catchability constant w.r.t. time and dependent on age

Year class = 1978

FLT04: RUSSIAN PST-T

| Age, | 15, | 14, | 13, | 12, | 11, | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 15336., | 5043., | 11246., | 17143., | 11341., | | | | |
| Raw Weights, | 5.490, | 2.977, | 2.140, | 2.435, | 2.299, | | | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 6036., | 10896., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .939, | .341, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

FLT10: RUSSIAN SURVE

| Age, | 15, | 14, | 13, | 12, | 11, | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 0., | 0., | 0., | 0., | 0., | | | | |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | | | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 0., | 20815., | 29348., | 2460., | 4039., | 6246., | 2798., | 2062., |
| Raw Weights, | .000, | .000, | .420, | .274, | .238, | .226, | .174, | .138, | .078, |

FLT11: NORWAY TRAWL

| Age, | 15, | 14, | 13, | 12, | 11, | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 5231., | 22054., | 20351., | 2466., | 13799., | | | | |
| Raw Weights, | 1.359, | .370, | .394, | .297, | 1.024, | | | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT04: RUSSIAN PST-T, | 11089., | .191, | .180, | .94, | 7, | .760, | .134 |
| FLT10: RUSSIAN SURVE, | 8147., | .455, | .414, | .91, | 7, | .071, | .178 |
| FLT11: NORWAY TRAWL , | 8916., | .421, | .345, | .82, | 5, | .157, | .164 |
| F shrinkage mean , | 3697., | 2.00,,,, | | | | .011, | .357 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 10352., | .16, | .13, | 20, | .788, | .143 |

continued...

**Table 6.14 (continued)**

Age 16  Catchability constant w.r.t. time and age (fixed at the value for age) 15

Year class = 1977

FLT04: RUSSIAN PST-T

| Age, | 16, | 15, | 14, | 13, | 12, | 11, | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 9082., | 4068., | 6342., | 7701., | 4011., | 4091., | | | |
| Raw Weights, | 1.838, | 3.724, | 1.220, | .922, | 1.194, | 1.147, | | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 6986., | 1537., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .455, | .163, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

FLT10: RUSSIAN SURVE

| Age, | 16, | 15, | 14, | 13, | 12, | 11, | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | | | |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 4663., | 29905., | 653., | 2038., | 2426., | 503., | 251., | 205., |
| Raw Weights, | .000, | .105, | .193, | .124, | .105, | .097, | .072, | .054, | .029, |

FLT11: NORWAY TRAWL

| Age, | 16, | 15, | 14, | 13, | 12, | 11, | | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 8518., | 12681., | 11019., | 1006., | 4038., | 0., | | | |
| Raw Weights, | .697, | .922, | .151, | .170, | .146, | .000, | | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

| Fleet, | Estimated, | Int, | Ext, | Var, | N, | Scaled, | Estimated |
|---|---|---|---|---|---|---|---|
| , | Survivors, | s.e, | s.e, | Ratio, | , | Weights, | F |
| FLT04: RUSSIAN PST-T, | 5232., | .204, | .138, | .68, | 8, | .773, | .247 |
| FLT10: RUSSIAN SURVE, | 2464., | .446, | .595, | 1.33, | 9, | .058, | .468 |
| FLT11: NORWAY TRAWL , | 8255., | .525, | .348, | .66, | 5, | .151, | .164 |
| F shrinkage mean , | 3339., | 2.00,,,, | | | | .018, | .365 |

Weighted prediction :

| Survivors, | Int, | Ext, | N, | Var, | F |
|---|---|---|---|---|---|
| at end of year, | s.e, | s.e, | , | Ratio, | |
| 5323., | .18, | .14, | 23, | .748, | .244 |

**continued...**

**Table 6.14 (continued)**

Age 17  Catchability constant w.r.t. time and age (fixed at the value for age) 15

Year class = 1976

FLT04: RUSSIAN PST-T

| Age, | 17, | 16, | 15, | 14, | 13, | 12, | 11, | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 5386., | 2308., | 3063., | 4497., | 3753., | 2561., | 3191., | | |
| Raw Weights, | .621, | 1.188, | 2.090, | .832, | .699, | .890, | .848, | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 1980., | 3047., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .328, | .108, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

FLT10: RUSSIAN SURVE

| Age, | 17, | 16, | 15, | 14, | 13, | 12, | 11, | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | 0., | | |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 20652., | 1010., | 2128., | 1758., | 2108., | 911., | 979., | 5413., |
| Raw Weights, | .000, | .069, | .127, | .080, | .065, | .058, | .041, | .029, | .014, |

FLT11: NORWAY TRAWL

| Age, | 17, | 16, | 15, | 14, | 13, | 12, | 11, | | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 6244., | 10706., | 1842., | 330., | 3709., | 0., | 0., | | |
| Raw Weights, | .241, | .451, | .517, | .103, | .129, | .000, | .000, | | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT04: RUSSIAN PST-T, | 3148., | .201, | .093, | .46, | 9, | .778, | .276 |
| FLT10: RUSSIAN SURVE, | 2153., | .486, | .381, | .78, | 8, | .049, | .381 |
| FLT11: NORWAY TRAWL , | 3687., | .548, | .498, | .91, | 5, | .147, | .240 |
| F shrinkage mean , | 463., | 2.00,,,, | | | | .026, | 1.150 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 3011., | .18, | .13, | 23, | .688, | .287 |

**continued...**

**Table 6.14 (continued)**

Age 18  Catchability constant w.r.t. time and age (fixed at the value for age) 15

Year class = 1975

FLT04: RUSSIAN PST-T

| Age, | 18, | 17, | 16, | 15, | 14, | 13, | 12, | 11, | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 2748., | 1582., | 1236., | 2185., | 3746., | 2609., | 2682., | 2336., | |
| Raw Weights, | .758, | .451, | .914, | 1.766, | .745, | .608, | .770, | .666, | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 4008., | 1005., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .199, | .068, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

FLT10: RUSSIAN SURVE

| Age, | 18, | 17, | 16, | 15, | 14, | 13, | 12, | 11, | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., | |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 7267., | 0., | 0., | 1296., | 759., | 446., | 1398., | 832., | 0., |
| Raw Weights, | .060, | .000, | .000, | .046, | .036, | .030, | .020, | .013, | .000, |

FLT11: NORWAY TRAWL

| Age, | 18, | 17, | 16, | 15, | 14, | 13, | 12, | 11, | |
|---|---|---|---|---|---|---|---|---|---|
| Survivors, | 3441., | 8398., | 1538., | 1523., | 2027., | 0., | 0., | 0., | |
| Raw Weights, | .148, | .175, | .347, | .437, | .092, | .000, | .000, | .000, | |
| Age, | 10, | 9, | 8, | 7, | 6, | 5, | 4, | 3, | 2, |
| Survivors, | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., | 0., |
| Raw Weights, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, | .000, |

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT04: RUSSIAN PST-T, | 2277., | .211, | .110, | .52, | 10, | .808, | .202 |
| FLT10: RUSSIAN SURVE, | 1627., | .613, | .457, | .74, | 6, | .024, | .273 |
| FLT11: NORWAY TRAWL , | 2216., | .585, | .306, | .52, | 5, | .139, | .207 |
| F shrinkage mean , | 2505., | 2.00,,,, | | | | .029, | .186 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 2257., | .20, | .09, | 22, | .452, | .204 |

**Table 6.15** *Sebastes mentella*. Fishing mortalities from the XSA.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: FI

At 31-Aug-94 11:17:38

Terminal Fs derived using XSA (With F shrinkage)

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 1, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 2, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 3, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 4, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 5, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 6, | .0003, | .0000, | .0000, | .0000, | .0001, | .0000, | .0000, | .0009, | .0004, |
| 7, | .0021, | .0000, | .0000, | .0000, | .0005, | .0000, | .0000, | .0016, | .0036, |
| 8, | .0116, | .0002, | .0001, | .0001, | .0032, | .0002, | .0004, | .0125, | .0106, |
| 9, | .0237, | .0023, | .0001, | .0008, | .0049, | .0011, | .0017, | .0144, | .0240, |
| 10, | .0129, | .0065, | .0016, | .0019, | .0085, | .0065, | .0066, | .0138, | .0210, |
| 11, | .0175, | .0059, | .0039, | .0035, | .0101, | .0240, | .0186, | .0191, | .0200, |
| 12, | .0146, | .0093, | .0048, | .0066, | .0106, | .0422, | .0578, | .0519, | .0386, |
| 13, | .0226, | .0101, | .0056, | .0087, | .0144, | .0504, | .0703, | .0701, | .0826, |
| 14, | .0209, | .0199, | .0045, | .0136, | .0108, | .0688, | .0814, | .0807, | .1050, |
| 15, | .0210, | .0168, | .0057, | .0079, | .0085, | .0560, | .1169, | .0730, | .0947, |
| 16, | .0182, | .0207, | .0059, | .0120, | .0092, | .0810, | .1861, | .1398, | .1165, |
| 17, | .0244, | .0141, | .0082, | .0072, | .0065, | .0354, | .1110, | .1160, | .1429, |
| 18, | .0214, | .0163, | .0060, | .0099, | .0099, | .0584, | .1133, | .0960, | .1085, |
| +gp, | .0214, | .0163, | .0060, | .0099, | .0099, | .0584, | .1133, | .0960, | .1085, |
| FBAR 10-15, | .0182, | .0114, | .0044, | .0070, | .0105, | .0413, | .0586, | .0514, | .0603, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 1, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 2, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 3, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 4, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 5, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 6, | .0015, | .0124, | .0352, | .0000, | .0075, | .0138, | .0060, | .0090, | .0001, | .0002, |
| 7, | .0131, | .0547, | .0730, | .0051, | .0631, | .0607, | .0319, | .0189, | .0092, | .0011, |
| 8, | .0381, | .1361, | .2110, | .0494, | .1647, | .1098, | .0930, | .0426, | .0342, | .0240, |
| 9, | .0723, | .2604, | .3527, | .1581, | .1912, | .1540, | .1392, | .1158, | .0725, | .0375, |
| 10, | .0867, | .3743, | .5820, | .3729, | .2107, | .1784, | .1724, | .1992, | .2752, | .1172, |
| 11, | .1055, | .5035, | .7352, | .4960, | .2118, | .2269, | .1697, | .2251, | .3401, | .2633, |
| 12, | .0940, | .4382, | .8344, | .8562, | .2832, | .3164, | .2402, | .2903, | .4022, | .5114, |
| 13, | .1271, | .3632, | .7470, | .7232, | .2974, | .4199, | .2508, | .3836, | .5457, | .8394, |
| 14, | .1717, | .4501, | .5562, | .6406, | .3025, | .2879, | .2560, | .4068, | .4753, | 1.0141, |
| 15, | .1516, | .5037, | .5402, | .5053, | .3333, | .2096, | .4174, | .3628, | .5876, | 1.3590, |
| 16, | .1529, | .4682, | .5649, | .4014, | .2722, | .3253, | .6701, | .3220, | .6211, | 1.5011, |
| 17, | .0883, | .5486, | .3693, | .5373, | .2243, | .2309, | .5480, | .4108, | .7431, | 1.9828, |
| 18, | .1385, | .4684, | .5577, | .5637, | .2866, | .2954, | .4298, | .3783, | .8172, | 1.3605, |
| +gp, | .1385, | .4684, | .5577, | .5637, | .2866, | .2954, | .4298, | .3783, | .8172, | 1.3605, |
| FBAR 10-15, | .1228, | .4389, | .6658, | .5990, | .2731, | .2732, | .2511, | .3113, | .4377, | .6841, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 1, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 2, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 3, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 4, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0071, | .0020, | .0030, |
| 5, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0713, | .0196, | .0015, | .0308, |
| 6, | .0000, | .0013, | .0003, | .0000, | .0000, | .0004, | .0000, | .0552, | .0778, | .0028, | .0453, |
| 7, | .0004, | .0076, | .0017, | .0000, | .0000, | .0032, | .0066, | .1155, | .0997, | .0097, | .0750, |
| 8, | .0077, | .0259, | .0032, | .0017, | .0000, | .0202, | .0310, | .0809, | .0483, | .0063, | .0452, |
| 9, | .0288, | .0842, | .0152, | .0173, | .0067, | .0653, | .0825, | .0602, | .0193, | .0115, | .0303, |
| 10, | .0764, | .3041, | .0623, | .0522, | .0342, | .0910, | .1473, | .1222, | .0186, | .0243, | .0550, |
| 11, | .2006, | .4268, | .1462, | .0638, | .0684, | .0945, | .1549, | .1375, | .0278, | .0306, | .0653, |
| 12, | .4957, | .6188, | .2225, | .1112, | .1176, | .1098, | .2459, | .2118, | .0690, | .0479, | .1096, |
| 13, | 1.1396, | 1.0224, | .4515, | .1742, | .2911, | .2724, | .3837, | .4390, | .1049, | .0780, | .2073, |
| 14, | 1.4533, | .7438, | .5411, | .1585, | .2844, | .3940, | .4581, | .6585, | .1564, | .1752, | .3300, |
| 15, | 1.5027, | .9249, | .3416, | .1793, | .2309, | .2476, | .3274, | .4258, | .2867, | .1427, | .2851, |
| 16, | 1.6557, | 1.0055, | .3271, | .1259, | .3448, | .2669, | .1273, | .3339, | .3930, | .2437, | .3235, |
| 17, | 1.1778, | 1.2397, | .4764, | .1365, | .2513, | .8139, | .1581, | 1.8860, | .4016, | .2867, | .8581, |
| 18, | 1.1496, | .8400, | .4063, | .1212, | .2909, | .8135, | 1.0018, | 2.0387, | .6130, | .2041, | .9519, |
| +gp, | 1.1496, | .8400, | .4063, | .1212, | .2909, | .8135, | 1.0018, | 2.0387, | .6130, | .2041, | |
| FBAR 10-15, | .8114, | .6735, | .2942, | .1232, | .1711, | .2016, | .2862, | .3325, | .1106, | .0831, | |

**Table 6.16** *Sebastes mentella*. Stock number at age from the XSA.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: FI

At 31-Aug-94 11:17:38

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, | 1973, |
| AGE | | | | | | | | | |
| 1, | 972956, | 977287, | 878508, | 715282, | 699229, | 821382, | 945656, | 944452, | 671407, |
| 2, | 530943, | 880367, | 884286, | 794906, | 647214, | 632689, | 743217, | 855665, | 854576, |
| 3, | 316861, | 480418, | 796589, | 800135, | 719261, | 585623, | 572480, | 672491, | 774238, |
| 4, | 200350, | 286707, | 434700, | 720784, | 723992, | 650814, | 529894, | 518002, | 608495, |
| 5, | 166803, | 181285, | 259423, | 393333, | 652192, | 655095, | 588881, | 479468, | 468707, |
| 6, | 156339, | 150930, | 164033, | 234736, | 355902, | 590128, | 592755, | 532841, | 433840, |
| 7, | 145826, | 141416, | 136567, | 148423, | 212391, | 322004, | 533970, | 536346, | 481692, |
| 8, | 144729, | 131678, | 127959, | 123571, | 134299, | 192090, | 291361, | 483155, | 484553, |
| 9, | 97106, | 129442, | 119122, | 115775, | 111797, | 121130, | 173779, | 263526, | 431729, |
| 10, | 93367, | 85807, | 116859, | 107771, | 104673, | 100660, | 109478, | 156972, | 235037, |
| 11, | 93669, | 83397, | 77136, | 105565, | 97333, | 93915, | 90491, | 98412, | 140085, |
| 12, | 143271, | 83286, | 75018, | 69524, | 95181, | 87183, | 82959, | 80367, | 87363, |
| 13, | 116313, | 127761, | 74665, | 67553, | 62493, | 85216, | 75626, | 70852, | 69043, |
| 14, | 142605, | 102894, | 114440, | 67185, | 60597, | 55739, | 73318, | 63783, | 59768, |
| 15, | 100915, | 126367, | 91269, | 103084, | 59969, | 54243, | 47080, | 61156, | 53239, |
| 16, | 120265, | 89413, | 112433, | 82112, | 92544, | 53804, | 46410, | 37901, | 51438, |
| 17, | 69384, | 106854, | 79248, | 101136, | 73412, | 82970, | 44895, | 34863, | 29820, |
| 18, | 73003, | 61267, | 95333, | 71124, | 90851, | 65997, | 72465, | 36355, | 28091, |
| +gp, | 128236, | 128434, | 574203, | 192631, | 271241, | 105863, | 146399, | 39522, | 31178, |
| TOTAL, | 3812942, | 4355011, | 5211788, | 5014628, | 5264570, | 5356545, | 5761117, | 5966131, | 5994294, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 1, | 458544, | 308655, | 180974, | 144736, | 166763, | 145180, | 133245, | 147073, | 204838, | 281048, |
| 2, | 607515, | 414908, | 279282, | 163752, | 130962, | 150893, | 131365, | 120565, | 133078, | 185345, |
| 3, | 773252, | 549702, | 375424, | 252705, | 148169, | 118499, | 136534, | 118863, | 109092, | 120413, |
| 4, | 700559, | 699667, | 497391, | 339698, | 228657, | 134069, | 107223, | 123541, | 107552, | 98711, |
| 5, | 550589, | 633892, | 633085, | 450058, | 307371, | 206898, | 121310, | 97019, | 111784, | 97317, |
| 6, | 424104, | 498194, | 573569, | 572839, | 407229, | 278121, | 187209, | 109766, | 87787, | 101147, |
| 7, | 392391, | 383168, | 445234, | 501018, | 518326, | 365713, | 248198, | 168380, | 98434, | 79428, |
| 8, | 434274, | 350440, | 328235, | 374504, | 451039, | 440314, | 311413, | 217529, | 149503, | 88254, |
| 9, | 433814, | 378250, | 276735, | 240501, | 322528, | 346133, | 356983, | 256765, | 188629, | 130734, |
| 10, | 381390, | 360153, | 263797, | 175975, | 185792, | 241048, | 268490, | 281033, | 206917, | 158736, |
| 11, | 208260, | 316422, | 227232, | 133381, | 109668, | 136180, | 182468, | 204471, | 208354, | 142188, |
| 12, | 124249, | 169567, | 173043, | 98572, | 73491, | 80294, | 98205, | 139336, | 147719, | 134179, |
| 13, | 76055, | 102339, | 98990, | 67974, | 37884, | 50096, | 52946, | 69883, | 94311, | 89402, |
| 14, | 57518, | 60604, | 64396, | 42437, | 29842, | 25461, | 29785, | 37280, | 43087, | 49445, |
| 15, | 48690, | 43832, | 34962, | 33408, | 20235, | 19953, | 17275, | 20863, | 22458, | 24237, |
| 16, | 43818, | 37861, | 23966, | 18431, | 18239, | 13119, | 14641, | 10297, | 13134, | 11292, |
| 17, | 41425, | 34028, | 21449, | 12327, | 11164, | 12571, | 8575, | 6778, | 6752, | 6386, |
| 18, | 23389, | 34314, | 17788, | 13415, | 6517, | 8072, | 9030, | 4486, | 4067, | 2906, |
| +gp, | 43005, | 62601, | 27991, | 33753, | 12270, | 26960, | 7630, | 6352, | 7822, | 941, |
| TOTAL, | 5822843, | 5443597, | 4543544, | 3669484, | 3186145, | 2799573, | 2422526, | 2140281, | 1945318, | 1802108, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 1, | 219209, | 95736, | 53310, | 46608, | 77585, | 221659, | 280918, | 93501, | 19672, | 2412, | 0, | 2710 |
| 2, | 254302, | 198349, | 86626, | 48236, | 42173, | 70201, | 200566, | 254186, | 84603, | 17800, | 2183, | 2624 |
| 3, | 167707, | 230102, | 179474, | 78382, | 43646, | 38159, | 63521, | 181479, | 229997, | 76552, | 16107, | 2403 |
| 4, | 108955, | 151748, | 208205, | 162394, | 70923, | 39493, | 34528, | 57476, | 164209, | 208109, | 69271, | 2190 |
| 5, | 89317, | 98586, | 137307, | 188392, | 146940, | 64174, | 35734, | 31242, | 52007, | 147528, | 187943, | 2069 |
| 6, | 88056, | 80817, | 89204, | 124240, | 170464, | 132957, | 58067, | 32334, | 26325, | 46146, | 133299, | 1995 |
| 7, | 91502, | 79677, | 73033, | 80688, | 112417, | 154242, | 120259, | 52540, | 27684, | 22036, | 41642, | 1909 |
| 8, | 71787, | 82762, | 71551, | 65972, | 73010, | 101719, | 139112, | 108103, | 42353, | 22673, | 19747, | 1777 |
| 9, | 77966, | 64457, | 72975, | 64538, | 59590, | 66062, | 90201, | 122035, | 90212, | 36516, | 20387, | 1547 |
| 10, | 113940, | 68543, | 53615, | 65033, | 57393, | 53559, | 55997, | 75152, | 103971, | 80067, | 32666, | 1295 |
| 11, | 127750, | 95517, | 45758, | 45584, | 55853, | 50183, | 44246, | 43727, | 60175, | 92347, | 70714, | 1045 |
| 12, | 98874, | 94578, | 56403, | 35771, | 38698, | 47197, | 41314, | 34292, | 34482, | 52954, | 81042, | 837 |
| 13, | 72804, | 54495, | 46091, | 40856, | 28962, | 31130, | 38266, | 29232, | 25106, | 29120, | 45677, | 627 |
| 14, | 34943, | 21076, | 17738, | 26552, | 31058, | 19587, | 21450, | 23590, | 17052, | 20454, | 24373, | 436 |
| 15, | 16229, | 7392, | 9065, | 9343, | 20504, | 21146, | 11951, | 12276, | 11049, | 13195, | 15534, | 300 |
| 16, | 5634, | 3268, | 2653, | 5829, | 7066, | 14727, | 14937, | 7795, | 7256, | 7506, | 10352, | 211 |
| 17, | 2277, | 974, | 1082, | 1731, | 4650, | 4529, | 10204, | 11900, | 5051, | 4432, | 5323, | 145 |
| 18, | 796, | 635, | 255, | 608, | 1366, | 3272, | 1816, | 7883, | 1633, | 3058, | 3011, | 95 |
| +gp, | 719, | 95, | 210, | 0, | 440, | 4162, | 25687, | 22949, | 22413, | 44301, | 34943, | |
| TOTAL, | 1642769, | 1428806, | 1204554, | 1090757, | 1042737, | 1138160, | 1288775, | 1201693, | 1025250, | 927206, | 814213, | |

**Table 6.17** *Sebastes mentella*. Fishing mortality at age from the final VPA.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: WE

At 31-Aug-94 11:07:01

Traditional vpa using file input for terminal F

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 6, | .0003, | .0000, | .0000, | .0000, | .0001, | .0000, | .0000, | .0009, | .0004, |
| 7, | .0021, | .0000, | .0000, | .0000, | .0005, | .0000, | .0000, | .0016, | .0036, |
| 8, | .0117, | .0002, | .0001, | .0001, | .0032, | .0002, | .0004, | .0126, | .0107, |
| 9, | .0237, | .0023, | .0001, | .0008, | .0050, | .0011, | .0017, | .0145, | .0241, |
| 10, | .0129, | .0065, | .0016, | .0019, | .0085, | .0065, | .0066, | .0139, | .0210, |
| 11, | .0175, | .0059, | .0039, | .0035, | .0102, | .0241, | .0187, | .0191, | .0200, |
| 12, | .0146, | .0093, | .0048, | .0066, | .0106, | .0423, | .0579, | .0520, | .0387, |
| 13, | .0226, | .0101, | .0056, | .0087, | .0144, | .0505, | .0705, | .0703, | .0828, |
| 14, | .0209, | .0199, | .0045, | .0136, | .0108, | .0688, | .0815, | .0809, | .1052, |
| 15, | .0211, | .0169, | .0057, | .0079, | .0085, | .0560, | .1168, | .0732, | .0950, |
| 16, | .0183, | .0207, | .0059, | .0120, | .0092, | .0810, | .1859, | .1397, | .1167, |
| 17, | .0244, | .0142, | .0082, | .0073, | .0065, | .0354, | .1109, | .1159, | .1428, |
| 18, | .0214, | .0163, | .0060, | .0099, | .0099, | .0583, | .1132, | .0960, | .1084, |
| +gp, | .0214, | .0163, | .0060, | .0099, | .0099, | .0583, | .1132, | .0960, | .1084, |
| FBAR 10-15, | .0183, | .0114, | .0044, | .0070, | .0105, | .0414, | .0587, | .0516, | .0605, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | .0015, | .0124, | .0354, | .0000, | .0076, | .0139, | .0060, | .0090, | .0001, | .0002, |
| 7, | .0131, | .0549, | .0732, | .0051, | .0634, | .0609, | .0319, | .0190, | .0092, | .0011, |
| 8, | .0383, | .1365, | .2114, | .0496, | .1653, | .1103, | .0932, | .0426, | .0344, | .0240, |
| 9, | .0726, | .2610, | .3531, | .1586, | .1918, | .1546, | .1399, | .1162, | .0726, | .0378, |
| 10, | .0870, | .3753, | .5821, | .3734, | .2113, | .1791, | .1732, | .2002, | .2758, | .1173, |
| 11, | .1059, | .5034, | .7353, | .4967, | .2125, | .2277, | .1705, | .2263, | .3418, | .2641, |
| 12, | .0942, | .4386, | .8306, | .8552, | .2844, | .3175, | .2413, | .2916, | .4043, | .5145, |
| 13, | .1273, | .3631, | .7455, | .7171, | .2983, | .4218, | .2521, | .3853, | .5480, | .8430, |
| 14, | .1720, | .4497, | .5548, | .6388, | .2996, | .2891, | .2580, | .4092, | .4782, | 1.0168, |
| 15, | .1518, | .5031, | .5389, | .5033, | .3328, | .2071, | .4194, | .3662, | .5920, | 1.3607, |
| 16, | .1532, | .4677, | .5634, | .4004, | .2712, | .3246, | .6544, | .3246, | .6289, | 1.5107, |
| 17, | .0885, | .5482, | .3690, | .5350, | .2240, | .2299, | .5449, | .3957, | .7494, | 2.0229, |
| 18, | .1384, | .4679, | .5569, | .5618, | .2855, | .2946, | .4265, | .3756, | .7592, | 1.3811, |
| +gp, | .1384, | .4679, | .5569, | .5618, | .2855, | .2946, | .4265, | .3756, | .7592, | 1.3811, |
| FBAR 10-15, | .1230, | .4389, | .6645, | .5974, | .2731, | .2737, | .2524, | .3131, | .4400, | .6861, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 6, | .0000, | .0013, | .0003, | .0000, | .0000, | .0004, | .0000, | .0550, | .0775, | .0028, | .0451, |
| 7, | .0004, | .0076, | .0017, | .0000, | .0000, | .0032, | .0066, | .1157, | .0992, | .0097, | .0749, |
| 8, | .0077, | .0259, | .0032, | .0017, | .0000, | .0202, | .0309, | .0810, | .0484, | .0063, | .0452, |
| 9, | .0289, | .0843, | .0153, | .0174, | .0067, | .0653, | .0826, | .0601, | .0193, | .0115, | .0303, |
| 10, | .0769, | .3040, | .0624, | .0523, | .0343, | .0911, | .1473, | .1223, | .0185, | .0243, | .0550, |
| 11, | .2008, | .4293, | .1464, | .0639, | .0686, | .0946, | .1549, | .1375, | .0279, | .0306, | .0653, |
| 12, | .4967, | .6164, | .2247, | .1114, | .1178, | .1100, | .2459, | .2118, | .0691, | .0479, | .1096, |
| 13, | 1.1451, | 1.0193, | .4494, | .1764, | .2912, | .2727, | .3839, | .4382, | .1049, | .0780, | .2070, |
| 14, | 1.4584, | .7563, | .5404, | .1579, | .2886, | .3938, | .4578, | .6569, | .1564, | .1752, | .3295, |
| 15, | 1.5046, | .9413, | .3528, | .1796, | .2297, | .2525, | .3273, | .4255, | .2866, | .1427, | .2849, |
| 16, | 1.6559, | 1.0162, | .3398, | .1314, | .3449, | .2650, | .1304, | .3338, | .3927, | .2437, | .3234, |
| 17, | 1.2114, | 1.2480, | .4895, | .1434, | .2644, | .8095, | .1568, | 1.9555, | .4011, | .2867, | .8811, |
| 18, | 1.2711, | .9106, | .4157, | .1261, | .3090, | .8835, | .9860, | 1.9021, | .6970, | .2041, | .9344, |
| +gp, | 1.2711, | .9106, | .4157, | .1261, | .3090, | .8835, | .9860, | 1.9021, | .6970, | .2041, | |
| FBAR 10-15, | .8138, | .6778, | .2960, | .1236, | .1717, | .2024, | .2862, | .3320, | .1106, | .0831, | |

**Table 6.18** *Sebastes mentella*. Stock number at age from the final VPA.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: WE

At 31-Aug-94 11:07:01

Traditional vpa using file input for terminal F

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
| AGE | | | | | | | | | |
| 6, | 155928, | 150473, | 163534, | 234057, | 354374, | 587750, | 589660, | 530392, | 432139, |
| 7, | 145356, | 141044, | 136154, | 147972, | 211776, | 320621, | 531819, | 533546, | 479475, |
| 8, | 144349, | 131253, | 127622, | 123197, | 133890, | 191534, | 290110, | 481209, | 482020, |
| 9, | 97011, | 129099, | 118736, | 115470, | 111459, | 120760, | 173276, | 262394, | 429970, |
| 10, | 93284, | 85723, | 116548, | 107423, | 104397, | 100354, | 109144, | 156516, | 234015, |
| 11, | 93592, | 83322, | 77060, | 105284, | 97018, | 93666, | 90215, | 98110, | 139674, |
| 12, | 143166, | 83217, | 74951, | 69456, | 94927, | 86898, | 82735, | 80118, | 87091, |
| 13, | 116322, | 127667, | 74603, | 67492, | 62431, | 84987, | 75371, | 70652, | 68820, |
| 14, | 142161, | 102904, | 114355, | 67129, | 60543, | 55683, | 73114, | 63557, | 59592, |
| 15, | 100651, | 125967, | 91279, | 103008, | 59919, | 54194, | 47034, | 60977, | 53039, |
| 16, | 119678, | 89176, | 112071, | 82121, | 92475, | 53759, | 46368, | 37865, | 51280, |
| 17, | 69472, | 106324, | 79034, | 100809, | 73421, | 82907, | 44858, | 34839, | 29794, |
| 18, | 73094, | 61347, | 94854, | 70930, | 90556, | 66006, | 72410, | 36328, | 28074, |
| +gp, | 128473, | 128673, | 571585, | 192205, | 270496, | 105973, | 146488, | 39540, | 31201, |
| TOTAL, | 1622538, | 1546187, | 1952386, | 1586554, | 1817684, | 2005093, | 2372602, | 2486043, | 2606184, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 6, | 422494, | 496085, | 570877, | 569901, | 405686, | 277501, | 185837, | 109476, | 87544, | 100816, |
| 7, | 390852, | 381712, | 443330, | 498594, | 515668, | 364318, | 247639, | 167139, | 98172, | 79209, |
| 8, | 432269, | 349049, | 326934, | 372810, | 448848, | 437936, | 310169, | 217028, | 148382, | 88017, |
| 9, | 431524, | 376446, | 275540, | 239446, | 321008, | 344261, | 354887, | 255669, | 188182, | 129723, |
| 10, | 379805, | 363110, | 262368, | 175142, | 184893, | 239775, | 266872, | 279203, | 205961, | 158344, |
| 11, | 207338, | 315020, | 225747, | 132638, | 109088, | 135436, | 181384, | 203079, | 206794, | 141444, |
| 12, | 123879, | 168756, | 172293, | 97919, | 73032, | 79810, | 97589, | 138402, | 146545, | 132944, |
| 13, | 75811, | 102017, | 98478, | 67935, | 37674, | 49726, | 52569, | 69371, | 93556, | 88506, |
| 14, | 57323, | 60396, | 64200, | 42281, | 30007, | 25296, | 29511, | 36966, | 42698, | 48940, |
| 15, | 48538, | 43670, | 34855, | 33355, | 20197, | 20123, | 17142, | 20630, | 22216, | 23949, |
| 16, | 43642, | 37733, | 23892, | 18399, | 18246, | 13101, | 14801, | 10198, | 12943, | 11121, |
| 17, | 41289, | 33879, | 21389, | 12306, | 11155, | 12588, | 8569, | 6961, | 6670, | 6244, |
| 18, | 23372, | 34194, | 17718, | 13382, | 6521, | 8068, | 9050, | 4496, | 4240, | 2852, |
| +gp, | 43041, | 62652, | 28020, | 33840, | 12313, | 27027, | 7678, | 6390, | 8214, | 934, |
| TOTAL, | 2721177, | 2824721, | 2565641, | 2307949, | 2194336, | 2034968, | 1783698, | 1525009, | 1272116, | 1013043, |

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 6, | 87854, | 80674, | 89087, | 124050, | 170503, | 132777, | 57887, | 32429, | 26390, | 45474, | 0, | 1989 |
| 7, | 91203, | 79494, | 72904, | 80581, | 112245, | 154278, | 120096, | 52377, | 27772, | 22097, | 41031, | 1903 |
| 8, | 71589, | 82491, | 71386, | 65855, | 72913, | 101564, | 139145, | 107956, | 42213, | 22755, | 19801, | 1771 |
| 9, | 77753, | 64277, | 72731, | 64388, | 59484, | 65974, | 90061, | 122067, | 90087, | 36390, | 20460, | 1541 |
| 10, | 113028, | 68351, | 53458, | 64813, | 57258, | 53463, | 55921, | 75032, | 104006, | 79955, | 32551, | 1290 |
| 11, | 127417, | 94700, | 45633, | 45445, | 55656, | 50062, | 44165, | 43670, | 60078, | 92379, | 70609, | 1041 |
| 12, | 98279, | 94321, | 55783, | 35667, | 38574, | 47022, | 41210, | 34228, | 34439, | 52868, | 81069, | 834 |
| 13, | 71913, | 54114, | 46076, | 40318, | 28872, | 31024, | 38114, | 29158, | 25061, | 29082, | 45599, | 624 |
| 14, | 34469, | 20704, | 17668, | 26601, | 30583, | 19525, | 21372, | 23492, | 17023, | 20417, | 24340, | 434 |
| 15, | 16019, | 7255, | 8794, | 9312, | 20554, | 20736, | 11916, | 12235, | 11021, | 13173, | 15505, | 298 |
| 16, | 5558, | 3219, | 2561, | 5592, | 7041, | 14781, | 14576, | 7772, | 7234, | 7487, | 10334, | 209 |
| 17, | 2221, | 960, | 1054, | 1650, | 4437, | 4513, | 10261, | 11576, | 5036, | 4420, | 5309, | 144 |
| 18, | 747, | 599, | 249, | 585, | 1293, | 3082, | 1817, | 7937, | 1482, | 3051, | 3003, | 94 |
| +gp, | 682, | 91, | 206, | 0, | 418, | 3948, | 25929, | 23485, | 20450, | 44293, | 34930, | |
| TOTAL, | 798732, | 651251, | 537590, | 564857, | 659832, | 702748, | 672470, | 583416, | 472292, | 473840, | 404542, | |

**Table 6.19** *Sebastes mentella*. Stock biomass at age from the final VPA.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: WE

At 31-Aug-94 11:07:01

Traditional vpa using file input for terminal F

| Table 12 Stock biomass at age (start of year) Tonnes<br>YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 6, | 26196, | 25280, | 27474, | 39322, | 59535, | 98742, | 99063, | 89106, | 72599, |
| 7, | 26600, | 25811, | 24916, | 27079, | 38755, | 58674, | 97323, | 97639, | 87744, |
| 8, | 32479, | 29532, | 28715, | 27719, | 30125, | 43095, | 65275, | 108272, | 108454, |
| 9, | 30171, | 40150, | 36927, | 35911, | 34664, | 37556, | 53889, | 81605, | 133721, |
| 10, | 34235, | 31460, | 42773, | 39424, | 38314, | 36830, | 40056, | 57441, | 85883, |
| 11, | 40432, | 35995, | 33290, | 45483, | 41912, | 40464, | 38973, | 42383, | 60339, |
| 12, | 72728, | 42274, | 38075, | 35283, | 48223, | 44144, | 42029, | 40700, | 44242, |
| 13, | 71073, | 78004, | 45582, | 41238, | 38146, | 51927, | 46051, | 43169, | 42049, |
| 14, | 96527, | 69872, | 77647, | 45580, | 41109, | 37809, | 49644, | 43155, | 40463, |
| 15, | 75791, | 94853, | 68733, | 77565, | 45119, | 40808, | 35416, | 45915, | 39938, |
| 16, | 98256, | 73213, | 92011, | 67422, | 75922, | 44136, | 38068, | 31087, | 42101, |
| 17, | 60579, | 92715, | 68918, | 87906, | 64023, | 72295, | 39117, | 30380, | 25981, |
| 18, | 66516, | 55826, | 86317, | 64547, | 82406, | 60065, | 65894, | 33059, | 25547, |
| +gp, | 128345, | 127772, | 589876, | 194128, | 277529, | 105973, | 149711, | 38631, | 30577, |
| TOTALBIO, | 859927, | 822757, | 1261254, | 828606, | 915781, | 772518, | 860508, | 782541, | 839639, |

| Table 12 Stock biomass at age (start of year) Tonnes<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | 70979, | 83342, | 95907, | 95743, | 68155, | 29693, | 19885, | 11167, | 8930, | 10283, |
| 7, | 71526, | 69853, | 81129, | 91243, | 94367, | 56469, | 38384, | 23065, | 13548, | 10931, |
| 8, | 97261, | 78536, | 73560, | 83882, | 100991, | 87587, | 62034, | 40801, | 27896, | 16547, |
| 9, | 134204, | 117075, | 85693, | 74468, | 99834, | 86754, | 89432, | 64428, | 47422, | 32690, |
| 10, | 139388, | 133261, | 96289, | 64277, | 67856, | 74330, | 82730, | 86553, | 63848, | 49087, |
| 11, | 89570, | 136089, | 97523, | 57299, | 47126, | 50653, | 67838, | 73921, | 75273, | 45262, |
| 12, | 62931, | 85728, | 87525, | 49743, | 37100, | 37671, | 46062, | 60897, | 64480, | 53178, |
| 13, | 46320, | 62332, | 60170, | 41509, | 23019, | 28245, | 29859, | 38848, | 52392, | 41244, |
| 14, | 38922, | 41009, | 43592, | 28709, | 20375, | 18087, | 21100, | 25137, | 29034, | 27553, |
| 15, | 36549, | 32884, | 26246, | 25117, | 15208, | 18071, | 15393, | 17082, | 18395, | 17483, |
| 16, | 35830, | 30979, | 19615, | 15105, | 14980, | 12237, | 13825, | 9239, | 11727, | 11032, |
| 17, | 36004, | 29542, | 18651, | 10731, | 9727, | 12890, | 8775, | 6752, | 6470, | 7031, |
| 18, | 21268, | 31117, | 16123, | 12177, | 5935, | 8472, | 9503, | 4721, | 4452, | 3277, |
| +gp, | 43041, | 63090, | 28609, | 34923, | 12682, | 30541, | 8484, | 7144, | 9216, | 1147, |
| TOTALBIO, | 923794, | 994837, | 830633, | 684927, | 617354, | 551697, | 513303, | 469756, | 433080, | 326745, |

| Table 12 Stock biomass at age (start of year) Tonnes<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | 8961, | 8229, | 9087, | 17863, | 24552, | 26290, | 8104, | 4216, | 5014, | 7276, |
| 7, | 9576, | 10732, | 8748, | 14505, | 20204, | 31164, | 17534, | 9428, | 6110, | 5303, |
| 8, | 11812, | 13776, | 9780, | 12842, | 14218, | 24578, | 21985, | 22671, | 10975, | 5689, |
| 9, | 16484, | 13820, | 15855, | 14101, | 12432, | 18605, | 18553, | 32958, | 25224, | 10189, |
| 10, | 31987, | 20710, | 16091, | 18666, | 16032, | 17696, | 15658, | 25511, | 32242, | 27185, |
| 11, | 43067, | 33334, | 16108, | 14997, | 18533, | 18923, | 15678, | 15285, | 19826, | 34180, |
| 12, | 37641, | 39615, | 24991, | 15658, | 15314, | 21442, | 19410, | 14376, | 13087, | 22733, |
| 13, | 31498, | 26029, | 23499, | 20603, | 13512, | 15946, | 20696, | 13413, | 11528, | 13669, |
| 14, | 17303, | 11677, | 10265, | 15003, | 16423, | 11090, | 13058, | 11981, | 7320, | 10004, |
| 15, | 9067, | 4882, | 5698, | 5923, | 12024, | 12213, | 7447, | 7096, | 4739, | 7245, |
| 16, | 3952, | 2605, | 2164, | 4317, | 5260, | 9933, | 9110, | 4586, | 3255, | 4043, |
| 17, | 1913, | 974, | 1000, | 1335, | 3585, | 3195, | 6762, | 6830, | 2619, | 2608, |
| 18, | 722, | 640, | 263, | 558, | 1165, | 2385, | 1198, | 4683, | 845, | 1861, |
| +gp, | 881, | 105, | 260, | 0, | 438, | 3308, | 18073, | 16440, | 13701, | 29233, |
| TOTALBIO, | 224863, | 187127, | 143810, | 156369, | 173693, | 216770, | 193266, | 189472, | 156485, | 181218, |

**Table 6.20** *Sebastes mentella*. Spawning stock biomass at age from the final VPA.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: WE

At 31-Aug-94 11:07:01

Traditional vpa using file input for terminal F

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1965, | 1966, | 1967, | 1968, | 1969, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | |
| 6, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 7, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 8, | 974, | 886, | 861, | 832, | 904, | 1293, | 1958, | 3248, | 3254, |
| 9, | 1810, | 2409, | 2216, | 2155, | 2080, | 2253, | 3233, | 4896, | 8023, |
| 10, | 2739, | 2517, | 3422, | 3154, | 3065, | 2946, | 3204, | 4595, | 6871, |
| 11, | 8895, | 7919, | 7324, | 10006, | 9221, | 8902, | 8574, | 9324, | 13275, |
| 12, | 26182, | 15219, | 13707, | 12702, | 17360, | 15892, | 15131, | 14652, | 15927, |
| 13, | 39090, | 42902, | 25070, | 22681, | 20980, | 28560, | 25328, | 23743, | 23127, |
| 14, | 69500, | 50308, | 55906, | 32818, | 29598, | 27222, | 35744, | 31072, | 29133, |
| 15, | 64422, | 80625, | 58423, | 65930, | 38351, | 34687, | 30104, | 39028, | 33948, |
| 16, | 86465, | 64428, | 80969, | 59331, | 66811, | 38840, | 33500, | 27357, | 37049, |
| 17, | 57550, | 88079, | 65472, | 83510, | 60822, | 68681, | 37161, | 28861, | 24682, |
| 18, | 64520, | 54151, | 83728, | 62610, | 79934, | 58263, | 63917, | 32067, | 24781, |
| +gp, | 128345, | 127772, | 589876, | 194128, | 277529, | 105973, | 149711, | 38631, | 30577, |
| TOTSPBIO, | 550493, | 537215, | 986974, | 549857, | 606655, | 393512, | 407565, | 257473, | 250645, |

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 7, | 0, | 0, | 730, | 821, | 849, | 508, | 345, | 208, | 122, | 98, |
| 8, | 2918, | 2356, | 1177, | 1342, | 1616, | 1401, | 993, | 653, | 446, | 265, |
| 9, | 8052, | 7024, | 8655, | 7521, | 10083, | 8762, | 9033, | 6507, | 4790, | 3302, |
| 10, | 11151, | 10661, | 18776, | 12534, | 13232, | 14494, | 16132, | 16878, | 12450, | 9572, |
| 11, | 19705, | 29940, | 29257, | 17190, | 14138, | 15196, | 20351, | 22176, | 22582, | 13579, |
| 12, | 22655, | 30862, | 47263, | 26861, | 20034, | 20342, | 24874, | 32884, | 34819, | 28716, |
| 13, | 25476, | 34283, | 42239, | 29139, | 16159, | 19828, | 20961, | 27271, | 36779, | 28953, |
| 14, | 28024, | 29526, | 37576, | 24747, | 17563, | 15591, | 18188, | 21668, | 25028, | 23751, |
| 15, | 31067, | 27951, | 25354, | 24263, | 14691, | 17456, | 14870, | 16501, | 17770, | 16888, |
| 16, | 31531, | 27262, | 19497, | 15015, | 14890, | 12163, | 13742, | 9184, | 11656, | 10966, |
| 17, | 34204, | 28065, | 18651, | 10731, | 9727, | 12890, | 8775, | 6752, | 6470, | 7031, |
| 18, | 20630, | 30183, | 16123, | 12177, | 5935, | 8472, | 9503, | 4721, | 4452, | 3277, |
| +gp, | 43041, | 63090, | 28609, | 34923, | 12682, | 30541, | 8484, | 7144, | 9216, | 1147, |
| TOTSPBIO, | 278454, | 321203, | 293908, | 217265, | 151599, | 177644, | 166251, | 172548, | 186579, | 147545, |

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 6, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 7, | 48, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 8, | 94, | 0, | 0, | 0, | 0, | 0, | 330, | 340, | 165, | 0, |
| 9, | 940, | 138, | 539, | 635, | 1032, | 74, | 928, | 1813, | 1564, | 234, |
| 10, | 5374, | 1636, | 1818, | 1419, | 1523, | 1380, | 1973, | 3367, | 4288, | 3072, |
| 11, | 13006, | 7267, | 3834, | 2669, | 3595, | 3804, | 3214, | 3087, | 4441, | 9126, |
| 12, | 20100, | 17946, | 12670, | 6733, | 7075, | 10421, | 9821, | 6915, | 5379, | 9957, |
| 13, | 22710, | 20329, | 18658, | 15143, | 9310, | 10413, | 12894, | 7310, | 6214, | 7846, |
| 14, | 15210, | 9879, | 8951, | 12407, | 13155, | 8506, | 9480, | 8878, | 5666, | 8433, |
| 15, | 8632, | 4394, | 5197, | 5242, | 10365, | 10161, | 5965, | 6032, | 4208, | 6890, |
| 16, | 3892, | 2409, | 2056, | 4135, | 5260, | 9933, | 9110, | 4411, | 3080, | 3719, |
| 17, | 1913, | 974, | 1000, | 1335, | 3585, | 3195, | 6762, | 6830, | 2598, | 2579, |
| 18, | 722, | 640, | 263, | 558, | 1165, | 2385, | 1198, | 4683, | 845, | 1861, |
| +gp, | 881, | 105, | 260, | 0, | 438, | 3308, | 18073, | 16440, | 13701, | 29233, |
| TOTSPBIO, | 93521, | 65716, | 55247, | 50275, | 56502, | 63581, | 79747, | 70106, | 52148, | 82952, |

**Table 6.21** *Sebastes mentella*. Summary table.

Run title : Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan (run name: WE,

At 31-Aug-94 11:07:01

Table 16 Summary (without SOP correction)

Traditional vpa using file input for terminal F

| | RECRUITS, Age 6 | TOTALBIO, | TOTSPBIO, | LANDINGS, | YIELD/SSB, | FBAR 10-15, |
|---|---|---|---|---|---|---|
| 1965, | 155928, | 859927, | 550493, | 15662, | .0285, | .0183, |
| 1966, | 150473, | 822757, | 537215, | 10143, | .0189, | .0114, |
| 1967, | 163534, | 1261254, | 986974, | 6239, | .0063, | .0044, |
| 1968, | 234057, | 828606, | 549856, | 5413, | .0098, | .0070, |
| 1969, | 354374, | 915781, | 606655, | 6836, | .0113, | .0105, |
| 1970, | 587751, | 772518, | 393511, | 22916, | .0582, | .0414, |
| 1971, | 589660, | 860508, | 407565, | 45063, | .1106, | .0587, |
| 1972, | 530392, | 782541, | 257473, | 28862, | .1121, | .0516, |
| 1973, | 432139, | 839639, | 250645, | 38380, | .1531, | .0605, |
| 1974, | 422494, | 923794, | 278454, | 69372, | .2491, | .1230, |
| 1975, | 496085, | 994837, | 321203, | 239070, | .7443, | .4389, |
| 1976, | 570877, | 830632, | 293909, | 269022, | .9153, | .6645, |
| 1977, | 569902, | 684927, | 217265, | 146365, | .6737, | .5974, |
| 1978, | 405686, | 617354, | 151599, | 92611, | .6109, | .2731, |
| 1979, | 277501, | 551697, | 177644, | 87145, | .4906, | .2737, |
| 1980, | 185837, | 513304, | 166251, | 79354, | .4773, | .2524, |
| 1981, | 109476, | 469755, | 172548, | 81546, | .4726, | .3131, |
| 1982, | 87544, | 433081, | 186579, | 115383, | .6184, | .4400, |
| 1983, | 100816, | 326745, | 147545, | 105273, | .7135, | .6861, |
| 1984, | 87854, | 224863, | 93521, | 72934, | .7799, | .8138, |
| 1985, | 80674, | 187127, | 65716, | 63068, | .9597, | .6778, |
| 1986, | 89087, | 143810, | 55246, | 23112, | .4183, | .2960, |
| 1987, | 124050, | 156369, | 50275, | 10518, | .2092, | .1236, |
| 1988, | 170503, | 173693, | 56502, | 15586, | .2758, | .1717, |
| 1989, | 132777, | 216770, | 63581, | 23494, | .3695, | .2024, |
| 1990, | 57887, | 193266, | 79747, | 35070, | .4398, | .2862, |
| 1991, | 32429, | 189472, | 70106, | 48735, | .6952, | .3320, |
| 1992, | 26390, | 156485, | 52147, | 16249, | .3116, | .1106, |
| 1993, | 45474, | 181218, | 82952, | 13330, | .1607, | .0831, |
| Arith. Mean , | 250746, | 555611, | 252523, | 61612, | .3826, | .2560, |
| Units, | (Thousands), | (Tonnes), | (Tonnes), | (Tonnes), | | |

**Table 6.22** *Sebastes mentella*. Input data for prediction and yield-per-recruit

14:07 Tuesday, August 30, 1994

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: Input data

| Year: 1994 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 133000.00 | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.175 | 0.0210 | 0.175 |
| 7 | 41031.000 | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.230 | 0.0360 | 0.230 |
| 8 | 19801.000 | 0.1000 | 0.0075 | 0.0000 | 0.0000 | 0.255 | 0.0210 | 0.255 |
| 9 | 20460.000 | 0.1000 | 0.0425 | 0.0000 | 0.0000 | 0.280 | 0.0140 | 0.280 |
| 10 | 32551.000 | 0.1000 | 0.1230 | 0.0000 | 0.0000 | 0.325 | 0.0260 | 0.325 |
| 11 | 70609.000 | 0.1000 | 0.2455 | 0.0000 | 0.0000 | 0.350 | 0.0310 | 0.350 |
| 12 | 81069.000 | 0.1000 | 0.4245 | 0.0000 | 0.0000 | 0.405 | 0.0520 | 0.405 |
| 13 | 45599.000 | 0.1000 | 0.5565 | 0.0000 | 0.0000 | 0.465 | 0.0980 | 0.465 |
| 14 | 24340.000 | 0.1000 | 0.8085 | 0.0000 | 0.0000 | 0.460 | 0.1560 | 0.460 |
| 15 | 15505.000 | 0.1000 | 0.9195 | 0.0000 | 0.0000 | 0.490 | 0.1350 | 0.490 |
| 16 | 10334.000 | 0.1000 | 0.9330 | 0.0000 | 0.0000 | 0.495 | 0.1530 | 0.495 |
| 17 | 5309.000 | 0.1000 | 0.9905 | 0.0000 | 0.0000 | 0.555 | 0.4180 | 0.555 |
| 18 | 3003.000 | 0.1000 | 1.0000 | 0.0000 | 0.0000 | 0.590 | 0.4430 | 0.590 |
| 19+ | 34930.000 | 0.1000 | 1.0000 | 0.0000 | 0.0000 | 0.665 | 0.4430 | 0.665 |
| 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 |
| 6 | 170000.00 | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.175 | 0.0210 | 0.175 |
| 7 | . | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.230 | 0.0360 | 0.230 |
| 8 | . | 0.1000 | 0.0075 | 0.0000 | 0.0000 | 0.255 | 0.0210 | 0.255 |
| 9 | . | 0.1000 | 0.0425 | 0.0000 | 0.0000 | 0.280 | 0.0140 | 0.280 |
| 10 | . | 0.1000 | 0.1230 | 0.0000 | 0.0000 | 0.325 | 0.0260 | 0.325 |
| 11 | . | 0.1000 | 0.2455 | 0.0000 | 0.0000 | 0.350 | 0.0310 | 0.350 |
| 12 | . | 0.1000 | 0.4245 | 0.0000 | 0.0000 | 0.405 | 0.0520 | 0.405 |
| 13 | . | 0.1000 | 0.5565 | 0.0000 | 0.0000 | 0.465 | 0.0980 | 0.465 |
| 14 | . | 0.1000 | 0.8085 | 0.0000 | 0.0000 | 0.460 | 0.1560 | 0.460 |
| 15 | . | 0.1000 | 0.9195 | 0.0000 | 0.0000 | 0.490 | 0.1350 | 0.490 |
| 16 | . | 0.1000 | 0.9330 | 0.0000 | 0.0000 | 0.495 | 0.1530 | 0.495 |
| 17 | . | 0.1000 | 0.9905 | 0.0000 | 0.0000 | 0.555 | 0.4180 | 0.555 |
| 18 | . | 0.1000 | 1.0000 | 0.0000 | 0.0000 | 0.590 | 0.4430 | 0.590 |
| 19+ | . | 0.1000 | 1.0000 | 0.0000 | 0.0000 | 0.665 | 0.4430 | 0.665 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1996 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 |
| 6 | 57000.000 | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.175 | 0.0210 | 0.175 |
| 7 | . | 0.1000 | 0.0000 | 0.0000 | 0.0000 | 0.230 | 0.0360 | 0.230 |
| 8 | . | 0.1000 | 0.0075 | 0.0000 | 0.0000 | 0.255 | 0.0210 | 0.255 |
| 9 | . | 0.1000 | 0.0425 | 0.0000 | 0.0000 | 0.280 | 0.0140 | 0.280 |
| 10 | . | 0.1000 | 0.1230 | 0.0000 | 0.0000 | 0.325 | 0.0260 | 0.325 |
| 11 | . | 0.1000 | 0.2455 | 0.0000 | 0.0000 | 0.350 | 0.0310 | 0.350 |
| 12 | . | 0.1000 | 0.4245 | 0.0000 | 0.0000 | 0.405 | 0.0520 | 0.405 |
| 13 | . | 0.1000 | 0.5565 | 0.0000 | 0.0000 | 0.465 | 0.0980 | 0.465 |
| 14 | . | 0.1000 | 0.8085 | 0.0000 | 0.0000 | 0.460 | 0.1560 | 0.460 |
| 15 | . | 0.1000 | 0.9195 | 0.0000 | 0.0000 | 0.490 | 0.1350 | 0.490 |
| 16 | . | 0.1000 | 0.9330 | 0.0000 | 0.0000 | 0.495 | 0.1530 | 0.495 |
| 17 | . | 0.1000 | 0.9905 | 0.0000 | 0.0000 | 0.555 | 0.4180 | 0.555 |
| 18 | . | 0.1000 | 1.0000 | 0.0000 | 0.0000 | 0.590 | 0.4430 | 0.590 |
| 19+ | . | 0.1000 | 1.0000 | 0.0000 | 0.0000 | 0.665 | 0.4430 | 0.665 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : TUE01
Date and time: 30AUG94:14:10

**Table 6.23** *Sebastes mentella*. Results from the prediction using a TAC of 13,000 t in 1994.

15:46 Tuesday, August 30, 1994 1

Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

Prediction with management option table

| Year: 1994 | | | | | Year: 1995 | | | | | Year: 1996 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 0.6921 | 0.0574 | 184675 | 82116 | 13000 | 0.0000 | 0.0000 | 202858 | 85252 | 0 | 213479 | 97804 |
| . | . | . | . | . | 0.0500 | 0.0042 | . | 85252 | 1052 | 212429 | 96940 |
| . | . | . | . | . | 0.1000 | 0.0083 | . | 85252 | 2091 | 211392 | 96089 |
| . | . | . | . | . | 0.1500 | 0.0125 | . | 85252 | 3118 | 210367 | 95250 |
| . | . | . | . | . | 0.2000 | 0.0166 | . | 85252 | 4131 | 209355 | 94423 |
| . | . | . | . | . | 0.2500 | 0.0208 | . | 85252 | 5132 | 208356 | 93608 |
| . | . | . | . | . | 0.3000 | 0.0249 | . | 85252 | 6121 | 207369 | 92805 |
| . | . | . | . | . | 0.3500 | 0.0291 | . | 85252 | 7098 | 206394 | 92014 |
| . | . | . | . | . | 0.4000 | 0.0332 | . | 85252 | 8062 | 205430 | 91233 |
| . | . | . | . | . | 0.4500 | 0.0374 | . | 85252 | 9016 | 204478 | 90464 |
| . | . | . | . | . | 0.5000 | 0.0415 | . | 85252 | 9958 | 203538 | 89706 |
| . | . | . | . | . | 0.5500 | 0.0456 | . | 85252 | 10888 | 202608 | 88958 |
| . | . | . | . | . | 0.6000 | 0.0498 | . | 85252 | 11808 | 201690 | 88221 |
| . | . | . | . | . | 0.6500 | 0.0540 | . | 85252 | 12717 | 200782 | 87494 |
| . | . | . | . | . | 0.7000 | 0.0581 | . | 85252 | 13616 | 199885 | 86777 |
| . | . | . | . | . | 0.7500 | 0.0623 | . | 85252 | 14504 | 198998 | 86070 |
| . | . | . | . | . | 0.8000 | 0.0664 | . | 85252 | 15381 | 198121 | 85373 |
| . | . | . | . | . | 0.8500 | 0.0706 | . | 85252 | 16249 | 197254 | 84685 |
| . | . | . | . | . | 0.9000 | 0.0747 | . | 85252 | 17107 | 196397 | 84006 |
| . | . | . | . | . | 0.9500 | 0.0789 | . | 85252 | 17955 | 195550 | 83337 |
| . | . | . | . | . | 1.0000 | 0.0830 | . | 85252 | 18794 | 194712 | 82677 |
| . | . | . | . | . | 1.0500 | 0.0872 | . | 85252 | 19623 | 193884 | 82025 |
| . | . | . | . | . | 1.1000 | 0.0913 | . | 85252 | 20443 | 193064 | 81383 |
| . | . | . | . | . | 1.1500 | 0.0955 | . | 85252 | 21254 | 192254 | 80749 |
| . | . | . | . | . | 1.2000 | 0.0996 | . | 85252 | 22056 | 191452 | 80123 |
| . | . | . | . | . | 1.2500 | 0.1038 | . | 85252 | 22850 | 190659 | 79505 |
| . | . | . | . | . | 1.3000 | 0.1079 | . | 85252 | 23634 | 189875 | 78896 |
| . | . | . | . | . | 1.3500 | 0.1121 | . | 85252 | 24411 | 189099 | 78294 |
| . | . | . | . | . | 1.4000 | 0.1162 | . | 85252 | 25179 | 188331 | 77701 |
| . | . | . | . | . | 1.4500 | 0.1204 | . | 85252 | 25939 | 187572 | 77115 |
| . | . | . | . | . | 1.5000 | 0.1245 | . | 85252 | 26691 | 186820 | 76536 |
| - | - | Tonnes | Tonnes | Tonnes | - | - | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name : TUE01
Date and time : 30AUG94:15:52
Computation of ref. F: Simple mean, age 10 - 15
Basis for 1994 : TAC constraints

| Year: 1994 | | | | | Year: 1995 | | | | | Year: 1996 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 0.6921 | 0.0574 | 184675 | 82116 | 13000 | $F_{a1}/F_{med}$ | 0.034 | 202858 | 85252 | 8445 | 205048 | 90924 |
| | | | | | $F_{a4}$ | 0.057 | | | 13473 | 200027 | 86891 |
| | | | | | $F_{a3}$ | 0.083 | | | 18794 | 194712 | 82677 |
| | | | | | $F_{a14}$ | 0.103 | | | 22850 | 190659 | 79505 |
| - | - | Tonnes | Tonnes | Tonnes | | - | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name : TUE01
Date and time : 30AUG94:16:25
Computation of ref. F: Simple mean, age 10 - 15
Basis for 1994 : TAC constraints

**Table 6.24** *Sebastes marinus*. Catch numbers at age.

Run title : Sebastes marinus in the Barents and Norwegian Seas (Fishing Areas (run name: WED

At 31-Aug-94 11:59:37

| Table 1 Catch numbers at age Numbers*10**-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
| AGE | | | | | | | | | | |
| 11, | 0, | 66, | 145, | 25, | 306, | 1339, | 266, | 321, | 413, | 416, |
| 12, | 199, | 880, | 251, | 123, | 389, | 1948, | 1488, | 350, | 574, | 1289, |
| 13, | 101, | 1009, | 838, | 332, | 841, | 1591, | 1708, | 1387, | 820, | 1065, |
| 14, | 601, | 2697, | 3150, | 413, | 1458, | 1527, | 1854, | 2062, | 1798, | 1562, |
| 15, | 1623, | 5720, | 3697, | 1281, | 1304, | 2013, | 1722, | 1258, | 3247, | 2484, |
| 16, | 1425, | 5300, | 5264, | 1735, | 907, | 1331, | 1571, | 2497, | 2611, | 1353, |
| 17, | 701, | 2275, | 2827, | 1141, | 1305, | 1619, | 1894, | 1695, | 2201, | 1580, |
| 18, | 4572, | 4421, | 7309, | 1409, | 2886, | 1575, | 1895, | 2472, | 1922, | 1477, |
| 19, | 1624, | 2632, | 3188, | 1570, | 3368, | 1413, | 1921, | 1150, | 1043, | 654, |
| 20, | 2124, | 1818, | 1866, | 1635, | 2954, | 1457, | 1808, | 1026, | 898, | 639, |
| 21, | 4551, | 2242, | 3237, | 2810, | 2887, | 976, | 1935, | 617, | 721, | 482, |
| 22, | 1475, | 1168, | 496, | 1372, | 1649, | 932, | 1304, | 425, | 573, | 471, |
| 23, | 2599, | 975, | 447, | 1678, | 2061, | 1053, | 908, | 659, | 281, | 509, |
| +gp, | 3403, | 1329, | 282, | 3859, | 3869, | 5625, | 6346, | 3991, | 3260, | 3139, |
| TOTALNUM, | 24998, | 32532, | 32997, | 19383, | 26184, | 24399, | 26620, | 19910, | 20362, | 17120, |
| TONSLAND, | 28379, | 29484, | 30203, | 24077, | 25908, | 23222, | 28091, | 19051, | 16972, | 15274, |
| SOPCOF %, | 101, | 100, | 100, | 99, | 100, | 86, | 102, | 103, | 98, | 102, |

**Table 6.25** *Sebastes marinus*. Catch weights at age.

Run title : Sebastes marinus in the Barents and Norwegian Seas (Fishing Areas (run name: WED

At 31-Aug-94 12:19:14

| Table 2 Catch weights at age (kg) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
| AGE | | | | | | | | | | |
| 11, | .4210, | .4170, | .4260, | .4630, | .3800, | .6200, | .5500, | .5300, | .5000, | .5200, |
| 12, | .5210, | .5150, | .5260, | .5720, | .4150, | .6600, | .7100, | .6100, | .5900, | .5100, |
| 13, | .5640, | .5580, | .5700, | .6200, | .4170, | .7200, | .7200, | .6400, | .5800, | .6300, |
| 14, | .7030, | .6960, | .7110, | .7730, | .4990, | .8100, | .7800, | .7100, | .6500, | .6300, |
| 15, | .7510, | .7430, | .7590, | .8250, | .5450, | .8600, | .8500, | .7600, | .6500, | .7500, |
| 16, | .8460, | .8370, | .8560, | .9300, | .6410, | .8900, | .8300, | .8300, | .7100, | .8400, |
| 17, | .8610, | .8510, | .8700, | .9460, | .7050, | .9400, | .9100, | .8400, | .8200, | .8700, |
| 18, | .9320, | .9220, | .9420, | 1.0240, | .7710, | 1.0400, | .9000, | 1.0000, | .8400, | .9600, |
| 19, | .9920, | .9810, | 1.0030, | 1.0900, | .8630, | 1.1000, | .9300, | .9600, | .9400, | .9800, |
| 20, | 1.0290, | 1.0180, | 1.0410, | 1.1310, | .9290, | 1.1300, | 1.0400, | 1.0400, | 1.0200, | 1.0200, |
| 21, | 1.1490, | 1.1370, | 1.1620, | 1.2630, | 1.0410, | 1.2700, | 1.1300, | 1.0300, | 1.0300, | 1.2000, |
| 22, | 1.2040, | 1.1910, | 1.2170, | 1.3230, | 1.1310, | 1.2800, | 1.0600, | 1.0800, | 1.1500, | 1.0200, |
| 23, | 1.4110, | 1.3960, | 1.4270, | 1.5510, | 1.3560, | 1.2500, | 1.2300, | 1.0200, | 1.2700, | 1.1700, |
| +gp, | 1.6590, | 1.5480, | 1.5390, | 1.8090, | 1.7390, | 1.6840, | 1.4450, | 1.2160, | 1.2700, | 1.2000, |
| SOPCOFAC, | 1.0140, | 1.0025, | 1.0019, | .9905, | 1.0027, | .8602, | 1.0179, | 1.0325, | .9772, | 1.0159, |

**Table 6.26** *Sebastes marinus*. SHOT forecast.

MARSHOT.XLS

Sebastes marinus W.G.1994 SHOT forecast spreadsheet version 3
Sub-area I and Divisions IIa and IIb

running recruitment weights
older 0.30 G-M = -0.1
centra 0.40 exp(d) 0.95
younge 0.30 ex (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 | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.29 | 0.67 | 37 | 18 | 25 | 104 | 106 | 30 | 0.35 |
| 1987 | 24 | 1 | 1 | 0.27 | 0.69 | 12 | 21 | 26 | 90 | 90 | 24 | 0.32 |
| 1988 | 26 | 1 | 1 | 0.32 | 0.64 | 33 | 20 | 22 | 81 | 82 | 26 | 0.4 |
| 1989 | 23 | 1 | 1 | 0.32 | 0.64 | 20 | 21 | 23 | 71 | 72 | 23 | 0.4 |
| 1990 | 28 | 1 | 1 | 0.42 | 0.54 | 37 | 21 | 21 | 67 | 66 | 28 | 0.56 |
| 1991 | 19 | 1 | 1 | 0.32 | 0.64 | 4 | 22 | 24 | 59 | 58 | 19 | 0.4 |
| 1992 | 17 | 1 | 1 | 0.29 | 0.67 | 15 | 22 | 19 | 59 | 59 | 17 | 0.35 |
| 1993 | 15 | 1 | 1 | 0.24 | 0.72 | 12 | 22 | 18 | 63 | 62 | 15 | 0.28 |
| 1994 | 16 | 1 | 1 | 0.24 | 0.72 | 22 | 22 | 16 | 67 | 67 | 16 | 0.28 |
| 1995 | | 1 | 1 | 0.24 | 0.72 | | 22 | 17 | | 70 | 17 | 0.28 |
| 1996 | | 1 | 1 | 0.24 | 0.72 | | 22 | 17 | | 73 | 17 | 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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Denmark | - | - | - | + | - |
| Faroe Islands | - | - | 42 | - | 186 |
| France | 138 | 239 | 13 | 13 | 67 |
| German Dem. Rep. | 2,089 | 3,807 | 2,659 | 1,855 | 712 |
| Germany, Fed. Rep. | 76 | 193 | 59 | 169 | 32 |
| Norway | 4,376 | 5,464 | 7,890 | 7,261 | 9,076 |
| UK (England & Wales) | 23 | 5 | 10 | 61 | 82 |
| UK (Scotland) | - | - | 2 | 20 | 2 |
| USSR | 15,181 | 10,237 | 12,200 | 9,733 | 9,430 |
| Spain | - | - | - | - | - |
| Total | 21,883 | 19,945 | 22,875 | 19,112 | 19,587 |

| Country | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|
| Denmark | - | - | 11 | - | 2[2] |
| Estonia | - | - | 2,564 | - | - |
| Faroe Islands | 67 | 163 | 314 | 16 | 61 |
| France | 31 | 49 | 119 | 111[1] | 40[3] |
| German Dem. Rep. | 589 | 909 | - | - | |
| Germany, Fed. Rep. | 11 | 45 | 101 | 13 | 22 |
| Greenland | - | - | - | 13 | 8 |
| Iceland | - | - | - | - | 56 |
| Lithuania | - | - | - | - | 30[3] |
| Norway | 11,043[2] | 16,825[2] | 26,400[2] | 8,256[2] | 10,322[2] |
| Portugal | - | - | - | 31 | 20[3] |
| UK (England & Wales) | 6 | 10 | + | 7 | 16 |
| UK (Scotland) | - | - | 2 | 3 | - |
| Russia[4] | 8,812 | 4,764[2] | 2,490[2] | 718 | 1,235 |
| Spain | - | - | 132[2] | 23 | - |
| Total | 20,559 | 22,765 | 32,133 | 9,191 | 11,812 |

[1]Provisional figures.
[2]Working Group figure.
[3]As reported to Norwegian authorities.
[4]USSR prior to 1991.

**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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Estonia | - | - | - | - | - |
| Faroe Islands | - | - | - | - | 9 |
| Germany, Fed. Rep. | - | - | 1 | 2 | 4 |
| Iceland | - | - | - | - | - |
| Norway | 593 | 602 | 557 | 984 | 978 |
| UK (England & Wales) | 17 | 1 | 5 | 10 | 7 |
| UK (Scotland) | - | - | 1 | + | - |
| USSR | 81 | 122 | 615 | 259 | 420 |
| Total | 691 | 725 | 1,179 | 1,255 | 1,418 |

| Country | 1989 | 1990 | 1991 | 1992 | 1993[1] |
|---|---|---|---|---|---|
| Estonia | - | - | 164 | - | - |
| Faroe Islands | - | 7 | - | - | 32 |
| Germany, Fed. Rep. | - | - | - | + | - |
| Iceland | | | - | - | 56 |
| Norway | 335[2] | 304[2] | 1,946[2] | 2,265[2] | 1,724[2] |
| UK (England & Wales) | + | - | - | - | - |
| UK (Scotland) | - | - | - | - | - |
| USSR/Russia | 482 | 321[2] | 522[2] | 467[2] | 867 |
| Total | 817 | 632 | 2,632 | 2,732 | 2,679 |

[1]Provisional figures.
[2]Working 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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Estonia | | | | | - |
| Faroe Islands | - | - | 6 | - | 177 |
| France | 138 | 239 | 13 | 13 | 67 |
| German Dem. Rep. | 189 | 82 | 55 | 12 | 130 |
| Germany, Fed. Rep. | 76 | 172 | 42 | 63 | 20 |
| Norway | 3,703 | 4,791 | 6,389 | 5,705 | 7,859 |
| UK (England & Wales) | 1 | 2 | 5 | 44 | 56 |
| UK (Scotland) | - | - | 1 | 10 | 2 |
| USSR | 5,459 | 6,894 | 5,553 | 4,739 | 4,002 |
| Total | 9,566 | 12,180 | 12,064 | 10,586 | 12,313 |

| Country | 1989 | 1990 | 1991 | 1992[1] | 1993[1] |
|---|---|---|---|---|---|
| Estonia | - | - | 1,400 | - | - |
| Faroe Islands | 67 | 133 | 314 | 16 | 29 |
| France | 31 | 49 | 119[1] | 108[1] | 38[3] |
| German Dem.Rep. | 94 | 10 | | | |
| Germany, Fed.Rep. | 10 | 2 | 21 | 1 | 14 |
| Greenland | | | | 13[4] | 8[4] |
| Norway | 7,208[2] | 8,025[2] | 9,826[2] | 4,113[2] | 7,934[2] |
| Portugal | | | | 15[3] | 6[3] |
| UK (England & Wales) | 6 | 1 | + | 1 | 2 |
| UK (Scotland) | - | - | 1 | - | - |
| USSR/Russia | 4,964 | 1,246[2] | 305[2] | 58 | 210 |
| Total | 12,380 | 9,466 | 11,985 | 4,325 | 8,241 |

[1]Provisional figures.
[2]Working Group figure.
[3]As reported to Norwegian authorities.
[4]Includes 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 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Denmark | - | - | - | + | - |
| Estonia | - | - | - | - | - |
| Faroe Islands | - | - | 36 | - | - |
| German Dem. Rep. | 1,900 | 3,725 | 2,604 | 1,843 | 582 |
| Germany, Fed. Rep. | - | 21 | 16 | 104 | 8 |
| Lithuania | - | - | - | - | 239 |
| Norway | 80 | 71 | 944 | 572 | 19 |
| UK (England & Wales) | 5 | 2 | + | 7 | + |
| UK (Scotland) | - | - | - | 10 | 5,008 |
| USSR | 9,641 | 3,221 | 6,032 | 4,735 | - |
| Spain | - | - | - | - | - |
| Total | 11,626 | 7,040 | 9,632 | 7,271 | 5,856 |

| Country | 1989 | 1990 | 1991 | 1992 | 1993[1] |
|---|---|---|---|---|---|
| Denmark | - | - | 11 | - | 2[3] |
| Estonia | - | - | 1,000 | | - |
| Faroe Islands | - | 23[2] | - | - | - |
| France | | | - | 3[2] | 2[3] |
| German Dem.Rep. | 495 | 899 | - | - | - |
| Germany,Fed.Rep. | 1 | 43 | 80 | 12[2] | 8 |
| Lithuania | - | - | - | - | 30 |
| Norway | 3,500[2] | 8,496[2] | 14,629[2] | 1,878[2] | 664[2] |
| Portugal | | | | 16[2] | 14[3] |
| UK (England & Wales) | - | 9 | + | 6 | 14 |
| UK (Scotland) | - | - | 1 | 3 | - |
| USSR/Russia | 3,366 | 3,197[2] | 1,663[2] | 193 | 158 |
| Spain | - | - | 132[2] | 23 | - |
| Total | 7,362 | 12,667 | 17,516 | 2,134 | 892 |

[1]Provisional figures.
[2]Working Group figure.
[3]As reported to Norwegian authorities.

**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[11] 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[9] | B[10] | 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 | - | - | - | 134 | 0.18 | - |
| 1992 | - | - | 0.40 | 0.73 | - | - | 23 | 0.25 | - |
| 1993[1] | - | - | 0.76 | 1.21 | - | - | 16 | 0.61 | - |
| 1994[1] | - | - | 0.79 | 1.31 | - | - | - | - | - |

[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 1991-1993, based on the Norwegian CPUE, type A.
[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] Norwegian factory trawlers, ISSCFV-code 09, 1000-1999.9 GRT
[11] From 1992 based on research fishing, two weeks in May/June and October.

**Table 7.6** Greenland halibut. Data for tuning.

16:38 Tuesday, August 30, 1994 1

Greenland Halibut in the North-East Arctic (Fishing Areas I and II

Norwegian Svalbard Trawl Survey, Autumn (code: FLT09) (Catch: Number)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1984 | 1 | 550 | 3042 | 2924 | 8573 | 6847 | 5657 | 4345 | 2796 |
| 1985 | 1 | 884 | 3921 | 4294 | 6674 | 8793 | 8622 | 3920 | 1817 |
| 1986 | 1 | 49 | 1005 | 1967 | 7314 | 4671 | 1754 | 2301 | 372 |
| 1987 | 1 | 630 | 1014 | 3076 | 4409 | 4786 | 3141 | 964 | 364 |
| 1988 | 1 | 818 | 4298 | 6191 | 6696 | 12289 | 2396 | 6015 | 338 |
| 1989 | 1 | 712 | 3232 | 8158 | 7493 | 7069 | 2374 | 1753 | 353 |
| 1990 | 1 | 115 | 336 | 5050 | 7130 | 7730 | 4490 | 2330 | 918 |
| 1991 | 1 | 71 | 877 | 3080 | 6720 | 9270 | 5450 | 2800 | 1660 |
| 1992 | 1 | 33 | 30 | 338 | 1190 | 3520 | 4420 | 2280 | 1280 |
| 1993 | 1 | 25 | 60 | 51 | 1049 | 2369 | 2056 | 2772 | 1114 |

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Greenland Halibut in the North-East Arctic (Fishing Areas I and II

Russian Bottom Trawl Survey, Autumn (code: FLT10) (Catch: Number)

| Year | Effort | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 | Catch, age 9 |
|---|---|---|---|---|---|---|---|
| 1990 | 1 | 83 | 189 | 172 | 83 | 29 | 12 |
| 1991 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1992 | 1 | 69 | 246 | 122 | 34 | 16 | 9 |
| 1993 | 1 | 32 | 80 | 121 | 45 | 19 | 13 |

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Greenland Halibut in the North-East Arctic (Fishing Areas I and II

Norwegian Svalbard Shrimp Survey (code: FLT11) (Catch: Number)

| Year | Effort | Catch, age 1 | Catch, age 2 | Catch, age 3 | Catch, age 4 | Catch, age 5 | Catch, age 6 | Catch, age 7 | Catch, age 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | 1 | 4163 | 14278 | 8259 | 8354 | 2594 | 0 | 0 | 0 |
| 1989 | 1 | 4653 | 9777 | 9943 | 4855 | 4057 | 1054 | 542 | 83 |
| 1990 | 1 | 247 | 1569 | 8324 | 9800 | 6910 | 2148 | 295 | 245 |
| 1991 | 1 | 25 | 577 | 2465 | 4969 | 5362 | 2541 | 1380 | 158 |
| 1992 | 1 | 95 | 57 | 505 | 1780 | 2914 | 1129 | 713 | 333 |
| 1993 | 1 | 39 | 54 | 50 | 814 | 1572 | 433 | 589 | 395 |

**Table 7.7** Greenland halibut. Tuning results.

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Lowestoft VPA Version 3.1

  29-Aug-94  16:58:30

Extended Survivors Analysis

Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

CPUE data from file /users/ifad/ifapwork/wg_108/ghal_nor/FLEET.K08

Catch data for  24 years. 1970 to 1993. Ages  1 to  16.

     Fleet,           First, Last, First, Last, Alpha,  Beta
                       year, year,  age ,  age
FLT09: Norwegian Sva,  1984, 1993,   1,     8,   .650,   .750
FLT10: Russian Botto,  1990, 1993,   4,     9,   .850,   .950
FLT11: Norwegian Sva,  1988, 1993,   1,     8,   .500,   .600


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 >=    9


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  105 iterations
```

continued...

Table 7.7 (continued)

Log catchability residuals.

Fleet : FLT09: Norwegian Sva

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -.79 | -.37 | -3.14 | -.77 | -.18 | .62 | -.09 | 1.96 | .96 | 1.10 |
| 2 | .14 | .29 | -1.13 | -1.00 | .26 | .30 | -1.02 | 1.07 | .28 | .69 |
| 3 | -.42 | -.03 | -.91 | -.52 | .30 | .39 | .24 | .71 | -.36 | .36 |
| 4 | .28 | .04 | .16 | -.47 | -.12 | .14 | -.10 | .22 | -.56 | .47 |
| 5 | .08 | .23 | -.36 | -.32 | .47 | -.11 | .15 | .16 | -.46 | .18 |
| 6 | .58 | .97 | -.71 | -.09 | -.38 | -.46 | .20 | .53 | -.01 | -.43 |
| 7 | .46 | .52 | -.06 | -.94 | .88 | -.34 | .00 | .23 | -.20 | -.40 |
| 8 | .75 | .67 | -.73 | -.78 | -.75 | -.83 | .22 | 1.05 | .52 | -.01 |
| 9 | No data for this fleet at this age | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Mean Log q | -3.3830 | -2.3457 | -1.6838 | -1.1511 | -.8793 | -1.2010 | -1.0122 | -1.6067 |
| S.E(Log q) | 1.3972 | .7778 | .5116 | .3328 | .3048 | .5284 | .5280 | .7332 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 1 | 1.93 | -3.196 | -1.54 | .62 | 10 | 1.86 | -3.38 |
| 2 | 1.22 | -1.381 | .89 | .85 | 10 | .90 | -2.35 |
| 3 | 1.08 | -.697 | 1.04 | .90 | 10 | .57 | -1.68 |
| 4 | 1.11 | -.678 | .18 | .83 | 10 | .38 | -1.15 |
| 5 | 1.03 | -.107 | .60 | .62 | 10 | .33 | -.88 |
| 6 | 1.65 | -.223 | -4.28 | .02 | 10 | .93 | -1.20 |
| 7 | -3.85 | -.801 | 41.02 | .00 | 10 | 2.08 | -1.01 |
| 8 | .71 | .254 | 3.68 | .09 | 10 | .55 | -1.61 |

continued...

Table 7.7 (continued)

Fleet : FLT10: Russian Botto

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No data for this fleet at this age | | | | | | | | | |
| 2 | No data for this fleet at this age | | | | | | | | | |
| 3 | No data for this fleet at this age | | | | | | | | | |
| 4 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.90 | 99.99 | .25 | .65 |
| 5 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.27 | 99.99 | .17 | .10 |
| 6 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .28 | 99.99 | -.31 | .03 |
| 7 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .82 | 99.99 | -.34 | -.47 |
| 8 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .53 | 99.99 | -.15 | -.37 |
| 9 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | .14 | 99.99 | .02 | -.16 |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|
| Mean Log q | -4.7659 | -4.1177 | -4.4455 | -5.0132 | -5.2498 | -5.2531 |
| S.E(Log q) | .8042 | .2369 | .2971 | .7115 | .4732 | .1517 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 4 | 2.79 | -4.220 | -2.82 | .85 | 3 | .73 | -4.77 |
| 5 | 1.26 | -.626 | 2.73 | .85 | 3 | .36 | -4.12 |
| 6 | 1.08 | -.046 | 4.05 | .27 | 3 | .45 | -4.45 |
| 7 | 4.64 | -.227 | -10.66 | .00 | 3 | 4.56 | -5.01 |
| 8 | 8.41 | -.374 | -19.97 | .00 | 3 | 5.28 | -5.25 |
| 9 | 1.07 | -.097 | 5.07 | .69 | 3 | .23 | -5.25 |

continued...

**Table 7.7 (continued)**

Fleet : FLT11: Norwegian Sva

| Age | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 99.99 | 99.99 | 99.99 | 99.99 | -.07 | .98 | -.84 | -.60 | .50 | .03 |
| 2 | 99.99 | 99.99 | 99.99 | 99.99 | .54 | .49 | -.40 | -.27 | -.01 | -.33 |
| 3 | 99.99 | 99.99 | 99.99 | 99.99 | .13 | .13 | .28 | .02 | -.42 | -.13 |
| 4 | 99.99 | 99.99 | 99.99 | 99.99 | .11 | -.29 | .22 | -.09 | -.16 | .21 |
| 5 | 99.99 | 99.99 | 99.99 | 99.99 | -.58 | -.17 | .53 | .10 | -.14 | .25 |
| 6 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.20 | .52 | .83 | -.27 | -.89 |
| 7 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.05 | -.62 | .96 | .15 | -.44 |
| 8 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | -.97 | .20 | -.04 | .50 | .29 |
| 9 | No data for this fleet at this age | | | | | | | | | |

Mean log catchability and standard error of ages with catchability independent of year class strength and constant w.r.t. time

| Age | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Mean Log q | -1.8923 | -1.4512 | -1.2473 | -1.1823 | -1.4130 | -2.3417 | -2.5638 | -2.9915 |
| S.E(Log q) | .6755 | .4169 | .2505 | .2125 | .3814 | .6849 | .6213 | .5740 |

Regression statistics :

Ages with q independent of year class strength and constant w.r.t. time.

| Age | Slope | t-value | Intercept | RSquare | No Pts | Reg s.e | Mean Q |
|---|---|---|---|---|---|---|---|
| 1 | .94 | .358 | 2.21 | .91 | 6 | .70 | -1.89 |
| 2 | .90 | 1.434 | 2.15 | .98 | 6 | .34 | -1.45 |
| 3 | .92 | 1.649 | 1.83 | .99 | 6 | .20 | -1.25 |
| 4 | 1.05 | -.460 | .75 | .95 | 6 | .24 | -1.18 |
| 5 | 1.31 | -.662 | -1.17 | .54 | 6 | .53 | -1.41 |
| 6 | .35 | .775 | 7.12 | .32 | 5 | .25 | -2.34 |
| 7 | -1.16 | -.846 | 17.13 | .05 | 5 | .75 | -2.56 |
| 8 | 2.16 | -.237 | -3.58 | .01 | 5 | 1.42 | -2.99 |

Terminal year survivor and F summaries :

Age 1 Catchability constant w.r.t. time and dependent on age

Year class = 1992

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, | Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 703., | 1.470, | .000, | .00, | 1, | .179, | .001 |
| FLT10: Russian Botto, | 1., | .000, | .000, | .00, | 0, | .000, | .000 |
| FLT11: Norwegian Sva, | 241., | .730, | .000, | .00, | 1, | .724, | .004 |
| F shrinkage mean , | 24., | 2.00,,,, | | | | .097, | .039 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 233., | .62, | .63, | 3, | 1.011, | .004 |

continued...

Table 7.7 (continued)

Age 2 Catchability constant w.r.t. time and dependent on age

Year class = 1991

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 636., | .715, | .113, | .16, | 2, .217, | .001 |
| FLT10: Russian Botto, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| FLT11: Norwegian Sva, | 268., | .384, | .366, | .95, | 2, .754, | .003 |
| F shrinkage mean , | 17., | 2.00,,,, | | | .028, | .053 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 299., | .33, | .34, | 5, | 1.033, | .003 |

Age 3 Catchability constant w.r.t. time and dependent on age

Year class = 1990

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 288., | .431, | .311, | .72, | 3, .229, | .032 |
| FLT10: Russian Botto, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| FLT11: Norwegian Sva, | 157., | .237, | .112, | .47, | 3, .759, | .057 |
| F shrinkage mean , | 227., | 2.00,,,, | | | .012, | .040 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 181., | .21, | .15, | 7, | .711, | .050 |

Age 4 Catchability constant w.r.t. time and dependent on age

Year class = 1989

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 2611., | .272, | .255, | .94, | 4, .310, | .078 |
| FLT10: Russian Botto, | 3664., | .929, | .000, | .00, | 1, .027, | .056 |
| FLT11: Norwegian Sva, | 1611., | .186, | .192, | 1.03, | 4, .657, | .123 |
| F shrinkage mean , | 2301., | 2.00,,,, | | | .006, | .088 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 1918., | .15, | .15, | 10, | .973, | .104 |

Age 5 Catchability constant w.r.t. time and dependent on age

Year class = 1988

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 3999., | .208, | .254, | 1.22, | 5, .331, | .235 |
| FLT10: Russian Botto, | 4796., | .286, | .041, | .14, | 2, .182, | .200 |
| FLT11: Norwegian Sva, | 4261., | .170, | .150, | .88, | 5, .482, | .222 |
| F shrinkage mean , | 8487., | 2.00,,,, | | | .005, | .118 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, | Var, Ratio, | F |
|---|---|---|---|---|---|
| 4277., | .12, | .11, | 13, | .891, | .221 |

continued...

**Table 7.7 (continued)**

Age 6 Catchability constant w.r.t. time and dependent on age

Year class = 1987

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 8589., | .195, | .152, | .78, | 6, .318, | .108 |
| FLT10: Russian Botto, | 10854., | .226, | .069, | .30, | 2, .256, | .086 |
| FLT11: Norwegian Sva, | 10173., | .166, | .144, | .87, | 6, .421, | .092 |
| F shrinkage mean , | 4490., | 2.00,,,, | | | .004, | .197 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 9770., | .11, | .08, | 15, | .738, | .096 |

Age 7 Catchability constant w.r.t. time and dependent on age

Year class = 1986

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 10659., | .185, | .100, | .54, | 7, .380, | .123 |
| FLT10: Russian Botto, | 7172., | .301, | .119, | .40, | 3, .161, | .178 |
| FLT11: Norwegian Sva, | 12087., | .166, | .107, | .64, | 6, .454, | .109 |
| F shrinkage mean , | 3016., | 2.00,,,, | | | .004, | .381 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 10526., | .11, | .08, | 17, | .667, | .125 |

Age 8 Catchability constant w.r.t. time and dependent on age

Year class = 1985

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 5371., | .185, | .171, | .93, | 8, .376, | .161 |
| FLT10: Russian Botto, | 3731., | .260, | .033, | .13, | 3, .214, | .225 |
| FLT11: Norwegian Sva, | 5818., | .177, | .147, | .83, | 6, .403, | .150 |
| F shrinkage mean , | 1786., | 2.00,,,, | | | .006, | .423 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 5097., | .11, | .10, | 18, | .836, | .169 |

Age 9 Catchability constant w.r.t. time and dependent on age

Year class = 1984

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 2807., | .196, | .135, | .69, | 8, .285, | .033 |
| FLT10: Russian Botto, | 2617., | .229, | .113, | .49, | 3, .475, | .036 |
| FLT11: Norwegian Sva, | 3806., | .234, | .175, | .75, | 5, .233, | .025 |
| F shrinkage mean , | 264., | 2.00,,,, | | | .007, | .309 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 2863., | .13, | .09, | 17, | .701, | .033 |

continued...

**Table 7.7 (continued)**

Age 10 Catchability constant w.r.t. time and age (fixed at the value for age) 9

Year class = 1983

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 505., | .195, | .226, | 1.16, | 8, .294, | 1.038 |
| FLT10: Russian Botto, | 508., | .291, | .150, | .51, | 2, .516, | 1.034 |
| FLT11: Norwegian Sva, | 345., | .317, | .153, | .48, | 4, .151, | 1.300 |
| F shrinkage mean , | 672., | 2.00,,,, | | | .039, | .863 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 483., | .18, | .10, | 15, | .561, | 1.066 |

Age 11 Catchability constant w.r.t. time and age (fixed at the value for age) 9

Year class = 1982

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 302., | .195, | .100, | .51, | 7, .605, | .910 |
| FLT10: Russian Botto, | 580., | .549, | .000, | .00, | 1, .140, | .573 |
| FLT11: Norwegian Sva, | 381., | .478, | .118, | .25, | 2, .160, | .779 |
| F shrinkage mean , | 273., | 2.00,,,, | | | .095, | .972 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 340., | .25, | .10, | 11, | .389, | .841 |

Age 12 Catchability constant w.r.t. time and age (fixed at the value for age) 9

Year class = 1981

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 37., | .205, | .220, | 1.08, | 6, .280, | 1.648 |
| FLT10: Russian Botto, | 48., | .302, | .000, | .00, | 1, .327, | 1.447 |
| FLT11: Norwegian Sva, | 16., | .637, | .000, | .00, | 1, .051, | 2.391 |
| F shrinkage mean , | 46., | 2.00,,,, | | | .342, | 1.478 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 41., | .69, | .13, | 9, | .185, | 1.557 |

Age 13 Catchability constant w.r.t. time and age (fixed at the value for age) 9

Year class = 1980

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 15., | .224, | .266, | 1.19, | 5, .264, | 1.265 |
| FLT10: Russian Botto, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| FLT11: Norwegian Sva, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| F shrinkage mean , | 20., | 2.00,,,, | | | .736, | 1.071 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 18., | 1.47, | .16, | 6, | .111, | 1.121 |

continued...

Table 7.7 (continued)

Age 14 Catchability constant w.r.t. time and age (fixed at the value for age) 9

Year class = 1979

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 4., | .272, | .298, | 1.09, | 4, .069, | 1.788 |
| FLT10: Russian Botto, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| FLT11: Norwegian Sva, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| F shrinkage mean , | 4., | 2.00,,,, | | | .931, | 1.826 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 4., | 1.86, | .07, | 5, | .038, | 1.823 |

Age 15 Catchability constant w.r.t. time and age (fixed at the value for age) 9

Year class = 1978

| Fleet, | Estimated, Survivors, | Int, s.e, | Ext, s.e, | Var, Ratio, | N, Scaled, Weights, | Estimated F |
|---|---|---|---|---|---|---|
| FLT09: Norwegian Sva, | 2., | .404, | .422, | 1.04, | 3, .023, | 1.196 |
| FLT10: Russian Botto, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| FLT11: Norwegian Sva, | 1., | .000, | .000, | .00, | 0, .000, | .000 |
| F shrinkage mean , | 2., | 2.00,,,, | | | .977, | 1.294 |

Weighted prediction :

| Survivors, at end of year, | Int, s.e, | Ext, s.e, | N, , | Var, Ratio, | F |
|---|---|---|---|---|---|
| 2., | 1.95, | .09, | 4, | .048, | 1.291 |

**Table 7.8** Greenland halibut. Stock numbers from tuning.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

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Terminal Fs derived using XSA (With F shrinkage)

| Table 10 Stock number at age (start of year) Numbers*10**-3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 1, | 39590, | 41952, | 37086, | 44658, | 32184, | 12572, | 4103, | 332, | 428, | 272, | 0, | 262 |
| 2, | 30742, | 34075, | 36108, | 31920, | 38437, | 27701, | 10821, | 3531, | 279, | 349, | 233, | 285 |
| 3, | 26546, | 26460, | 29329, | 31079, | 27474, | 33083, | 23843, | 9314, | 2977, | 221, | 299, | 277 |
| 4, | 22793, | 22848, | 22693, | 25113, | 26703, | 23642, | 28275, | 20381, | 7670, | 2473, | 181, | 254 |
| 5, | 17615, | 19585, | 19238, | 18618, | 21211, | 22768, | 19484, | 23615, | 15683, | 6200, | 1918, | 222 |
| 6, | 14595, | 14312, | 15726, | 15007, | 14900, | 17415, | 17647, | 14824, | 17371, | 12490, | 4277, | 186 |
| 7, | 11019, | 9132, | 9652, | 10441, | 10160, | 10468, | 10816, | 10493, | 9291, | 13854, | 9770, | 141 |
| 8, | 8799, | 6376, | 5484, | 5792, | 5673, | 5830, | 5585, | 5088, | 4824, | 7015, | 10526, | 91 |
| 9, | 4589, | 5776, | 4052, | 3300, | 3365, | 2938, | 3465, | 3050, | 2279, | 3438, | 5097, | 58 |
| 10, | 3543, | 2963, | 4070, | 2441, | 2142, | 1800, | 1778, | 1872, | 1706, | 1631, | 2863, | 39 |
| 11, | 1920, | 1945, | 1588, | 2578, | 1333, | 1046, | 1251, | 1077, | 465, | 917, | 483, | 25 |
| 12, | 1053, | 1094, | 1104, | 875, | 1883, | 701, | 687, | 837, | 237, | 228, | 340, | 15 |
| 13, | 893, | 591, | 605, | 548, | 566, | 1330, | 485, | 305, | 120, | 66, | 41, | 8 |
| 14, | 358, | 610, | 359, | 230, | 299, | 364, | 1033, | 380, | 105, | 31, | 18, | 4 |
| 15, | 132, | 185, | 414, | 26, | 139, | 127, | 182, | 802, | 89, | 9, | 4, | 2 |
| +gp, | 96, | 27, | 12, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 2, | |
| TOTAL, | 184284, | 187931, | 187520, | 192624, | 186470, | 161787, | 129456, | 95901, | 63523, | 49191, | 36054, | |

**Table 7.9** Greenland halibut. Catch at age.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

At 30-Aug-94 12:41:53

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|
| AGE | | | | |
| 3, | 1, | 1, | 1, | 1, |
| 4, | 34, | 1, | 461, | 19, |
| 5, | 526, | 80, | 1109, | 212, |
| 6, | 2792, | 4486, | 3521, | 1117, |
| 7, | 10464, | 12712, | 9605, | 3923, |
| 8, | 18562, | 12283, | 6438, | 3515, |
| 9, | 10034, | 6130, | 2775, | 2551, |
| 10, | 6671, | 4339, | 1734, | 1919, |
| 11, | 2517, | 2703, | 1368, | 1536, |
| 12, | 1250, | 1660, | 1234, | 1127, |
| 13, | 616, | 1044, | 675, | 716, |
| 14, | 1104, | 300, | 200, | 251, |
| 15, | 266, | 123, | 40, | 70, |
| +gp, | 15, | 20, | 40, | 56, |
| TOTALNUM, | 54852, | 45882, | 29201, | 17013, |
| TONSLAND, | 89484, | 79034, | 43055, | 29938, |
| SOPCOF %, | 94, | 104, | 97, | 92, |

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 1, | 22, | 1, | 62, | 78, | 88, | 64, | 664, | 48, | 314, |
| 4, | 276, | 334, | 98, | 755, | 532, | 887, | 275, | 1146, | 551, | 1212, |
| 5, | 917, | 840, | 830, | 2037, | 1897, | 2218, | 731, | 1896, | 1304, | 1543, |
| 6, | 2519, | 2337, | 2982, | 3255, | 3589, | 3155, | 1138, | 1917, | 1494, | 1864, |
| 7, | 6204, | 6520, | 5824, | 4200, | 4118, | 2727, | 1665, | 1919, | 1276, | 1851, |
| 8, | 3838, | 4118, | 5002, | 2524, | 2365, | 1234, | 1341, | 933, | 1208, | 2287, |
| 9, | 1834, | 2265, | 3000, | 1610, | 1509, | 495, | 944, | 484, | 1493, | 1491, |
| 10, | 1942, | 1654, | 1350, | 1104, | 946, | 319, | 473, | 448, | 1258, | 1228, |
| 11, | 1622, | 1857, | 915, | 1062, | 934, | 296, | 511, | 482, | 838, | 713, |
| 12, | 1338, | 1536, | 1212, | 858, | 438, | 243, | 275, | 380, | 502, | 488, |
| 13, | 734, | 1122, | 698, | 595, | 349, | 103, | 242, | 384, | 324, | 247, |
| 14, | 531, | 600, | 526, | 384, | 147, | 45, | 145, | 150, | 108, | 201, |
| 15, | 137, | 270, | 254, | 93, | 83, | 30, | 62, | 47, | 43, | 51, |
| +gp, | 79, | 98, | 104, | 87, | 29, | 21, | 16, | 15, | 3, | 13, |
| TOTALNUM, | 21972, | 23573, | 22796, | 18626, | 17014, | 11861, | 7882, | 10865, | 10450, | 13503, |
| TONSLAND, | 37763, | 38172, | 36074, | 28827, | 24617, | 17312, | 13284, | 15018, | 16789, | 22147, |
| SOPCOF %, | 98, | 88, | 92, | 100, | 104, | 100, | 108, | 102, | 98, | 95, |

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

At 30-Aug-94 12:41:53

| Table 1 Catch numbers at age Numbers*10**-3 YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 88, | 141, | 50, | 5, | 216, | 152, | 374, | 97, | 10, |
| 4, | 36, | 461, | 985, | 435, | 233, | 933, | 777, | 2004, | 433, | 227, |
| 5, | 915, | 1219, | 1672, | 1212, | 907, | 2101, | 2097, | 3185, | 1087, | 1142, |
| 6, | 3698, | 2874, | 3335, | 2972, | 2540, | 4498, | 5062, | 3739, | 1183, | 1056, |
| 7, | 3350, | 2561, | 2712, | 3572, | 3141, | 3692, | 4551, | 4535, | 1058, | 1507, |
| 8, | 1938, | 1548, | 1531, | 1746, | 2096, | 1674, | 1894, | 2264, | 770, | 1014, |
| 9, | 1064, | 972, | 1128, | 752, | 1182, | 809, | 1197, | 991, | 356, | 103, |
| 10, | 1191, | 1037, | 997, | 828, | 860, | 321, | 489, | 1235, | 594, | 992, |
| 11, | 602, | 614, | 530, | 362, | 481, | 230, | 259, | 744, | 186, | 484, |
| 12, | 340, | 363, | 434, | 202, | 313, | 127, | 308, | 647, | 149, | 167, |
| 13, | 171, | 161, | 314, | 186, | 133, | 121, | 41, | 170, | 78, | 41, |
| 14, | 132, | 120, | 305, | 63, | 140, | 141, | 94, | 256, | 88, | 24, |
| 15, | 41, | 55, | 232, | 7, | 47, | 28, | 43, | 497, | 55, | 6, |
| +gp, | 30, | 8, | 7, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| TOTALNUM, | 13508, | 12081, | 14323, | 12387, | 12078, | 14891, | 16964, | 20641, | 6134, | 6773, |
| TONSLAND, | 21883, | 19945, | 22875, | 19112, | 19587, | 20559, | 22765, | 32133, | 9191, | 11812, |
| SOPCOF %, | 100, | 98, | 96, | 100, | 99, | 101, | 100, | 101, | 100, | 100, |

**Table 7.10** Greenland halibut. Weight at age.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

At 30-Aug-94 12:41:53

| Table 2 Catch weights at age (kg) YEAR, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|
| AGE | | | | |
| 3, | .2000, | .2000, | .2000, | .2000, |
| 4, | .4410, | .4410, | .4410, | .4410, |
| 5, | .5670, | .5670, | .5670, | .5670, |
| 6, | .7370, | .7370, | .7370, | .7370, |
| 7, | 1.0790, | 1.0790, | 1.0790, | 1.0790, |
| 8, | 1.4210, | 1.4210, | 1.4210, | 1.4210, |
| 9, | 1.8480, | 1.8480, | 1.8480, | 1.8480, |
| 10, | 2.2810, | 2.2810, | 2.2810, | 2.2810, |
| 11, | 2.8870, | 2.8870, | 2.8870, | 2.8870, |
| 12, | 3.2470, | 3.2470, | 3.2470, | 3.2470, |
| 13, | 4.3030, | 4.3030, | 4.3030, | 4.3030, |
| 14, | 4.9310, | 4.9310, | 4.9310, | 4.9310, |
| 15, | 5.7650, | 5.7650, | 5.7650, | 5.7650, |
| +gp, | 6.3080, | 6.3080, | 6.3080, | 6.3080, |
| SOPCOFAC, | .9435, | 1.0434, | .9707, | .9229, |

| Table 2 Catch weights at age (kg) YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .2000, | .2000, | .2000, | .2000, | .2000, | .3000, | .2000, | .2000, | .2700, | .3100, |
| 4, | .4410, | .4410, | .4410, | .4410, | .4410, | .6000, | .4820, | .5000, | .6200, | .4500, |
| 5, | .5670, | .5670, | .5670, | .5670, | .5670, | .9000, | .7020, | .6600, | .6900, | .7500, |
| 6, | .7370, | .7370, | .7370, | .7370, | .7370, | 1.2000, | .8720, | .8400, | .8400, | 1.0400, |
| 7, | 1.0790, | 1.0790, | 1.0790, | 1.0790, | 1.0790, | 1.5000, | 1.1410, | 1.1500, | 1.0300, | 1.3400, |
| 8, | 1.4210, | 1.4210, | 1.4210, | 1.4210, | 1.4210, | 1.8000, | 1.4680, | 1.5600, | 1.3100, | 1.5700, |
| 9, | 1.8480, | 1.8480, | 1.8480, | 1.8480, | 1.8480, | 2.2000, | 1.7780, | 2.0400, | 1.7400, | 1.9700, |
| 10, | 2.2810, | 2.2810, | 2.2810, | 2.2810, | 2.2810, | 2.6000, | 2.3020, | 2.5700, | 2.2400, | 2.7300, |
| 11, | 2.8870, | 2.8870, | 2.8870, | 2.8870, | 2.8870, | 3.0000, | 2.6640, | 2.9800, | 2.7700, | 3.2900, |
| 12, | 3.2470, | 3.2470, | 3.2470, | 3.2470, | 3.2470, | 3.5000, | 3.0460, | 3.4300, | 3.3700, | 4.2200, |
| 13, | 4.3030, | 4.3030, | 4.3030, | 4.3030, | 4.3030, | 4.1000, | 3.3680, | 4.1300, | 4.3200, | 4.7100, |
| 14, | 4.9310, | 4.9310, | 4.9310, | 4.9310, | 4.9310, | 4.8000, | 4.2850, | 4.6800, | 5.3500, | 6.0800, |
| 15, | 5.7650, | 5.7650, | 5.7650, | 5.7650, | 5.7650, | 5.6000, | 5.0250, | 5.8100, | 5.7800, | 6.0000, |
| +gp, | 6.3080, | 6.3080, | 6.3080, | 6.3080, | 6.3080, | 7.0000, | 6.5890, | 6.5900, | 6.6000, | 6.6000, |
| SOPCOFAC, | .9794, | .8774, | .9245, | .9974, | 1.0375, | 1.0029, | 1.0766, | 1.0169, | .9829, | .9513, |

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

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| Table 2 Catch weights at age (kg) YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .3000, | .3000, | .3400, | .3070, | .4140, | .3100, | .2800, | .2900, | .2200, | .3200, |
| 4, | .4800, | .3800, | .4700, | .5740, | .5540, | .6300, | .5500, | .6000, | .4600, | .5300, |
| 5, | .6300, | .6000, | .6200, | .7090, | .7400, | .7600, | .7100, | .7700, | .6800, | .7900, |
| 6, | .9600, | .8900, | .9200, | 1.0030, | .9620, | 1.0300, | 1.0600, | 1.0500, | .9700, | 1.0200, |
| 7, | 1.1800, | 1.2000, | 1.2800, | 1.2660, | 1.2490, | 1.3200, | 1.2900, | 1.3800, | 1.2700, | 1.3500, |
| 8, | 1.5300, | 1.8500, | 1.9000, | 1.6830, | 1.6260, | 1.8000, | 1.7000, | 1.7500, | 1.7600, | 1.9000, |
| 9, | 2.3100, | 2.5900, | 2.4800, | 2.4820, | 2.1640, | 2.4200, | 2.1000, | 2.2000, | 2.2100, | 2.5700, |
| 10, | 2.8700, | 3.1800, | 3.1100, | 2.9820, | 2.8970, | 3.1300, | 2.6100, | 2.6000, | 2.5600, | 2.6900, |
| 11, | 3.4600, | 3.6200, | 3.3500, | 3.5470, | 3.4060, | 3.3700, | 2.8700, | 2.7900, | 3.1100, | 3.4300, |
| 12, | 3.7700, | 3.9500, | 3.7200, | 3.8000, | 3.6610, | 4.0500, | 3.4500, | 3.2800, | 3.5900, | 4.2700, |
| 13, | 3.9900, | 4.4800, | 4.0000, | 4.5600, | 4.2470, | 4.2900, | 3.7200, | 3.8900, | 3.8300, | 5.0900, |
| 14, | 4.3500, | 4.2500, | 4.1800, | 5.0020, | 4.1870, | 4.5000, | 4.0900, | 4.3800, | 4.2500, | 6.3300, |
| 15, | 4.4700, | 4.8000, | 4.5000, | 5.9530, | 4.4630, | 4.7200, | 4.5200, | 5.2900, | 4.8000, | 8.0000, |
| +gp, | 4.6000, | 5.0000, | 5.4000, | 5.9530, | 4.4630, | 4.7200, | 4.5200, | 5.2900, | 4.8000, | 8.0000, |
| SOPCOFAC, | 1.0001, | .9760, | .9572, | .9976, | .9907, | 1.0123, | 1.0010, | 1.0070, | 1.0030, | 1.0028, |

**Table 7.11** Greenland halibut. Maturity at age.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

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| Table 5 Proportion mature at age<br>YEAR, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|
| AGE | | | | |
| 3, | .0000, | .0000, | .0000, | .0000, |
| 4, | .0500, | .0500, | .0500, | .0500, |
| 5, | .2300, | .2300, | .2300, | .2300, |
| 6, | .4900, | .4900, | .4900, | .4900, |
| 7, | .6600, | .6600, | .6600, | .6600, |
| 8, | .7800, | .7800, | .7800, | .7800, |
| 9, | .8900, | .8900, | .8900, | .8900, |
| 10, | .9500, | .9500, | .9500, | .9500, |
| 11, | .9900, | .9900, | .9900, | .9900, |
| 12, | .9900, | .9900, | .9900, | .9900, |
| 13, | .9900, | .9900, | .9900, | .9900, |
| 14, | 1.0000, | 1.0000, | 1.0000, | 1.0000, |
| 15, | 1.0000, | 1.0000, | 1.0000, | 1.0000, |
| +gp, | 1.0000, | 1.0000, | 1.0000, | 1.0000, |

| Table 5 Proportion mature at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| 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, |
| 15, | 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: KN

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| Table 5 Proportion mature at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, | .0000, |
| 4, | .0500, | .0500, | .0500, | .0500, | .0200, | .0300, | .0500, | .0500, | .0500, | .0000, |
| 5, | .2300, | .2300, | .2300, | .2300, | .1100, | .1400, | .2000, | .2000, | .2000, | .3400, |
| 6, | .4900, | .4900, | .4900, | .4900, | .5100, | .5300, | .5900, | .5900, | .5900, | .4700, |
| 7, | .6600, | .6600, | .6600, | .6600, | .6700, | .6600, | .7000, | .7000, | .7000, | .6300, |
| 8, | .7800, | .7800, | .7800, | .7800, | .6800, | .6900, | .7200, | .7200, | .7200, | .7100, |
| 9, | .8900, | .8900, | .8900, | .8900, | .8000, | .7300, | .7600, | .7600, | .7600, | .7700, |
| 10, | .9500, | .9500, | .9500, | .9500, | .9200, | .8600, | .8500, | .8500, | .8500, | .9700, |
| 11, | .9900, | .9900, | .9900, | .9900, | .9800, | .9600, | .9400, | .9400, | .9400, | .9300, |
| 12, | .9900, | .9900, | .9900, | .9900, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | 1.0000, | .9600, |
| 13, | .9900, | .9900, | .9900, | .9900, | 1.0000, | 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, |
| 15, | 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 7.12** Greenland halibut. Fishing mortalities.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

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Traditional vpa using file input for terminal F

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|
| AGE | | | | |
| 3, | .0000, | .0000, | .0000, | .0000, |
| 4, | .0011, | .0000, | .0139, | .0007, |
| 5, | .0140, | .0029, | .0380, | .0075, |
| 6, | .0667, | .1507, | .1603, | .0464, |
| 7, | .2946, | .4513, | .5154, | .2546, |
| 8, | .6946, | .6260, | .4091, | .3388, |
| 9, | .5893, | .4874, | .2606, | .2654, |
| 10, | .5996, | .5169, | .2320, | .2733, |
| 11, | .4941, | .4898, | .2858, | .3126, |
| 12, | .5197, | .6706, | .4088, | .3803, |
| 13, | .7970, | 1.0700, | .6010, | .4161, |
| 14, | 1.6443, | 1.1608, | .5602, | .4411, |
| 15, | .8182, | .7898, | .4196, | .3655, |
| +gp, | .8182, | .7898, | .4196, | .3655, |
| FBAR 6-10, | .4490, | .4464, | .3155, | .2357, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | .0000, | .0008, | .0000, | .0025, | .0034, | .0034, | .0026, | .0275, | .0021, | .0128, |
| 4, | .0117, | .0137, | .0042, | .0338, | .0256, | .0467, | .0125, | .0558, | .0272, | .0622, |
| 5, | .0398, | .0424, | .0405, | .1074, | .1056, | .1342, | .0468, | .1059, | .0788, | .0939, |
| 6, | .1099, | .1279, | .1965, | .2083, | .2635, | .2419, | .0895, | .1577, | .1078, | .1463, |
| 7, | .3638, | .4275, | .4994, | .4372, | .4147, | .3092, | .1839, | .2024, | .1418, | .1788, |
| 8, | .3990, | .4128, | .6428, | .3953, | .4443, | .1978, | .2322, | .1410, | .1793, | .3801, |
| 9, | .2805, | .4097, | .5652, | .4127, | .4106, | .1468, | .2160, | .1163, | .3296, | .3301, |
| 10, | .3129, | .4136, | .4316, | .3938, | .4288, | .1337, | .1929, | .1428, | .4633, | .4660, |
| 11, | .3686, | .5228, | .3995, | .6769, | .6405, | .2171, | .3087, | .2899, | .4043, | .4909, |
| 12, | .4633, | .6705, | .7327, | .7606, | .6237, | .3180, | .3031, | .3743, | .5204, | .4111, |
| 13, | .4306, | .8473, | .7014, | .9538, | .7732, | .2712, | .5653, | .8454, | .5951, | .4949, |
| 14, | .5864, | .7121, | 1.2821, | 1.0416, | .6159, | .1936, | .7071, | .7892, | .5722, | .8774, |
| 15, | .4333, | .6365, | .7146, | .7726, | .6215, | .2267, | .4171, | .4913, | .5134, | .5512, |
| +gp, | .4333, | .6365, | .7146, | .7726, | .6215, | .2267, | .4171, | .4913, | .5134, | .5512, |
| FBAR 6-10, | .2932, | .3583, | .4671, | .3695, | .3924, | .2059, | .1829, | .1521, | .2444, | .3003, |

| Table 8 Fishing mortality (F) at age<br>YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | FBAR 91-93 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | | |
| 3, | .0000, | .0036, | .0052, | .0017, | .0002, | .0071, | .0069, | .0443, | .0358, | .0500, | .0434, |
| 4, | .0017, | .0221, | .0481, | .0190, | .0095, | .0436, | .0301, | .1121, | .0629, | .1042, | .0930, |
| 5, | .0579, | .0698, | .0989, | .0731, | .0475, | .1050, | .1234, | .1570, | .0777, | .2213, | .1520, |
| 6, | .3195, | .2449, | .2605, | .2412, | .2038, | .3276, | .3696, | .3168, | .0763, | .0956, | .1629, |
| 7, | .3974, | .3606, | .3621, | .4611, | .4067, | .4786, | .6053, | .6235, | .1310, | .1247, | .2931, |
| 8, | .2717, | .3042, | .3590, | .3949, | .5094, | .3724, | .4556, | .6548, | .1883, | .1694, | .3375, |
| 9, | .2880, | .2010, | .3579, | .2833, | .4788, | .3545, | .4690, | .4323, | .1862, | .0328, | .2171, |
| 10, | .4500, | .4733, | .3079, | .4565, | .5684, | .2162, | .3549, | 1.2407, | .4723, | 1.0660, | .9263, |
| 11, | .4130, | .4163, | .4455, | .1653, | .4948, | .2727, | .2563, | 1.3628, | .5684, | .8414, | .9242, |
| 12, | .4329, | .4433, | .5506, | .2864, | .1990, | .2194, | .6645, | 1.7890, | 1.1339, | 1.5570, | 1.4933, |
| 13, | .2326, | .3543, | .8166, | .4557, | .2926, | .1043, | .0967, | .9243, | 1.2123, | 1.1206, | 1.0857, |
| 14, | .5067, | .2401, | 2.4559, | .3511, | .6999, | .5402, | .1045, | 1.2947, | 2.3081, | 1.8231, | 1.8086, |
| 15, | .4077, | .3855, | .9275, | .3438, | .4527, | .2702, | .2938, | 1.1036, | 1.0877, | 1.2913, | 1.1609, |
| +gp, | .4077, | .3855, | .9275, | .3438, | .4527, | .2702, | .2938, | 1.1036, | 1.0877, | 1.2913, | |
| FBAR 6-10, | .3453, | .3168, | .3295, | .3674, | .4334, | .3498, | .4509, | .6536, | .2108, | .2977, | |

**Table 7.13** Greenland halibut. Stock numbers.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

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Traditional vpa using file input for terminal F

| Table 10 Stock number at age (start of year) | | | | | Numbers*10**-3 |
|---|---|---|---|---|---|
| YEAR, | 1970, | 1971, | 1972, | 1973, | |
| AGE | | | | | |
| 3, | 43233, | 41719, | 34189, | 29734, | |
| 4, | 34626, | 37210, | 35907, | 29426, | |
| 5, | 40613, | 29772, | 32026, | 30478, | |
| 6, | 46552, | 34468, | 25551, | 26538, | |
| 7, | 44004, | 37482, | 25517, | 18735, | |
| 8, | 39579, | 28211, | 20544, | 13117, | |
| 9, | 24091, | 17008, | 12985, | 11746, | |
| 10, | 15811, | 11503, | 8992, | 8612, | |
| 11, | 6910, | 7471, | 5905, | 6137, | |
| 12, | 3300, | 3628, | 3940, | 3819, | |
| 13, | 1196, | 1689, | 1597, | 2254, | |
| 14, | 1445, | 464, | 499, | 754, | |
| 15, | 507, | 240, | 125, | 245, | |
| +gp, | 29, | 39, | 125, | 196, | |
| TOTAL, | 301895, | 250905, | 207901, | 181789, | |

| Table 10 Stock number at age (start of year) | | | | | | | Numbers*10**-3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
| AGE | | | | | | | | | | |
| 3, | 30786, | 29184, | 28419, | 26365, | 24397, | 27841, | 26482, | 26388, | 25173, | 26633, |
| 4, | 25591, | 26497, | 25099, | 24459, | 22635, | 20927, | 23881, | 22734, | 22097, | 21622, |
| 5, | 25310, | 21771, | 22497, | 21512, | 20353, | 18989, | 17190, | 20300, | 18506, | 18509, |
| 6, | 26036, | 20935, | 17960, | 18594, | 16630, | 15762, | 14292, | 14118, | 15717, | 14721, |
| 7, | 21806, | 20078, | 15856, | 12701, | 12995, | 10998, | 10651, | 11248, | 10379, | 12145, |
| 8, | 12500, | 13045, | 11270, | 8283, | 7060, | 7388, | 6948, | 7628, | 7907, | 7752, |
| 9, | 8046, | 7220, | 7430, | 5101, | 4801, | 3897, | 5218, | 4741, | 5702, | 5688, |
| 10, | 7753, | 5231, | 4125, | 3634, | 2906, | 2741, | 2896, | 3618, | 3633, | 3530, |
| 11, | 5640, | 4880, | 2977, | 2306, | 2110, | 1629, | 2064, | 2055, | 2700, | 1967, |
| 12, | 3864, | 3358, | 2490, | 1719, | 1009, | 957, | 1128, | 1305, | 1324, | 1551, |
| 13, | 2247, | 2092, | 1478, | 1030, | 691, | 465, | 599, | 717, | 772, | 677, |
| 14, | 1279, | 1257, | 772, | 631, | 342, | 275, | 305, | 293, | 265, | 367, |
| 15, | 417, | 613, | 531, | 184, | 192, | 159, | 195, | 130, | 115, | 129, |
| +gp, | 241, | 222, | 217, | 172, | 67, | 111, | 50, | 41, | 8, | 33, |
| TOTAL, | 171517, | 156383, | 141122, | 126692, | 116187, | 112137, | 111900, | 115316, | 114297, | 115324, |

Traditional vpa using file input for terminal F

| Table 10 Stock number at age (start of year) | | | | | | | Numbers*10**-3 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, | 1994, | GMST |
| AGE | | | | | | | | | | | | |
| 3, | 26358, | 26299, | 29099, | 30938, | 27381, | 33004, | 23784, | 9283, | 2971, | 221, | 0, | 275 |
| 4, | 22632, | 22687, | 22554, | 24915, | 26582, | 23563, | 28207, | 20330, | 7643, | 2467, | 181, | 252 |
| 5, | 17488, | 19446, | 19099, | 18500, | 21041, | 22663, | 19416, | 23558, | 15643, | 6178, | 1913, | 221 |
| 6, | 14502, | 14205, | 15609, | 14891, | 14801, | 17270, | 17562, | 14771, | 17330, | 12458, | 4262, | 185 |
| 7, | 10946, | 9068, | 9570, | 10354, | 10071, | 10391, | 10713, | 10445, | 9262, | 13821, | 9745, | 140 |
| 8, | 8741, | 6331, | 5442, | 5735, | 5620, | 5771, | 5542, | 5034, | 4819, | 6993, | 10501, | 90 |
| 9, | 4563, | 5734, | 4020, | 3271, | 3326, | 2906, | 3423, | 3024, | 2251, | 3436, | 5081, | 58 |
| 10, | 3520, | 2944, | 4036, | 2419, | 2121, | 1773, | 1755, | 1843, | 1689, | 1608, | 2862, | 39 |
| 11, | 1906, | 1932, | 1579, | 2554, | 1319, | 1034, | 1230, | 1059, | 459, | 907, | 477, | 25 |
| 12, | 1036, | 1086, | 1096, | 870, | 1863, | 692, | 678, | 819, | 233, | 224, | 336, | 15 |
| 13, | 885, | 579, | 600, | 544, | 563, | 1314, | 478, | 300, | 118, | 65, | 41, | 8 |
| 14, | 355, | 604, | 349, | 228, | 297, | 361, | 1019, | 374, | 102, | 30, | 18, | 4 |
| 15, | 131, | 184, | 409, | 26, | 138, | 127, | 181, | 790, | 88, | 9, | 4, | 2 |
| +gp, | 96, | 27, | 12, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 2, | |
| TOTAL, | 113160, | 111125, | 113475, | 115245, | 115122, | 120871, | 113987, | 91631, | 62610, | 48415, | 35422, | |

**Table 7.14** Greenland halibut. Stock biomass.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

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Traditional vpa using file input for terminal F

Table 12 Stock biomass at age (start of year) Tonnes

| YEAR, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|
| AGE | | | | |
| 3, | 8647, | 8344, | 6838, | 5947, |
| 4, | 15270, | 16410, | 15835, | 12977, |
| 5, | 23027, | 16881, | 18159, | 17281, |
| 6, | 34309, | 25403, | 18831, | 19558, |
| 7, | 47480, | 40443, | 27533, | 20215, |
| 8, | 56241, | 40088, | 29194, | 18639, |
| 9, | 44520, | 31431, | 23995, | 21706, |
| 10, | 36065, | 26238, | 20510, | 19644, |
| 11, | 19948, | 21570, | 17046, | 17716, |
| 12, | 10714, | 11782, | 12795, | 12399, |
| 13, | 5145, | 7268, | 6872, | 9697, |
| 14, | 7125, | 2287, | 2459, | 3716, |
| 15, | 2926, | 1385, | 721, | 1413, |
| +gp, | 181, | 246, | 789, | 1237, |
| TOTALBIO, | 311598, | 249774, | 201576, | 182146, |

Table 12 Stock biomass at age (start of year) Tonnes

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 6157, | 5837, | 5684, | 5273, | 4879, | 8352, | 5296, | 5278, | 6797, | 8256, |
| 4, | 11286, | 11685, | 11069, | 10787, | 9982, | 12556, | 11511, | 11367, | 13700, | 9730, |
| 5, | 14351, | 12344, | 12756, | 12197, | 11540, | 17090, | 12067, | 13398, | 12769, | 13882, |
| 6, | 19189, | 15429, | 13237, | 13704, | 12256, | 18914, | 12463, | 11859, | 13202, | 15309, |
| 7, | 23529, | 21664, | 17109, | 13705, | 14022, | 16497, | 12153, | 12935, | 10690, | 16274, |
| 8, | 17763, | 18536, | 16015, | 11770, | 10033, | 13298, | 10200, | 11899, | 10358, | 12171, |
| 9, | 14868, | 13342, | 13731, | 9426, | 8872, | 8573, | 9277, | 9671, | 9921, | 11206, |
| 10, | 17685, | 11932, | 9410, | 8289, | 6628, | 7126, | 6667, | 9299, | 8137, | 9636, |
| 11, | 16283, | 14089, | 8595, | 6657, | 6091, | 4886, | 5498, | 6125, | 7479, | 6472, |
| 12, | 12545, | 10903, | 8086, | 5580, | 3275, | 3349, | 3437, | 4474, | 4462, | 6545, |
| 13, | 9669, | 9004, | 6361, | 4433, | 2975, | 1908, | 2018, | 2962, | 3336, | 3190, |
| 14, | 6309, | 6200, | 3806, | 3111, | 1685, | 1318, | 1308, | 1372, | 1418, | 2229, |
| 15, | 2406, | 3532, | 3061, | 1063, | 1105, | 889, | 979, | 753, | 662, | 772, |
| +gp, | 1518, | 1403, | 1371, | 1088, | 422, | 778, | 331, | 273, | 53, | 217, |
| TOTALBIO, | 173558, | 155900, | 130289, | 107083, | 93764, | 115536, | 93205, | 101665, | 102984, | 115889, |

Traditional vpa using file input for terminal F

Table 12 Stock biomass at age (start of year) Tonnes

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 7907, | 7890, | 9894, | 9498, | 11336, | 10231, | 6660, | 2692, | 654, | 71, |
| 4, | 10864, | 8621, | 10600, | 14301, | 14726, | 14845, | 15514, | 12198, | 3516, | 1308, |
| 5, | 11018, | 11668, | 11842, | 13117, | 15571, | 17224, | 13786, | 18140, | 10638, | 4880, |
| 6, | 13922, | 12642, | 14360, | 14936, | 14238, | 17788, | 18616, | 15510, | 16810, | 12707, |
| 7, | 12916, | 10882, | 12250, | 13108, | 12578, | 13716, | 13819, | 14415, | 11762, | 18658, |
| 8, | 13374, | 11713, | 10340, | 9652, | 9137, | 10388, | 9421, | 8809, | 8482, | 13286, |
| 9, | 10540, | 14850, | 9969, | 8119, | 7197, | 7033, | 7188, | 6653, | 4975, | 8831, |
| 10, | 10101, | 9363, | 12553, | 7214, | 6145, | 5551, | 4580, | 4792, | 4325, | 4326, |
| 11, | 6596, | 6992, | 5289, | 9057, | 4493, | 3485, | 3529, | 2955, | 1427, | 3110, |
| 12, | 3907, | 4288, | 4079, | 3307, | 6821, | 2803, | 2338, | 2687, | 838, | 955, |
| 13, | 3531, | 2592, | 2399, | 2481, | 2389, | 5638, | 1780, | 1167, | 451, | 329, |
| 14, | 1546, | 2565, | 1461, | 1141, | 1243, | 1626, | 4168, | 1637, | 436, | 191, |
| 15, | 586, | 884, | 1839, | 154, | 617, | 599, | 819, | 4180, | 423, | 70, |
| +gp, | 442, | 134, | 67, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| TOTALBIO, | 107250, | 105085, | 106941, | 106085, | 106491, | 110928, | 102217, | 95834, | 64736, | 68722, |

**Table 7.15** Greenland halibut. Spawning stock biomass.

Run title : Greenland Halibut in the North-East Arctic (Fishing Areas I and II (run name: KN

At 30-Aug-94 12:41:53

Traditional vpa using file input for terminal F

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1970, | 1971, | 1972, | 1973, |
|---|---|---|---|---|
| AGE | | | | |
| 3, | 0, | 0, | 0, | 0, |
| 4, | 764, | 820, | 792, | 649, |
| 5, | 5296, | 3883, | 4177, | 3975, |
| 6, | 16811, | 12448, | 9227, | 9584, |
| 7, | 31337, | 26692, | 18172, | 13342, |
| 8, | 43868, | 31269, | 22771, | 14538, |
| 9, | 39623, | 27974, | 21356, | 19319, |
| 10, | 34262, | 24926, | 19484, | 18662, |
| 11, | 19748, | 21354, | 16876, | 17539, |
| 12, | 10607, | 11664, | 12667, | 12275, |
| 13, | 5094, | 7195, | 6804, | 9600, |
| 14, | 7125, | 2287, | 2459, | 3716, |
| 15, | 2926, | 1385, | 721, | 1413, |
| +gp, | 181, | 246, | 789, | 1237, |
| TOTSPBIO, | 217642, | 172142, | 136293, | 125849, |

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1974, | 1975, | 1976, | 1977, | 1978, | 1979, | 1980, | 1981, | 1982, | 1983, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 4, | 564, | 584, | 553, | 539, | 499, | 628, | 576, | 568, | 685, | 487, |
| 5, | 3301, | 2839, | 2934, | 2805, | 2654, | 3931, | 2776, | 3082, | 2937, | 3193, |
| 6, | 9402, | 7560, | 6486, | 6715, | 6006, | 9268, | 6107, | 5811, | 6469, | 7502, |
| 7, | 15529, | 14298, | 11292, | 9045, | 9254, | 10888, | 8021, | 8537, | 7055, | 10741, |
| 8, | 13855, | 14458, | 12492, | 9180, | 7825, | 10372, | 7956, | 9281, | 8079, | 9493, |
| 9, | 13233, | 11874, | 12221, | 8389, | 7896, | 7630, | 8257, | 8608, | 8830, | 9973, |
| 10, | 16801, | 11335, | 8939, | 7875, | 6296, | 6770, | 6334, | 8834, | 7730, | 9154, |
| 11, | 16120, | 13948, | 8509, | 6591, | 6030, | 4837, | 5443, | 6064, | 7404, | 6408, |
| 12, | 12420, | 10794, | 8005, | 5524, | 3242, | 3316, | 3402, | 4430, | 4417, | 6480, |
| 13, | 9572, | 8914, | 6297, | 4389, | 2945, | 1889, | 1998, | 2932, | 3303, | 3158, |
| 14, | 6309, | 6200, | 3806, | 3111, | 1685, | 1318, | 1308, | 1372, | 1418, | 2229, |
| 15, | 2406, | 3532, | 3061, | 1063, | 1105, | 889, | 979, | 753, | 662, | 772, |
| +gp, | 1518, | 1403, | 1371, | 1088, | 422, | 778, | 331, | 273, | 53, | 217, |
| TOTSPBIO, | 121030, | 107740, | 85966, | 66314, | 55860, | 62514, | 53486, | 60544, | 59042, | 69805, |

Table 13 Spawning stock biomass at age (spawning time) Tonnes

| YEAR, | 1984, | 1985, | 1986, | 1987, | 1988, | 1989, | 1990, | 1991, | 1992, | 1993, |
|---|---|---|---|---|---|---|---|---|---|---|
| AGE | | | | | | | | | | |
| 3, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| 4, | 543, | 431, | 530, | 715, | 295, | 445, | 776, | 610, | 176, | 0, |
| 5, | 2534, | 2684, | 2724, | 3017, | 1713, | 2411, | 2757, | 3628, | 2128, | 1659, |
| 6, | 6822, | 6195, | 7036, | 7319, | 7262, | 9428, | 10983, | 9151, | 9918, | 5972, |
| 7, | 8524, | 7182, | 8085, | 8651, | 8427, | 9053, | 9673, | 10090, | 8234, | 11755, |
| 8, | 10432, | 9136, | 8065, | 7528, | 6213, | 7168, | 6783, | 6343, | 6107, | 9433, |
| 9, | 9380, | 13217, | 8873, | 7226, | 5757, | 5134, | 5463, | 5057, | 3781, | 6800, |
| 10, | 9596, | 8895, | 11925, | 6853, | 5653, | 4774, | 3893, | 4073, | 3676, | 4197, |
| 11, | 6530, | 6922, | 5236, | 8967, | 4403, | 3346, | 3317, | 2778, | 1341, | 2892, |
| 12, | 3868, | 4245, | 4038, | 3274, | 6821, | 2803, | 2338, | 2687, | 838, | 917, |
| 13, | 3495, | 2566, | 2375, | 2456, | 2389, | 5638, | 1780, | 1167, | 451, | 329, |
| 14, | 1546, | 2565, | 1461, | 1141, | 1243, | 1626, | 4168, | 1637, | 436, | 191, |
| 15, | 586, | 884, | 1839, | 154, | 617, | 599, | 819, | 4180, | 423, | 70, |
| +gp, | 442, | 134, | 67, | 0, | 0, | 0, | 0, | 0, | 0, | 0, |
| TOTSPBIO, | 64299, | 65057, | 62254, | 57302, | 50793, | 52425, | 52751, | 51400, | 37508, | 44215, |

**Table 7.16** Greenland halibut. Stock summary.

Table 16 Summary (without SOP correction)

Traditional vpa using file input for terminal F

| | RECRUITS, Age 3 | TOTALBIO, | TOTSPBIO, | LANDINGS, | YIELD/SSB, | FBAR 6-10, |
|---|---|---|---|---|---|---|
| 1970, | 43233, | 311598, | 217641, | 89484, | .4112, | .4490, |
| 1971, | 41719, | 249774, | 172142, | 79034, | .4591, | .4464, |
| 1972, | 34189, | 201576, | 136293, | 43055, | .3159, | .3155, |
| 1973, | 29734, | 182146, | 125849, | 29938, | .2379, | .2357, |
| 1974, | 30786, | 173557, | 121030, | 37763, | .3120, | .2932, |
| 1975, | 29184, | 155900, | 107740, | 38172, | .3543, | .3583, |
| 1976, | 28419, | 130289, | 85966, | 36074, | .4196, | .4671, |
| 1977, | 26365, | 107083, | 66314, | 28827, | .4347, | .3695, |
| 1978, | 24397, | 93764, | 55860, | 24617, | .4407, | .3924, |
| 1979, | 27841, | 115536, | 62514, | 17312, | .2769, | .2059, |
| 1980, | 26482, | 93205, | 53486, | 13284, | .2484, | .1829, |
| 1981, | 26388, | 101665, | 60544, | 15018, | .2481, | .1521, |
| 1982, | 25173, | 102984, | 59042, | 16789, | .2844, | .2444, |
| 1983, | 26633, | 115889, | 69805, | 22147, | .3173, | .3003, |
| 1984, | 26358, | 107250, | 64299, | 21883, | .3403, | .3453, |
| 1985, | 26299, | 105085, | 65057, | 19945, | .3066, | .3168, |
| 1986, | 29099, | 106941, | 62254, | 22875, | .3674, | .3295, |
| 1987, | 30938, | 106085, | 57302, | 19112, | .3335, | .3674, |
| 1988, | 27381, | 106491, | 50793, | 19587, | .3856, | .4334, |
| 1989, | 33004, | 110928, | 52425, | 20559, | .3922, | .3498, |
| 1990, | 23784, | 102217, | 52751, | 22765, | .4316, | .4509, |
| 1991, | 9283, | 95834, | 51400, | 32133, | .6252, | .6536, |
| 1992, | 2971, | 64736, | 37508, | 9191, | .2450, | .2108, |
| 1993, | 221, | 68722, | 44215, | 11812, | .2672, | .2977, |
| Arith. Mean , | 26245, | 129552, | 80510, | 28807, | .3523, | .3403, |
| Units, | (Thousands), | (Tonnes), | (Tonnes), | (Tonnes), | | |

**Table 7.17** Greenland halibut. Input data to predictions.



Greenland Halibut in the North-East Arctic (Fishing Areas I and II

Prediction with management option table: Input data

| Year: 1994 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 299.000 | 0.1500 | 0.0000 | 0.0000 | 0.0000 | 0.277 | 0.0333 | 0.277 |
| 4 | 181.000 | 0.1500 | 0.0333 | 0.0000 | 0.0000 | 0.530 | 0.0715 | 0.530 |
| 5 | 1913.000 | 0.1500 | 0.2467 | 0.0000 | 0.0000 | 0.747 | 0.1168 | 0.747 |
| 6 | 4262.000 | 0.1500 | 0.5500 | 0.0000 | 0.0000 | 1.013 | 0.1253 | 1.013 |
| 7 | 9745.000 | 0.1500 | 0.6767 | 0.0000 | 0.0000 | 1.333 | 0.2262 | 1.333 |
| 8 | 10501.000 | 0.1500 | 0.7167 | 0.0000 | 0.0000 | 1.803 | 0.2592 | 1.803 |
| 9 | 5081.000 | 0.1500 | 0.7633 | 0.0000 | 0.0000 | 2.327 | 0.1661 | 2.327 |
| 10 | 2862.000 | 0.1500 | 0.8900 | 0.0000 | 0.0000 | 2.617 | 0.7119 | 2.617 |
| 11 | 477.000 | 0.1500 | 0.9367 | 0.0000 | 0.0000 | 3.110 | 0.7096 | 3.110 |
| 12 | 336.000 | 0.1500 | 0.9867 | 0.0000 | 0.0000 | 3.713 | 1.1488 | 3.713 |
| 13 | 41.000 | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 4.270 | 0.8312 | 4.270 |
| 14 | 18.000 | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 4.987 | 1.3931 | 4.987 |
| 15 | 4.000 | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 6.030 | 0.8923 | 6.030 |
| 16+ | 2.000 | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 6.030 | . | 6.030 |
| 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 | 201.000 | 0.1500 | 0.0000 | 0.0000 | 0.0000 | 0.277 | 0.0333 | 0.277 |
| 4 | . | 0.1500 | 0.0333 | 0.0000 | 0.0000 | 0.530 | 0.0715 | 0.530 |
| 5 | . | 0.1500 | 0.2467 | 0.0000 | 0.0000 | 0.747 | 0.1168 | 0.747 |
| 6 | . | 0.1500 | 0.5500 | 0.0000 | 0.0000 | 1.013 | 0.1253 | 1.013 |
| 7 | . | 0.1500 | 0.6767 | 0.0000 | 0.0000 | 1.333 | 0.2262 | 1.333 |
| 8 | . | 0.1500 | 0.7167 | 0.0000 | 0.0000 | 1.803 | 0.2592 | 1.803 |
| 9 | . | 0.1500 | 0.7633 | 0.0000 | 0.0000 | 2.327 | 0.1661 | 2.327 |
| 10 | . | 0.1500 | 0.8900 | 0.0000 | 0.0000 | 2.617 | 0.7119 | 2.617 |
| 11 | . | 0.1500 | 0.9367 | 0.0000 | 0.0000 | 3.110 | 0.7096 | 3.110 |
| 12 | . | 0.1500 | 0.9867 | 0.0000 | 0.0000 | 3.713 | 1.1488 | 3.713 |
| 13 | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 4.270 | 0.8312 | 4.270 |
| 14 | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 4.987 | 1.3931 | 4.987 |
| 15 | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 6.030 | 0.8923 | 6.030 |
| 16+ | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 6.030 | . | 6.030 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

| Year: 1996 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | 5284.000 | 0.1500 | 0.0000 | 0.0000 | 0.0000 | 0.277 | 0.0333 | 0.277 |
| 4 | . | 0.1500 | 0.0333 | 0.0000 | 0.0000 | 0.530 | 0.0715 | 0.530 |
| 5 | . | 0.1500 | 0.2467 | 0.0000 | 0.0000 | 0.747 | 0.1168 | 0.747 |
| 6 | . | 0.1500 | 0.5500 | 0.0000 | 0.0000 | 1.013 | 0.1253 | 1.013 |
| 7 | . | 0.1500 | 0.6767 | 0.0000 | 0.0000 | 1.333 | 0.2262 | 1.333 |
| 8 | . | 0.1500 | 0.7167 | 0.0000 | 0.0000 | 1.803 | 0.2592 | 1.803 |
| 9 | . | 0.1500 | 0.7633 | 0.0000 | 0.0000 | 2.327 | 0.1661 | 2.327 |
| 10 | . | 0.1500 | 0.8900 | 0.0000 | 0.0000 | 2.617 | 0.7119 | 2.617 |
| 11 | . | 0.1500 | 0.9367 | 0.0000 | 0.0000 | 3.110 | 0.7096 | 3.110 |
| 12 | . | 0.1500 | 0.9867 | 0.0000 | 0.0000 | 3.713 | 1.1488 | 3.713 |
| 13 | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 4.270 | 0.8312 | 4.270 |
| 14 | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 4.987 | 1.3931 | 4.987 |
| 15 | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 6.030 | 0.8923 | 6.030 |
| 16+ | . | 0.1500 | 1.0000 | 0.0000 | 0.0000 | 6.030 | . | 6.030 |
| Unit | Thousands | - | - | - | - | Kilograms | - | Kilograms |

Notes: Run name : KNUTPR1
Date and time: 30AUG94:12:47

**Table 7.18** Greenland halibut. Management options.

12:32 Tuesday, August 30, 1994 1

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: 1994 | | | | | Year: 1995 | | | | | Year: 1996 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 1.0406 | 0.3098 | 60199 | 43693 | 14500 | 0.0000 | 0.0000 | 48554 | 37750 | 0 | 52103 | 42893 |
| . | . | . | . | . | 0.0500 | 0.0149 | . | 37750 | 809 | 51199 | 42088 |
| . | . | . | . | . | 0.1000 | 0.0298 | . | 37750 | 1598 | 50320 | 41305 |
| . | . | . | . | . | 0.1500 | 0.0447 | . | 37750 | 2366 | 49463 | 40543 |
| . | . | . | . | . | 0.2000 | 0.0595 | . | 37750 | 3114 | 48628 | 39802 |
| . | . | . | . | . | 0.2500 | 0.0744 | . | 37750 | 3843 | 47815 | 39081 |
| . | . | . | . | . | 0.3000 | 0.0893 | . | 37750 | 4555 | 47023 | 38379 |
| . | . | . | . | . | 0.3500 | 0.1042 | . | 37750 | 5248 | 46251 | 37696 |
| . | . | . | . | . | 0.4000 | 0.1191 | . | 37750 | 5924 | 45498 | 37031 |
| . | . | . | . | . | 0.4500 | 0.1340 | . | 37750 | 6584 | 44764 | 36383 |
| . | . | . | . | . | 0.5000 | 0.1489 | . | 37750 | 7227 | 44048 | 35752 |
| . | . | . | . | . | 0.5500 | 0.1638 | . | 37750 | 7855 | 43350 | 35137 |
| . | . | . | . | . | 0.6000 | 0.1786 | . | 37750 | 8468 | 42669 | 34538 |
| . | . | . | . | . | 0.6500 | 0.1935 | . | 37750 | 9067 | 42004 | 33954 |
| . | . | . | . | . | 0.7000 | 0.2084 | . | 37750 | 9651 | 41356 | 33384 |
| . | . | . | . | . | 0.7500 | 0.2233 | . | 37750 | 10222 | 40722 | 32829 |
| . | . | . | . | . | 0.8000 | 0.2382 | . | 37750 | 10779 | 40104 | 32288 |
| . | . | . | . | . | 0.8500 | 0.2531 | . | 37750 | 11324 | 39500 | 31760 |
| . | . | . | . | . | 0.9000 | 0.2680 | . | 37750 | 11856 | 38911 | 31245 |
| . | . | . | . | . | 0.9500 | 0.2829 | . | 37750 | 12376 | 38334 | 30742 |
| . | . | . | . | . | 1.0000 | 0.2977 | . | 37750 | 12885 | 37771 | 30252 |
| . | . | . | . | . | 1.0500 | 0.3126 | . | 37750 | 13382 | 37221 | 29773 |
| . | . | . | . | . | 1.1000 | 0.3275 | . | 37750 | 13868 | 36683 | 29305 |
| . | . | . | . | . | 1.1500 | 0.3424 | . | 37750 | 14344 | 36158 | 28848 |
| . | . | . | . | . | 1.2000 | 0.3573 | . | 37750 | 14809 | 35643 | 28402 |
| . | . | . | . | . | 1.2500 | 0.3722 | . | 37750 | 15264 | 35141 | 27967 |
| . | . | . | . | . | 1.3000 | 0.3871 | . | 37750 | 15709 | 34649 | 27541 |
| . | . | . | . | . | 1.3500 | 0.4019 | . | 37750 | 16146 | 34167 | 27125 |
| . | . | . | . | . | 1.4000 | 0.4168 | . | 37750 | 16573 | 33697 | 26718 |
| . | . | . | . | . | 1.4500 | 0.4317 | . | 37750 | 16991 | 33236 | 26320 |
| . | . | . | . | . | 1.5000 | 0.4466 | . | 37750 | 17400 | 32784 | 25932 |
| . | . | . | . | . | 1.5500 | 0.4615 | . | 37750 | 17801 | 32343 | 25551 |
| . | . | . | . | . | 1.6000 | 0.4764 | . | 37750 | 18194 | 31910 | 25179 |
| . | . | . | . | . | 1.6500 | 0.4913 | . | 37750 | 18579 | 31486 | 24815 |
| . | . | . | . | . | 1.7000 | 0.5062 | . | 37750 | 18956 | 31071 | 24459 |
| . | . | . | . | . | 1.7500 | 0.5210 | . | 37750 | 19326 | 30665 | 24111 |
| . | . | . | . | . | 1.8000 | 0.5359 | . | 37750 | 19689 | 30266 | 23770 |
| . | . | . | . | . | 1.8500 | 0.5508 | . | 37750 | 20045 | 29876 | 23435 |
| . | . | . | . | . | 1.9000 | 0.5657 | . | 37750 | 20393 | 29493 | 23108 |
| . | . | . | . | . | 1.9500 | 0.5806 | . | 37750 | 20735 | 29118 | 22788 |
| . | . | . | . | . | 2.0000 | 0.5955 | . | 37750 | 21071 | 28749 | 22474 |
| - | - | Tonnes | Tonnes | Tonnes | - | - | Tonnes | Tonnes | Tonnes | Tonnes | Tonnes |

Notes: Run name : KNUTPR1
Date and time : 30AUG94:12:47
Computation of ref. F: Simple mean, age 6 - 10
Basis for 1994 : TAC constraints

**Table 7.19** Greenland halibut. Medium-term projections.



Greenland Halibut in the North-East Arctic (Fishing Areas I and II

Single option prediction: Summary table

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.0406 | 0.3098 | 7572 | 14500 | 35722 | 60199 | 24211 | 43705 | 24209 | 43693 |
| 1995 | 0.0000 | 0.0000 | 0 | 0 | 23958 | 48554 | 17717 | 37750 | 17717 | 37750 |
| 1996 | 0.0000 | 0.0000 | 0 | 0 | 25902 | 52103 | 16824 | 42894 | 16824 | 42894 |
| 1997 | 0.0000 | 0.0000 | 0 | 0 | 32283 | 56817 | 15886 | 47085 | 15886 | 47085 |
| 1998 | 0.0000 | 0.0000 | 0 | 0 | 37730 | 62285 | 15554 | 50579 | 15554 | 50579 |
| 1999 | 0.0000 | 0.0000 | 0 | 0 | 42367 | 68078 | 16608 | 54279 | 16608 | 54279 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : KNUTPRE2
Date and time : 30AUG94:13:33
Computation of ref. F: Simple mean, age 6 - 10
Prediction basis : F factors

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.0406 | 0.3098 | 7572 | 14500 | 35722 | 60199 | 24211 | 43705 | 24209 | 43693 |
| 1995 | 0.2000 | 0.0595 | 1347 | 3114 | 23958 | 48554 | 17717 | 37750 | 17717 | 37750 |
| 1996 | 0.2000 | 0.0595 | 1631 | 4383 | 24655 | 48629 | 15746 | 39803 | 15746 | 39803 |
| 1997 | 0.2000 | 0.0595 | 1836 | 5367 | 29704 | 48496 | 13522 | 39256 | 13522 | 39256 |
| 1998 | 0.2000 | 0.0595 | 1852 | 5766 | 33838 | 48186 | 11909 | 36926 | 11909 | 36926 |
| 1999 | 0.2000 | 0.0595 | 1734 | 5560 | 37365 | 47986 | 11906 | 34557 | 11906 | 34557 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : KNUTPRE2
Date and time : 30AUG94:13:33
Computation of ref. F: Simple mean, age 6 - 10
Prediction basis : F factors

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.0406 | 0.3098 | 7572 | 14500 | 35722 | 60199 | 24211 | 43705 | 24209 | 43693 |
| 1995 | 1.0000 | 0.2977 | 5696 | 12885 | 23958 | 48554 | 17717 | 37750 | 17717 | 37750 |
| 1996 | 1.0000 | 0.2977 | 5023 | 12679 | 20653 | 37772 | 12323 | 30252 | 12323 | 30252 |
| 1997 | 1.0000 | 0.2977 | 4059 | 10185 | 23153 | 28422 | 7644 | 20649 | 7644 | 20649 |
| 1998 | 1.0000 | 0.2977 | 3185 | 6958 | 26191 | 22750 | 5053 | 12712 | 5053 | 12712 |
| 1999 | 1.0000 | 0.2977 | 2798 | 4569 | 29609 | 21181 | 5187 | 8847 | 5187 | 8847 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : KNUTPRE2
Date and time : 30AUG94:13:33
Computation of ref. F: Simple mean, age 6 - 10
Prediction basis : F factors

| | | | | | | | 1 January | | Spawning time | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | F Factor | Reference F | Catch in numbers | Catch in weight | Stock size | Stock biomass | Sp.stock size | Sp.stock biomass | Sp.stock size | Sp.stock biomass |
| 1994 | 1.0406 | 0.3098 | 7572 | 14500 | 35722 | 60199 | 24211 | 43705 | 24209 | 43693 |
| 1995 | 0.1000 | 0.0298 | 689 | 1598 | 23958 | 48554 | 17717 | 37750 | 17717 | 37750 |
| 1996 | 0.1000 | 0.0298 | 873 | 2365 | 25264 | 50320 | 16272 | 41305 | 16272 | 41305 |
| 1997 | 0.1000 | 0.0298 | 1036 | 3082 | 30928 | 52420 | 14641 | 42942 | 14641 | 42942 |
| 1998 | 0.1000 | 0.0298 | 1102 | 3548 | 35620 | 54577 | 13571 | 43103 | 13571 | 43103 |
| 1999 | 0.1000 | 0.0298 | 1083 | 3694 | 39567 | 56687 | 13961 | 43080 | 13961 | 43080 |
| Unit | - | - | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes | Thousands | Tonnes |

Notes: Run name : KNUTPRE2
Date and time : 30AUG94:13:33
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 - areas: 05, 00, 06 and 07. (in 1000 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 | *) | *) | *) | *) | *) | *) | *) | *) | *) |

| 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|
| 40 | 49 | 42 | 38 | 33 | 28 | 26 | 31 | 22 | 17 |

| 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|
| 24 | 25 | 35 | 43 **) |

*) No data.
**) Provisional data

B) Russian/USSR data of Murman cod in Division I. (in 1000 tonnes).

| 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 1993.

| | Age (year) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Sveinsgrunnen 0529 | | | 46.0 | 52.3 | 68.0 | 57.0 | 78.0 | | | | | 107.0 | | | |
| Vesterålen (1) | | 26.0 | 42.3 | 50.5 | 56.7 | 64.7 | 68.3 | 80.0 | | | | | | | |
| Outer Lofoten (2) | | 40.0 | | 55.7 | 59.0 | 59.0 | | | | | 96.0 | | | | |
| Outer Vestfjord (3) | | | | 48.5 | 69.0 | 80.0 | 85.5 | | 94.0 | | | | | | |
| Trænabanken (4) | | | | 57.7 | 70.9 | 76.3 | 83.7 | | | | | | | | |
| Outer Helgeland (5) | | | | | 67.0 | | | | | | | | | | |
| Vågsfjord 0541 | 21.2 | 25.9 | 36.5 | 47.6 | 54.5 | 61.3 | 70.5 | 89.5 | | 112.0 | | | | | |
| Andfjord 0525 | 17.0 | 26.5 | 40.6 | 51.0 | 58.9 | 64.8 | 72.3 | 87.3 | | 100.0 | | | | | |
| Kvæfjord 0542 | 17.8 | 30.9 | 44.1 | 47.2 | 55.2 | 57.0 | | | | | | 124.0 | | | |
| Sortlandssundet (6) | 17.3 | 25.3 | 37.3 | 46.6 | 53.3 | 57.8 | 63.0 | 73.0 | 96.0 | | 110.0 | 93.0 | | | |
| Ofotfjord 0037 | | 32.6 | 38.2 | 44.1 | 45.0 | | | | | | | | | | |
| Tysfjord 0038 | 21.9 | 31.6 | 41.1 | 47.4 | 57.5 | 49.0 | | | | | | | | | |
| Vestfjord (7) | 16.5 | 31.8 | 42.6 | 52.5 | 63.4 | 68.4 | 81.6 | | | | | 94.0 | | | |
| Sagfjord 0045 | | | | | | | | | | | | | | | |
| Folla 0051 | | 32.9 | 38.0 | 48.6 | 60.4 | 60.5 | 72.0 | 86.0 | | | | | | | |
| Skjerstadfjord 0054 | | | 48.0 | 60.4 | 55.0 | | | | | | | | | | |
| Bodø 0053 | 21.3 | 28.2 | 38.6 | 46.8 | 51.3 | 53.0 | 55.7 | | | | | | | | |
| Fleinvær 0005 | | | | 53.5 | 71.3 | 77.9 | 83.3 | 92.5 | | | | | | | |
| Støtt 0632 | 25.0 | 38.0 | 45.7 | 44.7 | 54.7 | | | | | | | | | | |
| Rana 0634 | 19.3 | 26.3 | 34.4 | 45.5 | 50.1 | 66.2 | 65.0 | | | | | | | | |
| Dønna 0633 | 18.0 | 33.0 | 47.0 | 61.0 | 59.8 | 72.4 | | | | | | | | | |
| Velfjord 0635 | | | 44.5 | 59.4 | 61.2 | 64.0 | | | | | | | | | |
| Bindal 0636 | | | | | | | | | | | | | | | |

(1) includes 0518,0519,0520,0523,0524

(2) includes 0506,0507,0508,0509,0512,0513,0514,0515

(3) includes 0503,0504,0052

(4) includes 0501,0502,0624,0625,0626,0628,0629,3705,3706,3709

Tot. N= 1260 otholits

(5) includes 0617,0622,0623,0627,0630,0631

(6) includes 0516,0543

(7) includes 0009,0010,0011,0044,0046,0048

Table 8.3 Weight (gram) at age (year) for Coastal cod from the survey during the autumn of 1993.

| | Age (year) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Sveinsgrunnen 0529 | | | 850 | 1543 | 2890 | 1925 | 4430 | | | | | 10830 | | | |
| Vesterålen (1) | | 173 | 748 | 1276 | 1893 | 2887 | 3140 | 5105 | | | | | | | |
| Outer Lofoten (2) | | 630 | | 1805 | 1935 | 1785 | | | | | 8970 | | | | |
| Outer Vestfjord (3) | | | | 1980 | 3655 | 6055 | 6452 | | 9405 | | | | | | |
| Trænabanken (4) | | | | 1782 | 3312 | 4353 | 5828 | | | | | | | | |
| Outer Helgeland (5) | | | | | 2335 | | | | | | | | | | |
| Vågsfjord 0541 | 85 | 160 | 482 | 1015 | 1586 | 2125 | 3352 | 7992 | | 12540 | | | | | |
| Andfjord 0525 | 45 | 179 | 662 | 1251 | 2034 | 2776 | 4089 | 7401 | | 9475 | | | | | |
| Kvæfjord 0542 | 51 | 302 | 881 | 1069 | 1774 | 1838 | | | | | | 14920 | | | |
| Sortlandssundet (6) | 46 | 161 | 566 | 1056 | 1515 | 1827 | 2693 | 3585 | 8770 | | 11400 | 10140 | | | |
| Ofotfjord 0037 | | 342 | 520 | 854 | 818 | | | | | | | | | | |
| Tysfjord 0038 | 96 | 295 | 696 | 1047 | 1865 | 1050 | | | | | | | | | |
| Vestfjord (7) | 39 | 311 | 768 | 1467 | 2509 | 3287 | 5400 | | | | | 8360 | | | |
| Sagfjord 0045 | | | | | | | | | | | | | | | |
| Folla 0051 | | 311 | 552 | 1124 | 2067 | 2204 | 3235 | 6473 | | | | | | | |
| Skjerstadfjord 0054 | | | 1010 | 2030 | 1805 | | | | | | | | | | |
| Bodø 0053 | 97 | 217 | 578 | 977 | 1379 | 1524 | 1620 | | | | | | | | |
| Fleinvær 0005 | | | | 1360 | 3452 | 4563 | 5502 | 7523 | | | | | | | |
| Støtt 0632 | 135 | 570 | 833 | 888 | 1714 | | | | | | | | | | |
| Rana 0634 | 59 | 175 | 371 | 868 | 1133 | 2518 | 2260 | | | | | | | | |
| Dønna 0633 | 45 | 348 | 1066 | 2143 | 2074 | 3576 | | | | | | | | | |
| Velfjord 0635 | | | 798 | 2132 | 2015 | 2587 | | | | | | | | | |
| Bindal 0636 | | | | | | | | | | | | | | | |

(1) includes 0518,0519,0520,0523,0524

(2) includes 0506,0507,0508,0509,0512,0513,0514,0515

(3) includes 0503,0504,0052

(4) includes 0501,0502,0624,0625,0626,0628,0629,3705,3706,3709

Tot. N= 1260 otholits

(5) includes 0618,0622,0623,0627,0630,0631

(6) includes 0516,0543

(7) includes 0009,0010,0011,0044,0046,0048

Table 8.4 Percent maturity at age (year) for Coastal cod from the survey during the autumn of 1993.

| | Age (year) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15+ | N |
| Sveinsgrunnen 0529 | | | | | 0 | 100 | 100 | 100 | 100 | | | | | 100 | | | 8 |
| Vesterålen (1) | | | | 0 | 33 | 77 | 93 | 100 | 100 | 100 | | | | | | | 93 |
| Outer Lofoten (2) | | | | 0 | | 100 | 100 | 100 | | | | | 100 | | | | 12 |
| Outer Vestfjord (3) | | | | | | 100 | 100 | 100 | 100 | | 100 | | | | | | 7 |
| Trænabanken (4) | | | | | | 100 | 100 | 100 | 100 | | | | | | | | 17 |
| Outer Helgeland (5) | | | | | | | 100 | | | | | | | | | | 1 |
| Vågsfjord 0541 | | | 0 | 0 | 36 | 85 | 96 | 100 | 100 | 100 | | 100 | | | | | 94 |
| Andfjord 0525 | | | 0 | 0 | 40 | 67 | 100 | 98 | 100 | 100 | | 100 | | | | | 143 |
| Kvæfjord 0542 | | | 0 | 0 | 100 | 92 | 100 | 100 | | | | | | 100 | | | 47 |
| Sortlandssundet (6) | | | 0 | 8 | 33 | 98 | 96 | 100 | 100 | 100 | 100 | | 100 | 100 | | | 183 |
| Ofotfjord 0037 | | | | 5 | 0 | 33 | 50 | | | | | | | | | | 46 |
| Tysfjord 0038 | | | 0 | 40 | 63 | 90 | 100 | 100 | | | | | | | | | 43 |
| Vestfjord (7) | | | 0 | 3 | 29 | 63 | 86 | 74 | 100 | | | | | 100 | | | 249 |
| Sagfjord 0045 | | | | | | | | | | | | | | | | | |
| Folla 0051 | | | | 71 | 75 | 88 | 94 | 100 | 100 | 100 | | | | | | | 58 |
| Skjerstadfjord 0059 | | | | | 0 | 80 | 100 | | | | | | | | | | 8 |
| Bodø 0053 | | | 0 | 33 | 100 | 100 | 100 | 100 | 100 | | | | | | | | 69 |
| Fleinvær 0005 | | | | | | 100 | 100 | 100 | 100 | 75 | | | | | | | 28 |
| Støtt 0632 | | | 0 | 0 | 100 | 67 | 100 | | | | | | | | | | 15 |
| Rana 0634 | | | 0 | 0 | 0 | 77 | 81 | 100 | 100 | | | | | | | | 89 |
| Dønna 0633 | | | 0 | 0 | 43 | 100 | 75 | 100 | | | | | | | | | 33 |
| Velfjord 0635 | | | | | 0 | 100 | 100 | 100 | | | | | | | | | 17 |
| Bindal 0636 | | | | | | | | | | | | | | | | | |

(1) includes 0518,0519,0520,0523,0524

(2) includes 0506,0507,0508,0509,0512,0513,0514,0515

(3) includes 0503,0504,0052

(4) includes 0501,0502,0624,0625,0626,0628,0629,3705,3706,3709

Tot. N = 1260 otholits

(5) includes 0617,0622,0623,0627,0630,0631

(6) includes 0516,0543

(7) includes 0009,0010,0011,0044,0046,0048

Table 8.5 Biomass of Coastal cod and North-East Arctic cod in each year class from the coastal survey during the autumn 1993.

| Total biomass of cod (tonnes) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Totalt |
| Sveinsgrunnen 0529 | 0 | 0 | 0 | 35 | 192 | 569 | 220 | 184 | 0 | 0 | 0 | 0 | 450 | 0 | 0 | 0 | 1651 |
| Vesterålen (1) | 0 | 16 | 532 | 2472 | 4010 | 5156 | 3359 | 3295 | 208 | 227 | 0 | 358 | 1614 | 0 | 0 | 0 | 21248 |
| Ytre Lofoten (2) | 1 | 0 | 73 | 148 | 1440 | 3246 | 2806 | 2253 | 647 | 0 | 1787 | 3208 | 2439 | 1348 | 0 | 0 | 19396 |
| Ytre Vestfjorden (3) | 0 | 0 | 0 | 0 | 418 | 1251 | 1824 | 1689 | 634 | 840 | 200 | 0 | 483 | 0 | 0 | 0 | 7339 |
| Trænabanken (4) | 0 | 0 | 0 | 240 | 671 | 3324 | 1638 | 3623 | 0 | 0 | 1350 | 1563 | 1794 | 1438 | 0 | 0 | 15640 |
| Ytre Helgeland (5) | 0 | 0 | 0 | 0 | 0 | 2720 | 1982 | 2050 | 2050 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8802 |
| Vågsfjord 0541 | 0 | 13 | 19 | 91 | 334 | 460 | 221 | 133 | 101 | 0 | 53 | 0 | 0 | 0 | 0 | 0 | 1424 |
| Andfjord 0525 | 0 | 0 | 7 | 30 | 288 | 760 | 1732 | 984 | 303 | 65 | 180 | 0 | 0 | 0 | 0 | 0 | 4349 |
| Kvæfjord 0542 | 0 | 6 | 25 | 53 | 134 | 236 | 123 | 22 | 0 | 0 | 51 | 0 | 71 | 0 | 0 | 0 | 721 |
| Sortlandssundet (6) | 0 | 2 | 27 | 68 | 340 | 693 | 101 | 36 | 92 | 40 | 0 | 99 | 47 | 0 | 0 | 0 | 1544 |
| Ofotfjorden 0037 | 0 | 2 | 38 | 79 | 160 | 68 | 68 | 48 | 42 | 0 | 33 | 0 | 0 | 0 | 0 | 0 | 539 |
| Tysfjorden 0038 | 1 | 18 | 18 | 68 | 169 | 187 | 30 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 542 |
| Vestfjorden (7) | 1 | 5 | 23 | 607 | 2338 | 3398 | 3490 | 2888 | 1136 | 1900 | 1799 | 434 | 0 | 0 | 0 | 0 | 18020 |
| Sagfjord 0045 | 1 | 1 | 0 | 0 | 21 | 39 | 17 | 0 | 32 | 0 | 0 | 55 | 50 | 0 | 75 | 0 | 291 |
| Folla 0051 | 0 | 0 | 9 | 18 | 72 | 127 | 64 | 12 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 350 |
| Skjærdtadfjorden 0054 | 0 | 12 | 5 | 32 | 86 | 15 | 16 | 78 | 73 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 355 |
| Bodø 0053 | 0 | 4 | 34 | 53 | 229 | 449 | 80 | 250 | 0 | 0 | 112 | 0 | 0 | 0 | 0 | 0 | 1210 |
| Fleinvær 0005 | 0 | 2 | 0 | 0 | 248 | 2430 | 1819 | 1881 | 1714 | 297 | 500 | 902 | 0 | 0 | 0 | 1316 | 11108 |
| Støtt 0632 | 0 | 5 | 52 | 123 | 205 | 533 | 248 | 149 | 0 | 0 | 0 | 396 | 0 | 0 | 0 | 0 | 1710 |
| Rana 0634 | 0 | 1 | 4 | 7 | 26 | 42 | 39 | 5 | 5 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 136 |
| Dønna 0633 | 0 | 2 | 59 | 232 | 757 | 273 | 529 | 0 | 0 | 182 | 0 | 0 | 0 | 0 | 0 | 0 | 2033 |
| Velfjord 0635 | 0 | 2 | 29 | 86 | 353 | 482 | 132 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 1201 |
| Bindalen 0636 | 0 | 0 | 3 | 10 | 34 | 12 | 24 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 91 |
| Total | 5 | 91 | 957 | 4452 | 12524 | 26472 | 20563 | 19645 | 7084 | 3602 | 6069 | 7014 | 6948 | 2786 | 75 | 1416 | 119701 |

Table 8.6 Biomass of Coastal cod in each year class from the coastal survey during the autumn 1993.

| Total biomass of Coastal cod (tonnes) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Totalt |
| Sveinsgrunnen 0529 | 0 | 0 | 0 | 35 | 192 | 569 | 220 | 184 | 0 | 0 | 0 | 0 | 352 | 0 | 0 | 0 | 1508 |
| Vesterålen (1) | 0 | 16 | 532 | 2472 | 3759 | 4673 | 2099 | 2471 | 150 | 130 | 0 | 223 | 1006 | 0 | 0 | 0 | 16262 |
| Ytre Lofoten (2) | 1 | 0 | 73 | 148 | 1440 | 3246 | 2806 | 1903 | 573 | 0 | 1276 | 2625 | 1870 | 1079 | 0 | 0 | 17457 |
| Ytre Vestfjorden (3) | 0 | 0 | 0 | 0 | 418 | 1251 | 1824 | 1689 | 533 | 578 | 138 | 0 | 355 | 0 | 0 | 0 | 6481 |
| Trænabanken (4) | 0 | 0 | 0 | 240 | 671 | 3324 | 1638 | 3623 | 0 | 0 | 750 | 938 | 1086 | 822 | 0 | 0 | 12562 |
| Ytre Helgeland (5) | 0 | 0 | 0 | 0 | 0 | 2720 | 1798 | 1684 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7553 |
| Vågsfjord 0541 | 0 | 13 | 19 | 91 | 334 | 460 | 221 | 133 | 91 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 1309 |
| Andfjord 0525 | 0 | 0 | 7 | 30 | 288 | 722 | 1700 | 984 | 253 | 45 | 124 | 0 | 0 | 0 | 0 | 0 | 3817 |
| Kvæfjord 0542 | 0 | 6 | 25 | 53 | 134 | 236 | 123 | 0 | 0 | 0 | 34 | 0 | 51 | 0 | 0 | 0 | 585 |
| Sortlandssundet (6) | 0 | 2 | 27 | 68 | 340 | 693 | 101 | 36 | 84 | 31 | 0 | 85 | 38 | 0 | 0 | 0 | 1435 |
| Ofotfjorden 0037 | 0 | 2 | 38 | 79 | 144 | 68 | 62 | 39 | 36 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 463 |
| Tysfjorden 0038 | 1 | 18 | 18 | 68 | 130 | 83 | 15 | 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 403 |
| Vestfjorden (7) | 1 | 5 | 23 | 607 | 2300 | 3251 | 2652 | 2682 | 803 | 1069 | 1012 | 264 | 0 | 0 | 0 | 0 | 14129 |
| Sagfjord 0045 | 1 | 1 | 0 | 0 | 19 | 32 | 13 | 0 | 27 | 0 | 0 | 41 | 36 | 0 | 70 | 0 | 244 |
| Folla 0051 | 0 | 0 | 9 | 18 | 72 | 127 | 64 | 12 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 319 |
| Skjærdtadfjorden 0054 | 0 | 12 | 5 | 32 | 86 | 15 | 0 | 0 | 51 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 239 |
| Bodø 0053 | 0 | 4 | 34 | 53 | 229 | 430 | 80 | 187 | 0 | 0 | 73 | 0 | 0 | 0 | 0 | 0 | 1022 |
| Fleinvær 0005 | 0 | 2 | 0 | 0 | 248 | 2430 | 1819 | 1881 | 1225 | 172 | 290 | 564 | 0 | 0 | 0 | 789 | 9051 |
| Støtt 0632 | 0 | 5 | 52 | 123 | 205 | 533 | 226 | 123 | 0 | 0 | 0 | 308 | 0 | 0 | 0 | 0 | 1491 |
| Rana 0634 | 0 | 1 | 4 | 7 | 26 | 42 | 39 | 5 | 4 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 124 |
| Dønna 0633 | 0 | 2 | 59 | 232 | 757 | 273 | 529 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 1805 |
| Velfjord 0635 | 0 | 2 | 29 | 86 | 353 | 482 | 132 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 928 |
| Bindalen 0636 | 0 | 0 | 3 | 10 | 34 | 12 | 24 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 70 |
| Total | 5 | 91 | 957 | 4452 | 12232 | 25356 | 18233 | 14635 | 5816 | 2353 | 3965 | 5161 | 4912 | 1982 | 67 | 1007 | 99257 |

Table 8.7 Numbers of Coastal cod in each year class from the coastal survey during the autumn 1993.

| | Total number of Coastal cod (x1000) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Totalt |
| Sveinsgrunnen 0529 | 0 | 0 | 0 | 42 | 125 | 208 | 83 | 42 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 494 |
| Vesterålen (1) | 43 | 383 | 1701 | 3189 | 2551 | 1926 | 691 | 478 | 31 | 24 | 0 | 26 | 106 | 0 | 0 | 0 | 9339 |
| Ytre Lofoten (2) | 1049 | 0 | 117 | 233 | 1049 | 1748 | 1049 | 492 | 103 | 0 | 166 | 286 | 179 | 93 | 0 | 0 | 6188 |
| Ytre Vestfjorden (3) | 0 | 0 | 0 | 0 | 204 | 307 | 409 | 307 | 43 | 70 | 35 | 0 | 38 | 0 | 0 | 0 | 1309 |
| Trænabanken (4) | 125 | 0 | 0 | 125 | 376 | 1004 | 376 | 627 | 0 | 0 | 70 | 75 | 76 | 72 | 0 | 0 | 2519 |
| Ytre Helgeland (5) | 0 | 0 | 0 | 0 | 0 | 1262 | 572 | 260 | 271 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2167 |
| Vågsfjord 0541 | 0 | 165 | 114 | 216 | 372 | 296 | 93 | 38 | 11 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1205 |
| Andfjord 0525 | 0 | 11 | 43 | 54 | 248 | 369 | 635 | 259 | 36 | 7 | 15 | 0 | 0 | 0 | 0 | 0 | 1515 |
| Kvæfjord 0542 | 0 | 100 | 81 | 81 | 138 | 143 | 52 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 499 |
| Sortlandssundet (6) | 0 | 37 | 166 | 138 | 345 | 460 | 55 | 14 | 21 | 4 | 0 | 8 | 4 | 0 | 0 | 0 | 1168 |
| Ofotfjorden 0037 | 0 | 22 | 129 | 178 | 181 | 53 | 24 | 11 | 8 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 548 |
| Tysfjorden 0038 | 376 | 194 | 61 | 97 | 131 | 59 | 12 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 794 |
| Vestfjorden (7) | 1028 | 106 | 142 | 992 | 2161 | 1898 | 1131 | 658 | 175 | 100 | 60 | 22 | 0 | 0 | 0 | 0 | 7223 |
| Sagfjord 0045 | 164 | 17 | 0 | 0 | 22 | 24 | 10 | 0 | 4 | 0 | 0 | 3 | 3 | 0 | 4 | 0 | 222 |
| Folla 0051 | 15 | 7 | 29 | 33 | 66 | 62 | 29 | 4 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 231 |
| Skjærdtadfjorden 0054 | 0 | 128 | 26 | 60 | 43 | 9 | 0 | 0 | 12 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 217 |
| Bodø 0053 | 26 | 39 | 157 | 92 | 236 | 314 | 52 | 59 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 863 |
| Fleinvær 0005 | 0 | 57 | 0 | 0 | 172 | 738 | 401 | 344 | 164 | 33 | 33 | 72 | 0 | 0 | 0 | 34 | 1815 |
| Støtt 0632 | 0 | 38 | 115 | 154 | 231 | 346 | 105 | 32 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 939 |
| Rana 0634 | 0 | 10 | 23 | 16 | 30 | 30 | 16 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 118 |
| Dønna 0633 | 0 | 42 | 189 | 273 | 420 | 126 | 147 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 1082 |
| Velfjord 0635 | 0 | 11 | 82 | 131 | 267 | 251 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 619 |
| Bindalen 0636 | 0 | 2 | 8 | 12 | 19 | 6 | 7 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 42 |
| Total | 2825 | 1369 | 3183 | 6115 | 9429 | 11529 | 6100 | 3028 | 920 | 278 | 406 | 529 | 449 | 172 | 4 | 45 | 41114 |

**Table 8.8** Spawning stock (in tonnes) of Coastal cod in each year class from the survey during the autumn of 1993.

| Biomass of Coastal cod (tonnes) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Total |
| Sveinsgrunnen 0529 | 0 | 0 | 0 | 0 | 134,7 | 568,8 | 220,3 | 184,1 | 0 | 0 | 0 | 0 | 352 | 0 | 0 | 0 | 1.460 |
| Vesterålen (1) | 0 | 0 | 0 | 0 | 1241 | 3598 | 1952 | 2471 | 150 | 130 | 0 | 223 | 1006 | 0 | 0 | 0 | 10.771 |
| Ytre Lofoten (2) | 0 | 0 | 0 | 0 | 719,9 | 3246 | 2806 | 1903 | 573 | 0 | 1276 | 2625 | 1870 | 1079 | 0 | 0 | 16.098 |
| Ytre Vestfjorden (3) | 0 | 0 | 0 | 0 | 208,8 | 1251 | 1824 | 1689 | 533 | 578 | 138 | 0 | 355 | 0 | 0 | 0 | 6.577 |
| Trænabanken (4) | 0 | 0 | 0 | 0 | 335,3 | 3324 | 1638 | 3623 | 0 | 0 | 750 | 938 | 1086 | 822 | 0 | 0 | 12.515 |
| Ytre Helgeland (5) | 0 | 0 | 0 | 0 | 0 | 0 | 1798 | 1684 | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.242 |
| Vågsfjord 0541 | 0 | 0 | 0 | 0 | 120,3 | 391 | 212,4 | 132,5 | 90,6 | 0 | 39,8 | 0 | 0 | 0 | 0 | 0 | 987 |
| Andfjord 0525 | 0 | 0 | 0 | 0 | 115,3 | 483,6 | 1700 | 964 | 253 | 44,9 | 124 | 0 | 0 | 0 | 0 | 0 | 3.685 |
| Kvæfjord 0542 | 0 | 0 | 0 | 0 | 134,1 | 217,3 | 122,9 | 0 | 0 | 0 | 33,9 | 0 | 51,1 | 0 | 0 | 0 | 559 |
| Sortlandssundet (6) | 0 | 0 | 0 | 5,46 | 112 | 679,5 | 96,9 | 36,18 | 84 | 31,4 | 0 | 85,4 | 38,1 | 0 | 0 | 0 | 1.169 |
| Ofotfjorden 0037 | 0 | 0 | 0 | 3,94 | 36,07 | 22,6 | 30,84 | 31,41 | 36,1 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 183 |
| Tysfjorden 0038 | 0 | 0 | 0 | 27 | 81,85 | 74,98 | 15,13 | 39,36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 238 |
| Vestfjorden (7) | 0 | 0 | 0 | 18,2 | 667 | 2048 | 2281 | 1984 | 803 | 1069 | 1012 | 264 | 0 | 0 | 0 | 0 | 10.148 |
| Sagfjord 0045 | 0 | 0 | 0 | 0 | 11,47 | 28,4 | 13,3 | 0 | 27,4 | 0 | 0 | 41,3 | 36,4 | 0 | 70 | 0 | 229 |
| Folla 0051 | 0 | 0 | 0 | 12,6 | 53,94 | 111,7 | 60,62 | 11,83 | 42,3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 293 |
| Skjærstadfjorden 0054 | 0 | 0 | 0 | 0 | 43,2 | 12,28 | 0 | 0 | 51,3 | 20,3 | 0 | 0 | 0 | 0 | 0 | 0 | 127 |
| Bodø 0053 | 0 | 0 | 0 | 17,5 | 228,8 | 430,2 | 79,83 | 187,4 | 0 | 0 | 72,6 | 0 | 0 | 0 | 0 | 0 | 1.016 |
| Fleinvær 0005 | 0 | 0 | 0 | 0 | 123,8 | 2430 | 1819 | 1881 | 1225 | 172 | 290 | 564 | 0 | 0 | 0 | 789 | 9.293 |
| Støtt 0632 | 0 | 0 | 0 | 0 | 204,7 | 357,4 | 225,8 | 123,3 | 0 | 0 | 0 | 308 | 0 | 0 | 0 | 0 | 1.219 |
| Rana 0634 | 0 | 0 | 0 | 0 | 12,99 | 32,53 | 31,95 | 4,88 | 4,23 | 2,29 | 2,74 | 0 | 0 | 0 | 0 | 0 | 92 |
| Dønna 0633 | 0 | 0 | 0 | 0 | 325,4 | 272,5 | 396,8 | 0 | 0 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 1.121 |
| Velfjord 0635 | 0 | 0 | 0 | 0 | 176,4 | 482,5 | 132,2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 855 |
| Bindalen 0636 | 0 | 0 | 0 | 0 | 10,16 | 6,101 | 17,76 | 0 | 0 | 4,89 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| Total | 0 | 0 | 0 | 84,7 | 5097 | 20068 | 17476 | 16950 | 5634 | 2179 | 3761 | 5048 | 4794 | 1900 | 70 | 853 | 83.915 |

**Table 8.9** Spawning stock (in numbers) of Coastal cod in each year class from the survey during the autumn of 1993.

| Numbers of mature Coastal cod (1.000) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Total |
| Sveinsgrunnen 0529 | 0 | 0 | 0 | 0 | 87,29 | 207,8 | 83,2 | 41,6 | 0 | 0 | 0 | 0 | 32,5 | 0 | 0 | 0 | 452 |
| Vesterålen (1) | 0 | 0 | 0 | 0 | 841,8 | 1483 | 642,5 | 478,3 | 30,7 | 24,3 | 0 | 26,5 | 106 | 0 | 0 | 0 | 3.633 |
| Ytre Lofoten (2) | 0 | 0 | 0 | 0 | 524,4 | 1748 | 1049 | 492,2 | 103 | 0 | 166 | 286 | 179 | 93,2 | 0 | 0 | 4.641 |
| Ytre Vestfjorden (3) | 0 | 0 | 0 | 0 | 102,2 | 306,7 | 409 | 306,7 | 43 | 70,3 | 35,1 | 0 | 37,6 | 0 | 0 | 0 | 1.311 |
| Trænabanken (4) | 0 | 0 | 0 | 0 | 188,2 | 1004 | 376,4 | 627,3 | 0 | 0 | 69,7 | 75,3 | 76 | 71,7 | 0 | 0 | 2.488 |
| Ytre Helgeland (5) | 0 | 0 | 0 | 0 | 0 | 0 | 572,5 | 259,6 | 271 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.103 |
| Vågsfjord 0541 | 0 | 0 | 0 | 0 | 133,9 | 251,5 | 89,27 | 38,08 | 11,5 | 0 | 3,15 | 0 | 0 | 0 | 0 | 0 | 527 |
| Andfjord 0525 | 0 | 0 | 0 | 0 | 99,27 | 247,3 | 635,5 | 253,9 | 36,1 | 7,45 | 14,9 | 0 | 0 | 0 | 0 | 0 | 1.294 |
| Kvæfjord 0542 | 0 | 0 | 0 | 0 | 138,1 | 131,5 | 52,39 | 0 | 0 | 0 | 3,18 | 0 | 3,45 | 0 | 0 | 0 | 329 |
| Sortlandssundet (6) | 0 | 0 | 0 | 11,1 | 114 | 451,2 | 52,99 | 13,8 | 21 | 3,58 | 0 | 7,98 | 3,75 | 0 | 0 | 0 | 679 |
| Ofotfjorden 0037 | 0 | 0 | 0 | 8,91 | 45,13 | 17,64 | 12,13 | 8,827 | 7,68 | 0 | 2,93 | 0 | 0 | 0 | 0 | 0 | 103 |
| Tysfjorden 0038 | 0 | 0 | 0 | 38,8 | 82,3 | 53,38 | 12,15 | 9,45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 196 |
| Vestfjorden (7) | 0 | 0 | 0 | 29,8 | 626,6 | 1196 | 972,6 | 486,9 | 175 | 99,7 | 59,8 | 21,6 | 0 | 0 | 0 | 0 | 3.668 |
| Sagfjord 0045 | 0 | 0 | 0 | 0 | 13,48 | 21,6 | 10,13 | 0 | 3,57 | 0 | 0 | 3,19 | 3,03 | 0 | 4 | 0 | 59 |
| Folla 0051 | 0 | 0 | 0 | 23,4 | 49,36 | 54,7 | 27,54 | 3,7 | 6,52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 165 |
| Skjærstadfjorden 0054 | 0 | 0 | 0 | 0 | 21,25 | 6,8 | 0 | 0 | 12 | 4,53 | 0 | 0 | 0 | 0 | 0 | 0 | 45 |
| Bodø 0053 | 0 | 0 | 0 | 30,3 | 235,8 | 313,9 | 52,4 | 58,95 | 0 | 0 | 8,48 | 0 | 0 | 0 | 0 | 0 | 700 |
| Fleinvær 0005 | 0 | 0 | 0 | 0 | 85,78 | 738,1 | 401,1 | 343,8 | 164 | 33,2 | 33,2 | 71,6 | 0 | 0 | 0 | 34 | 1.905 |
| Støtt 0632 | 0 | 0 | 0 | 0 | 230,6 | 231,8 | 105,1 | 31,91 | 0 | 0 | 0 | 29,9 | 0 | 0 | 0 | 0 | 629 |
| Rana 0634 | 0 | 0 | 0 | 0 | 15,24 | 23 | 13,33 | 1,829 | 1,08 | 0,44 | 0,44 | 0 | 0 | 0 | 0 | 0 | 55 |
| Dønna 0633 | 0 | 0 | 0 | 0 | 180,7 | 126,1 | 110,3 | 0 | 0 | 14,5 | 0 | 0 | 0 | 0 | 0 | 0 | 432 |
| Velfjord 0635 | 0 | 0 | 0 | 0 | 133,5 | 250,7 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3,4 | 437 |
| Bindalen 0636 | 0 | 0 | 0 | 0 | 5,644 | 2,823 | 4,94 | 0 | 0 | 0,56 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| Total | 0 | 0 | 0 | 142 | 3955 | 8867 | 5733 | 3457 | 887 | 259 | 397 | 522 | 441 | 165 | 4 | 38 | 24.867 |

**Table 8.10** Coastal cod. SHOT forecast.

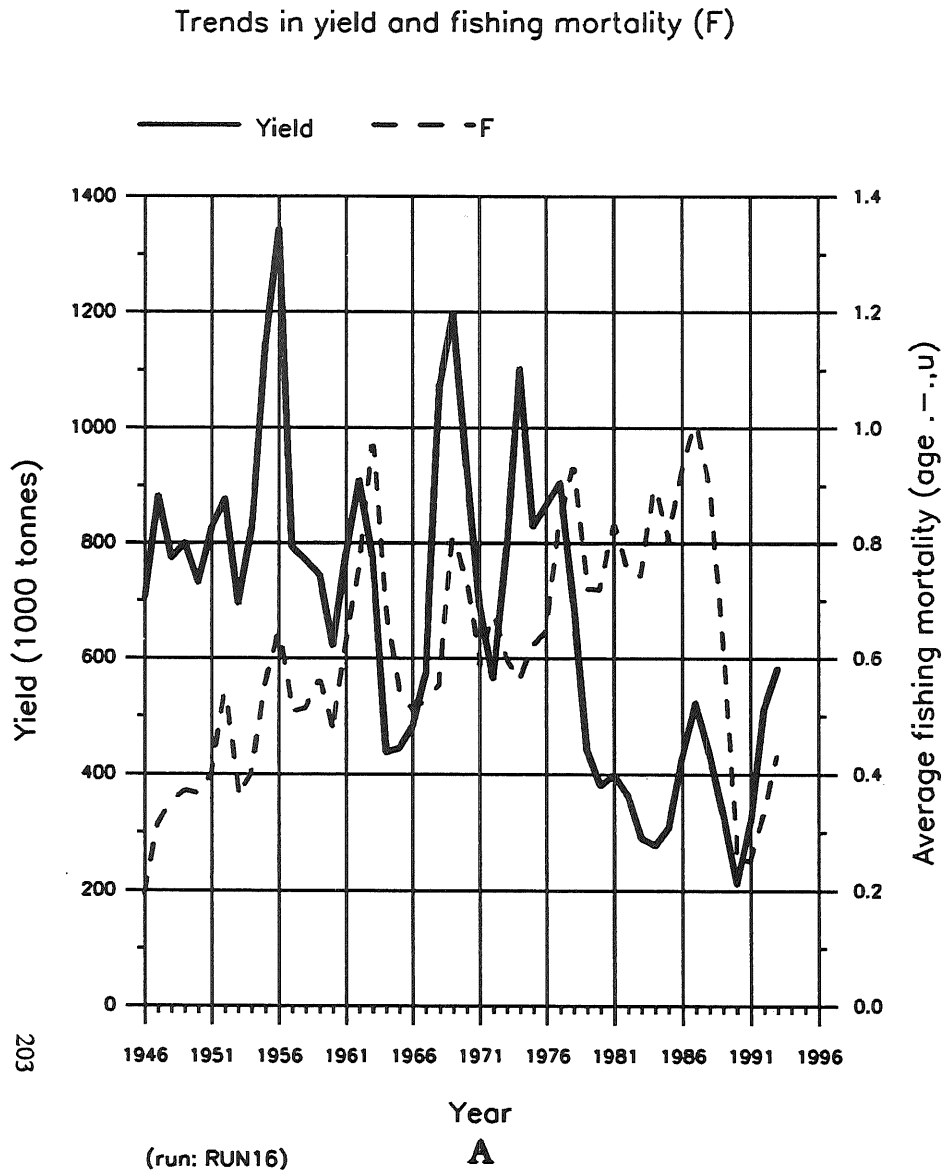
Coastal cod AFWG 1994 SHOT forecast spreadsheet version 3
Sub-area IIa

running recruitment weights G=0.41 (CM1994/Assess:2), M=0.2
older 0.25 G-M = 0.21
centra 0.50 exp(d) 1.23
younge 0.25 ex (d/2) 1.11

| 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 | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978 | | 1 | | 0.60 | 0.56 | | | | 0 | | | 0.8 |
| 1979 | | 1 | 1 | 0.60 | 0.56 | 0 | | | 0 | | | 0.8 |
| 1980 | 40 | 1 | 1 | 0.60 | 0.56 | 66 | | | 66 | | | 0.8 |
| 1981 | 49 | 1 | 1 | 0.60 | 0.56 | 44 | | | 81 | | | 0.8 |
| 1982 | 42 | 1 | 1 | 0.60 | 0.56 | 24 | 37 | 50 | 70 | 82 | 50 | 0.8 |
| 1983 | 38 | 1 | 1 | 0.60 | 0.56 | 24 | 33 | 44 | 63 | 73 | 44 | 0.8 |
| 1984 | 33 | 1 | 1 | 0.50 | 0.68 | 14 | 32 | 40 | 66 | 67 | 33 | 0.6 |
| 1985 | 28 | 1 | 1 | 0.40 | 0.79 | 5 | 29 | 37 | 70 | 74 | 30 | 0.45 |
| 1986 | 26 | 1 | 1 | 0.33 | 0.87 | 5 | 25 | 32 | 80 | 81 | 26 | 0.35 |
| 1987 | 31 | 1 | 1 | 0.32 | 0.88 | 26 | 23 | 30 | 97 | 92 | 29 | 0.34 |
| 1988 | 22 | 1 | 1 | 0.20 | 1.01 | -46 | 23 | 35 | 109 | 109 | 22 | 0.2 |
| 1989 | 17 | 1 | 1 | 0.13 | 1.09 | -56 | 16 | 25 | 135 | 127 | 16 | 0.12 |
| 1990 | 24 | 1 | 1 | 0.14 | 1.08 | 41 | 10 | 20 | 177 | 158 | 21 | 0.13 |
| 1991 | 25 | 1 | 1 | 0.12 | 1.11 | -13 | 12 | 28 | 216 | 204 | 24 | 0.11 |
| 1992 | 41 | 1 | 1 | 0.17 | 1.04 | 86 | 12 | 28 | 236 | 238 | 41 | 0.17 |
| 1993 | 35 | 1 | 1 | 0.14 | 1.08 | -70 | 12 | 45 | 259 | 260 | 35 | 0.13 |
| 1994 | 43 | 1 | 1 | 0.15 | 1.07 | 38 | 12 | 40 | 297 | 294 | 43 | 0.14 |
| 1995 | | 1 | 1 | 0.15 | 1.06 | | 12 | 47 | | 327 | 51 | 0.15 |

Figure 3.1.A and B

# FISH STOCK SUMMARY
## STOCK: Cod in the North–East Arctic (Fishing Areas I and II)
## 30–8–1994



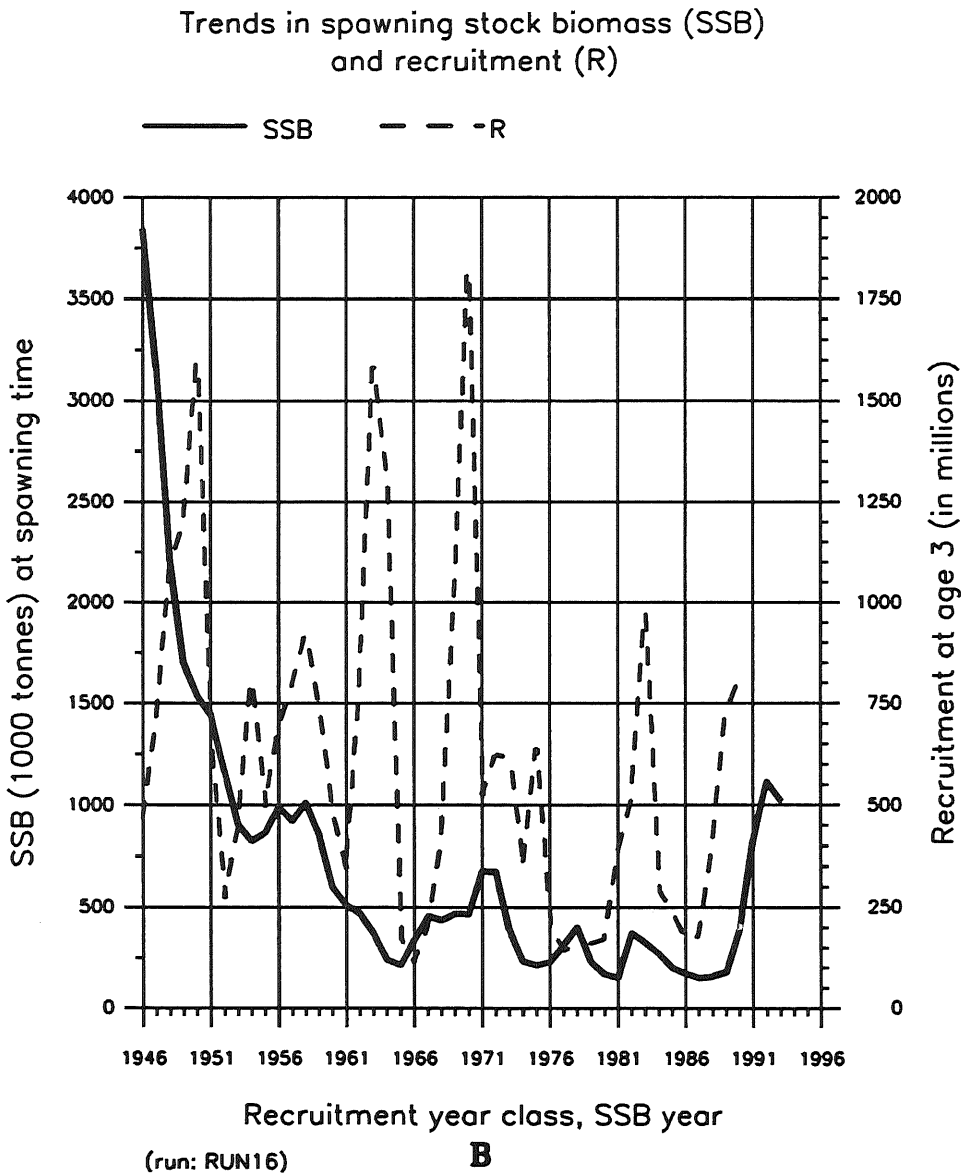
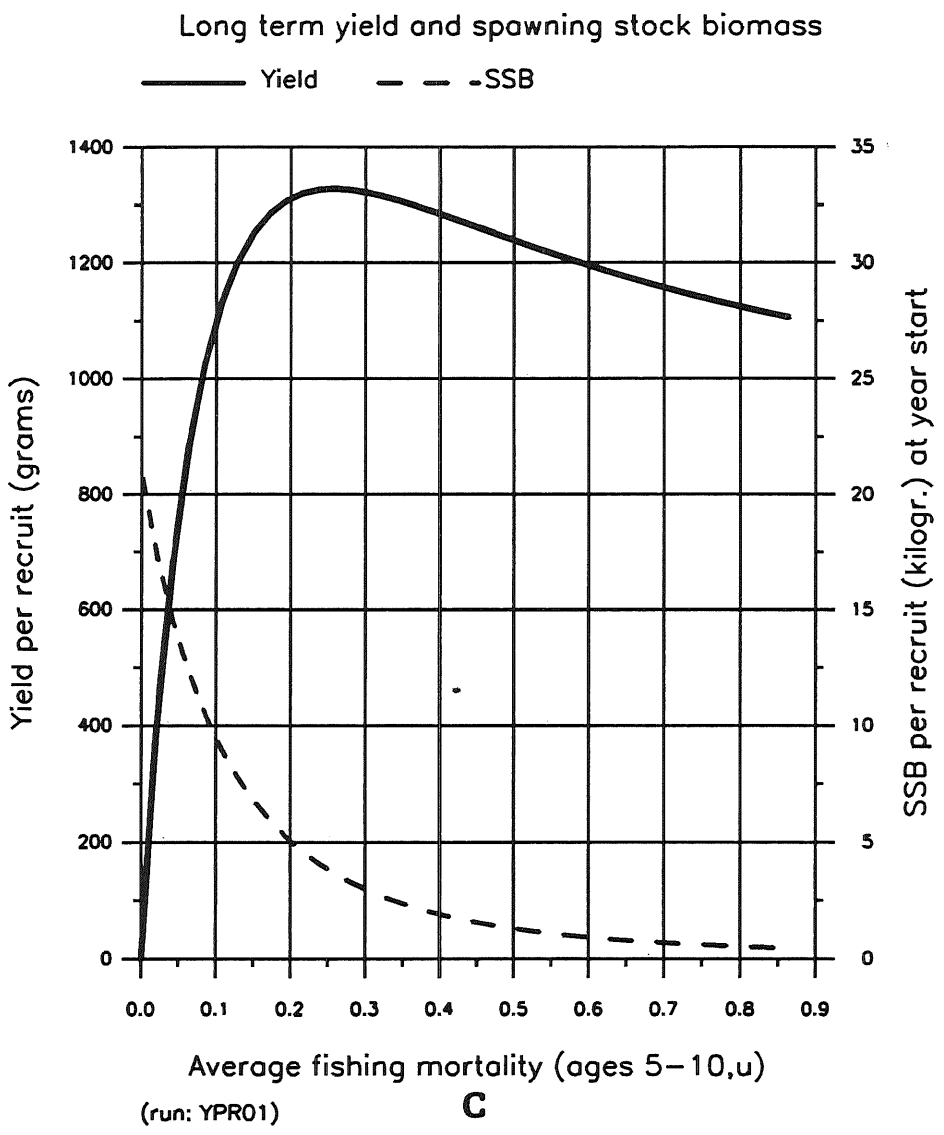



Figure 3.1.C and D

# FISH STOCK SUMMARY

## STOCK: Cod in the North–East Arctic (Fishing Areas I and II)

## 31–8–1994



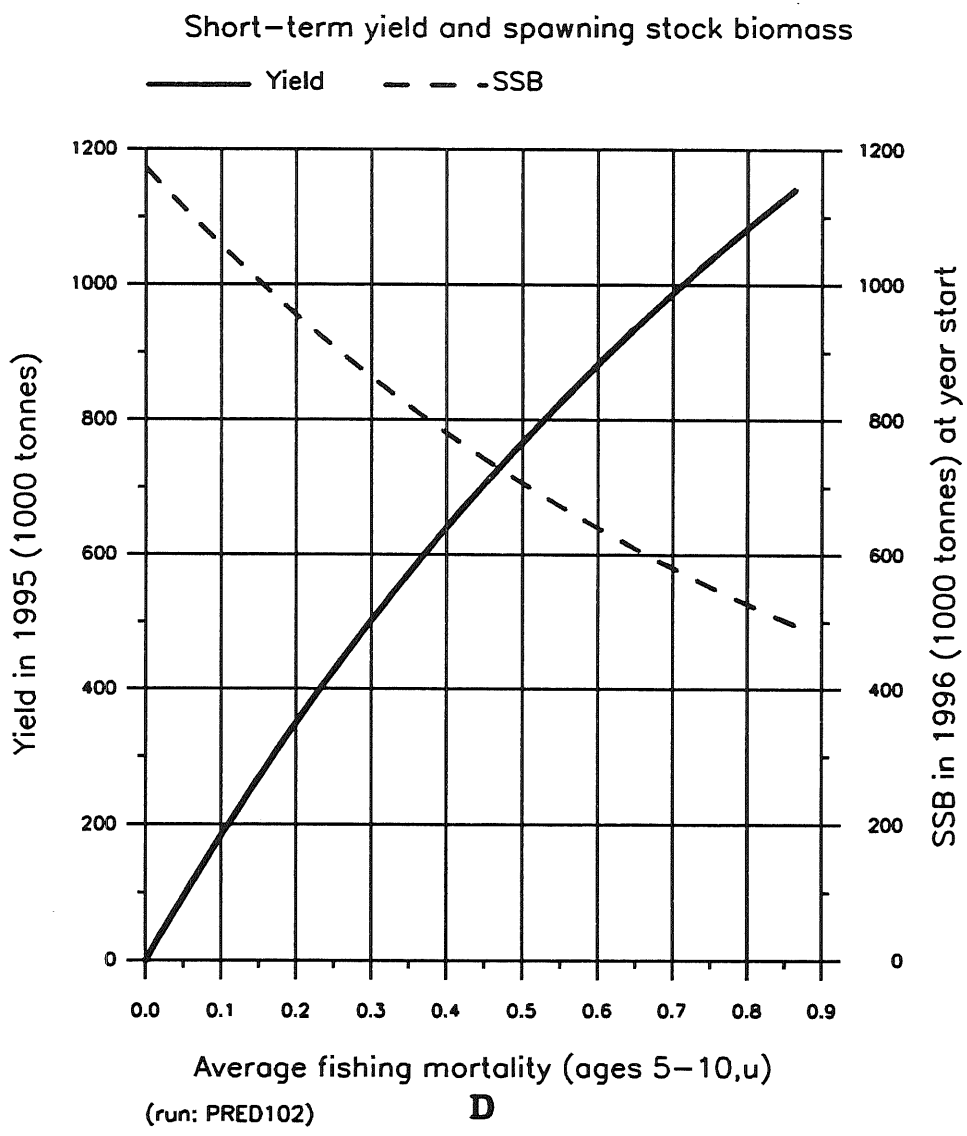
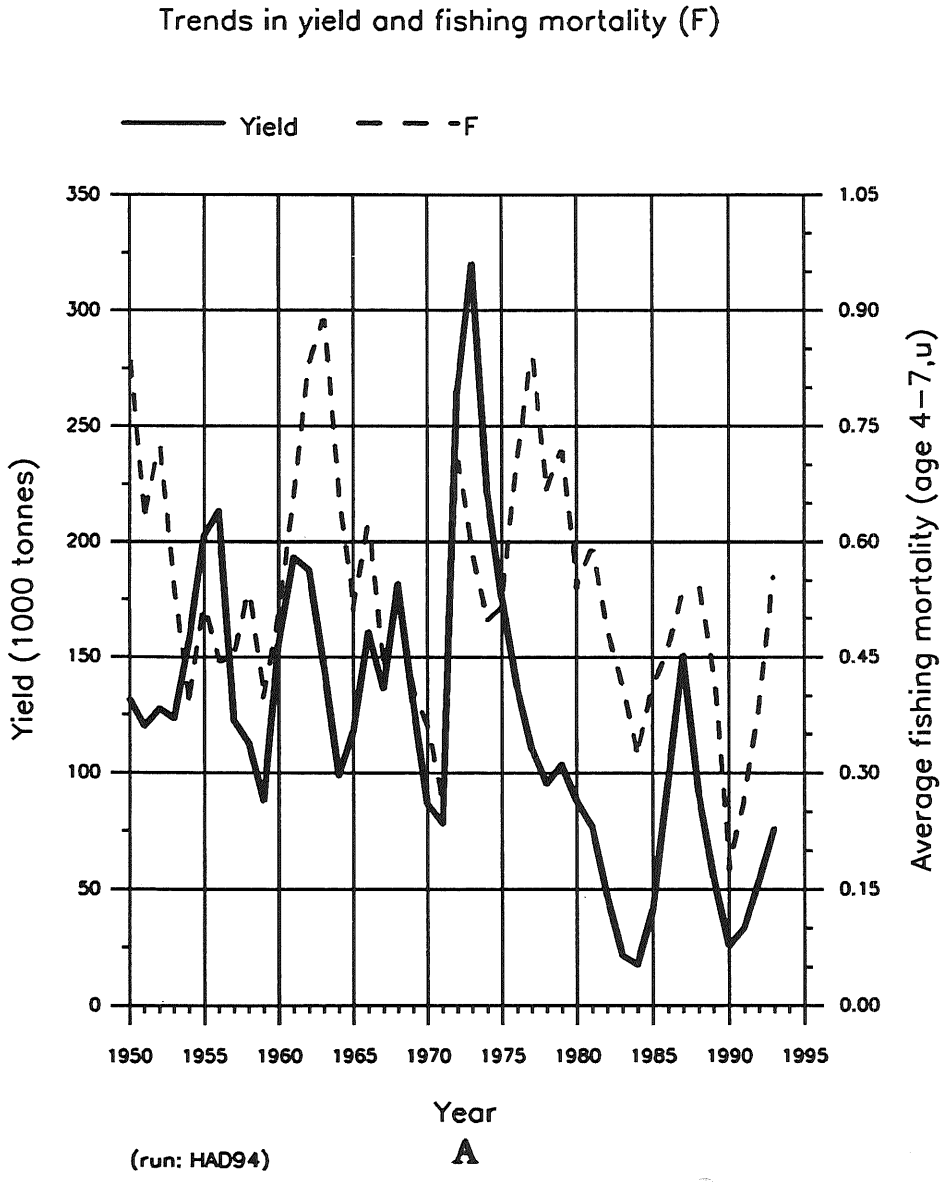



Figure 4.1.A and B

# FISH STOCK SUMMARY

## STOCK: Haddock in the North–East Arctic (Fishing Areas I and II)

## 31–8–1994



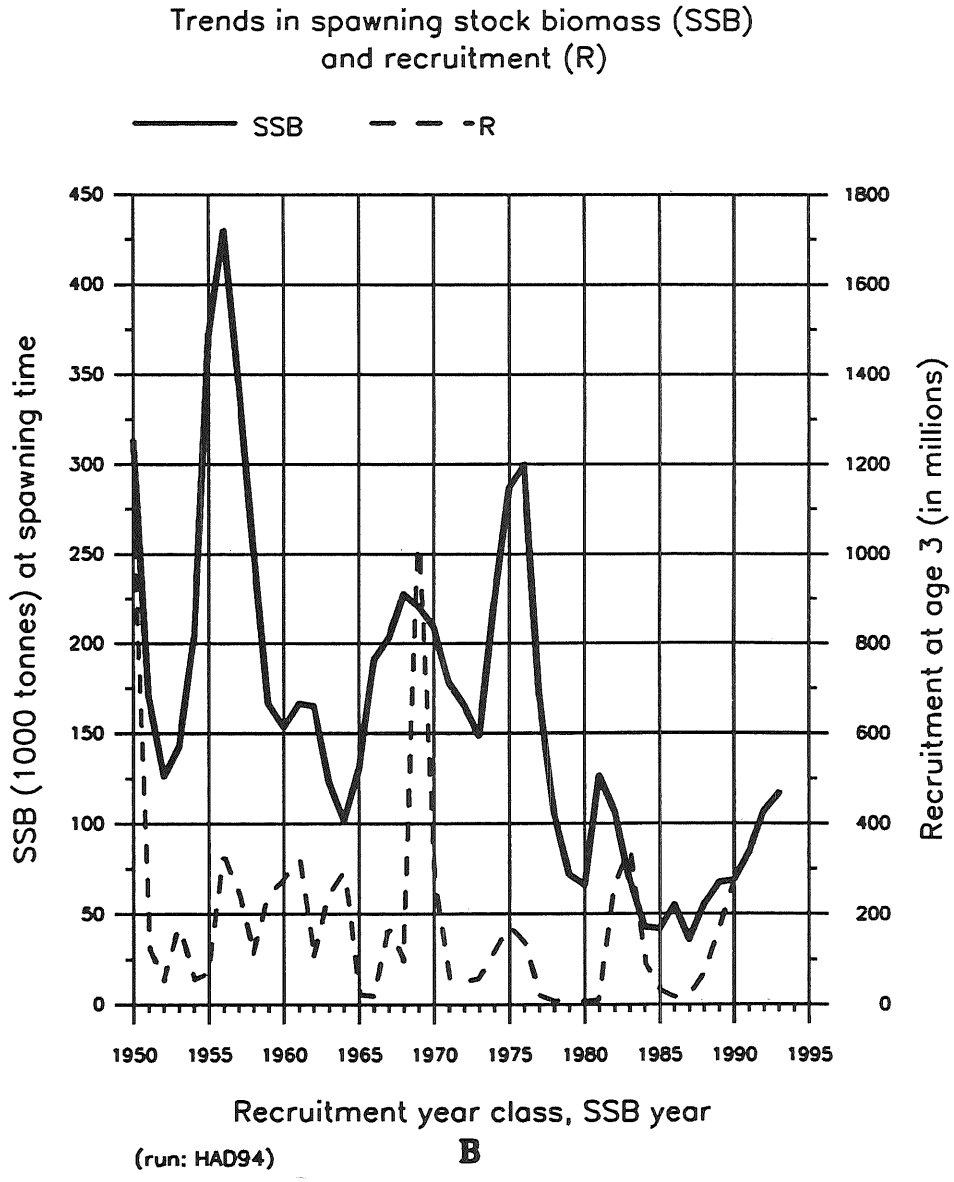
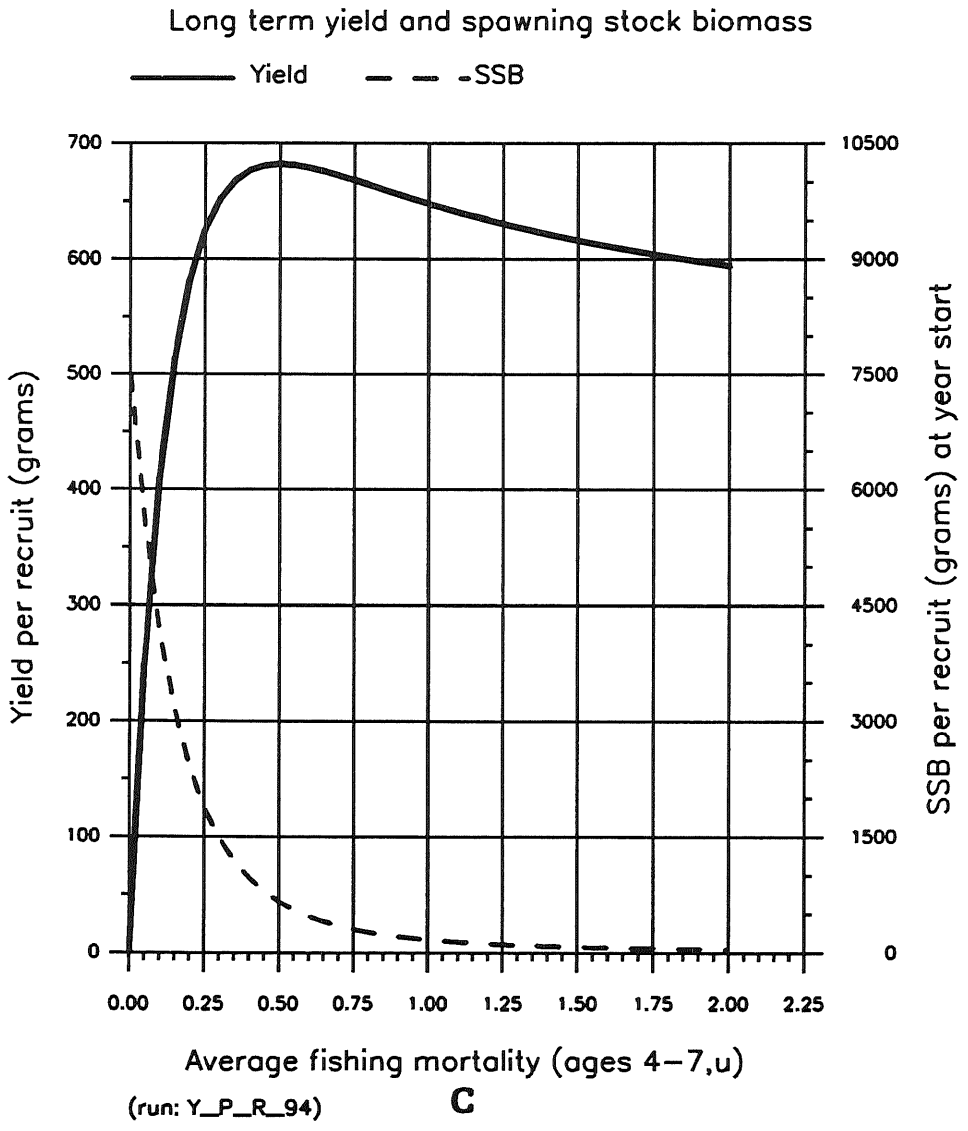



Figure 4.1.C and D

# FISH STOCK SUMMARY

## STOCK: Haddock in the North–East Arctic (Fishing Areas I and II)

## 31–8–1994



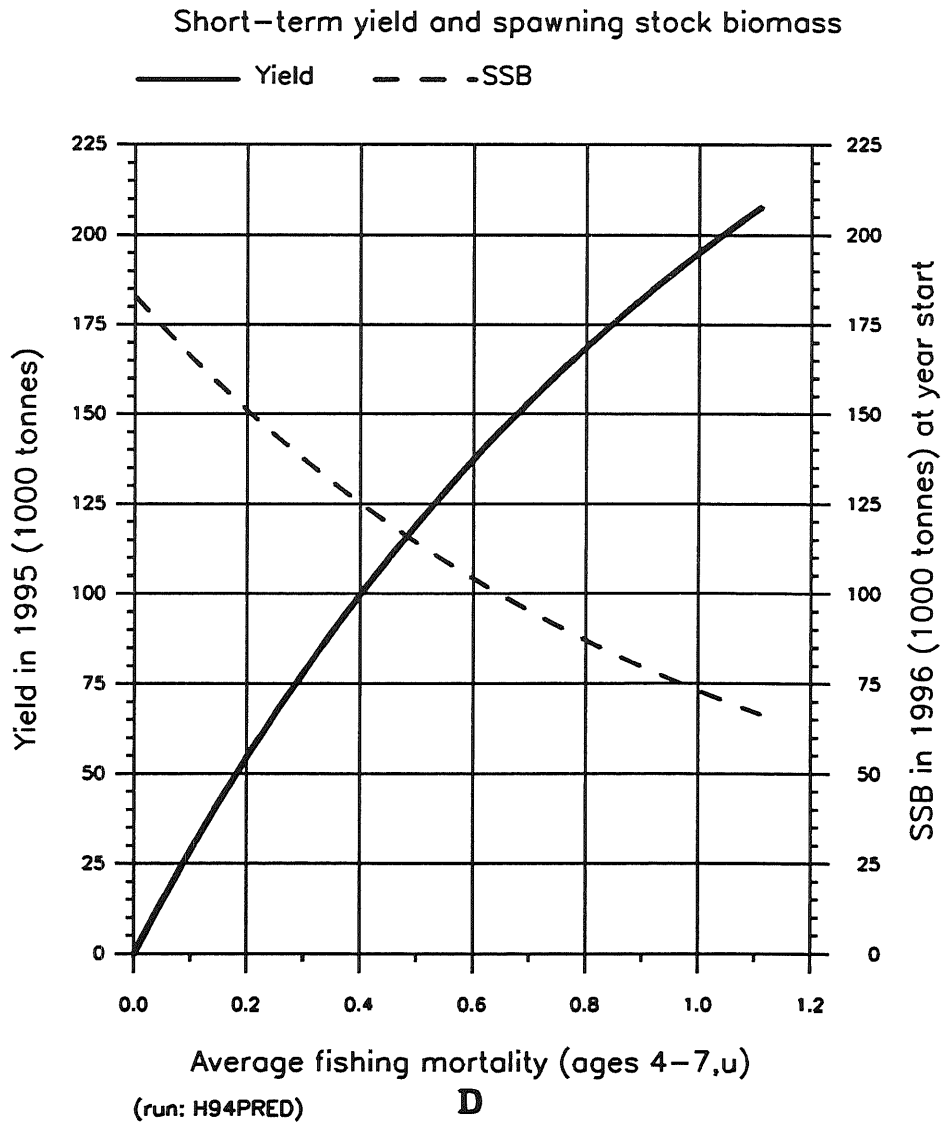



Figure 5.1

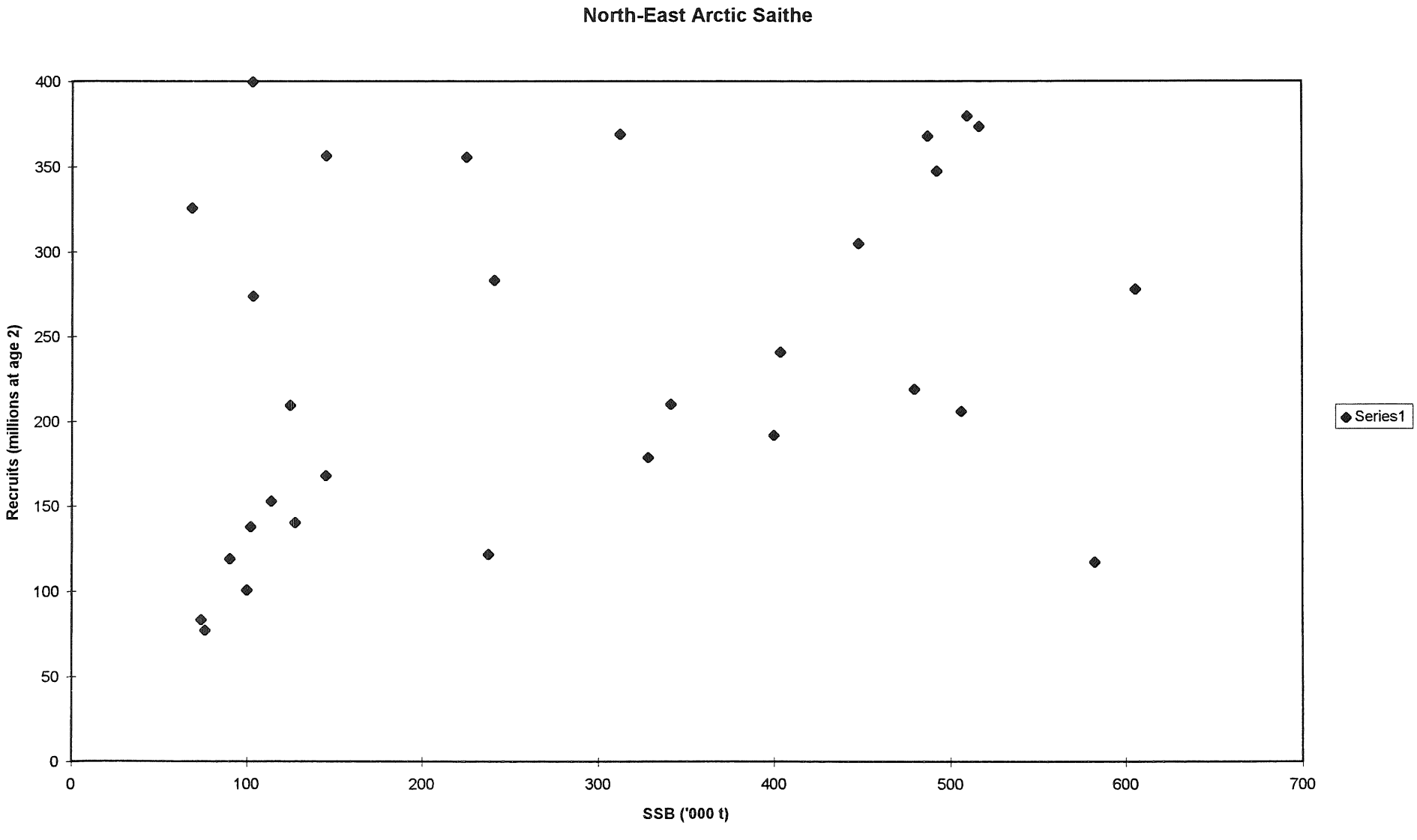

North-East Arctic Saithe
Recruits (millions at age 2)
SSB ('000 t)
0
50
100
150
200
250
300
350
400
0
100
200
300
400
500
600
700
Series1

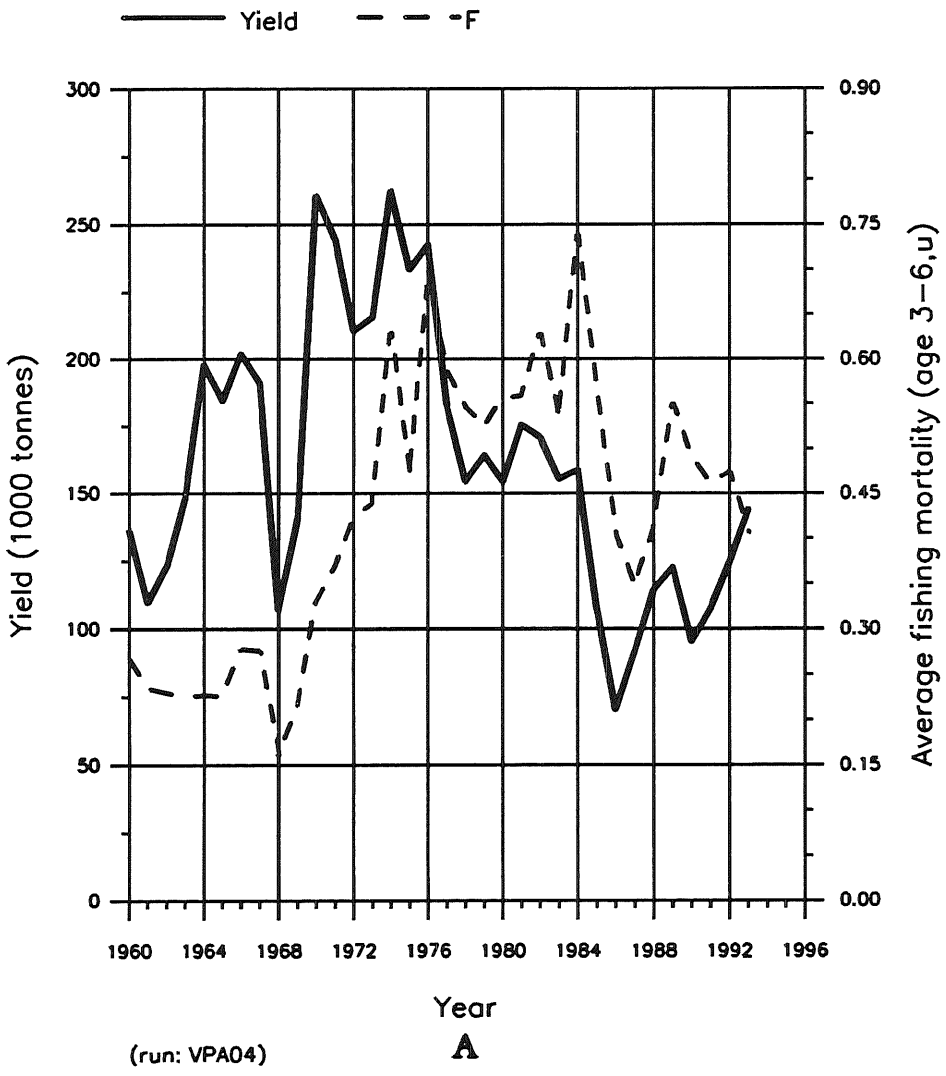
Figure 5.2.A and B

# FISH STOCK SUMMARY

## STOCK: Saithe in the North–East Arctic (Fishing Areas I and II)

## 30–8–1994

Trends in yield and fishing mortality (F)




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

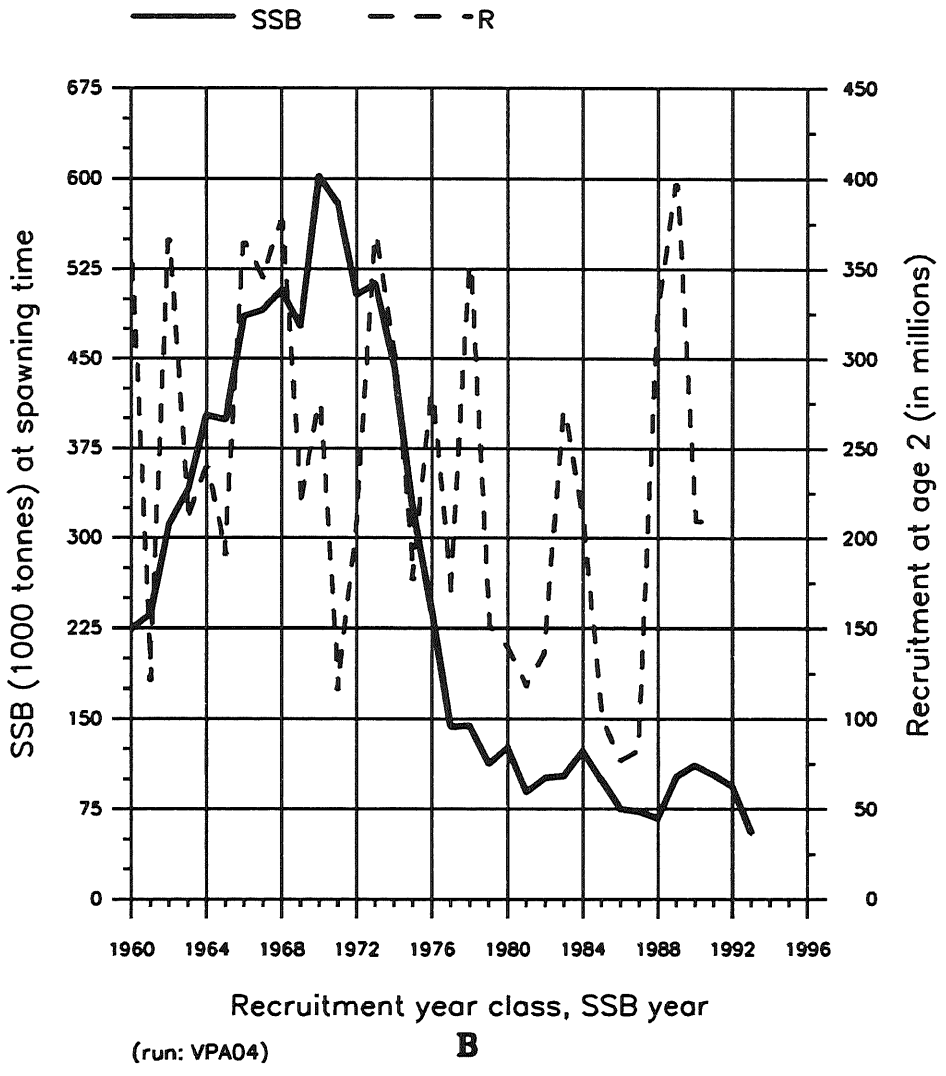
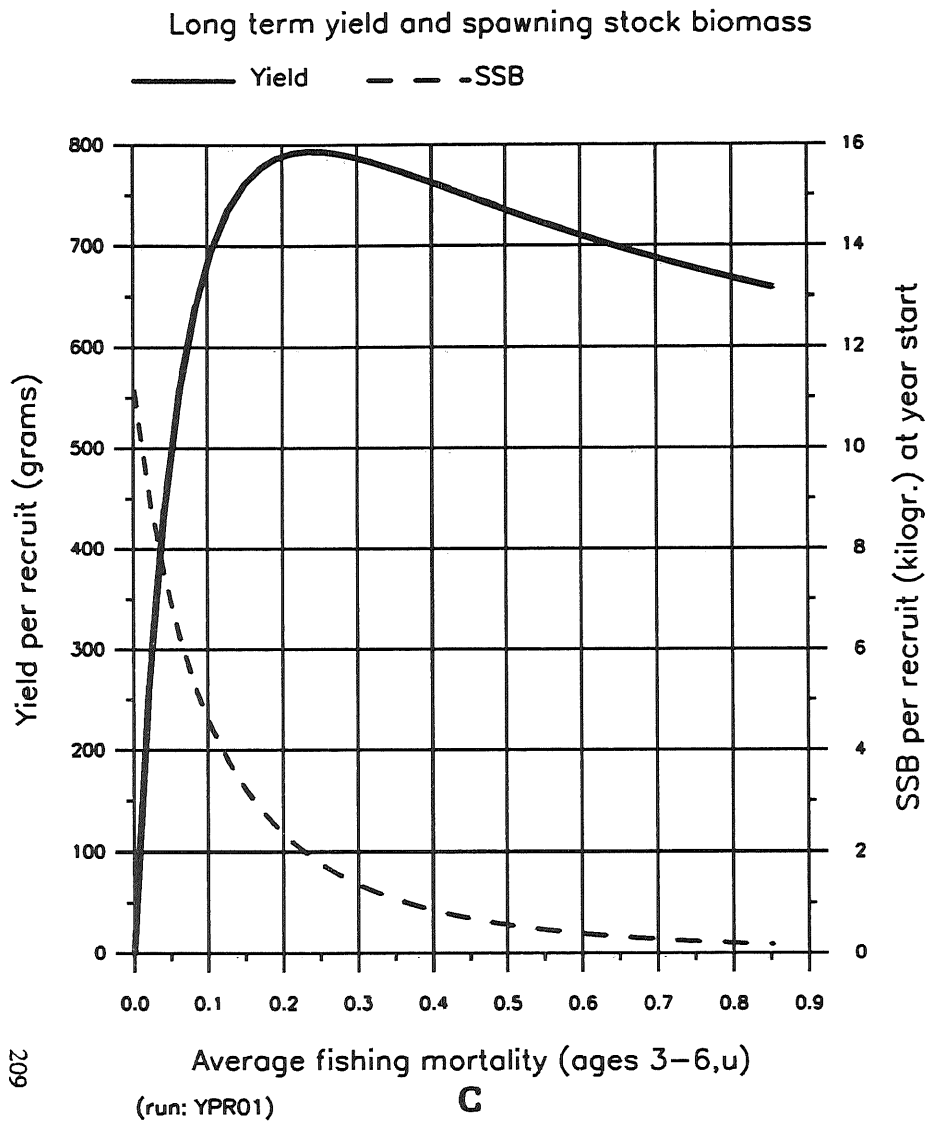


Figure 5.2.C and D

# FISH STOCK SUMMARY

## STOCK: Saithe in the North–East Arctic (Fishing Areas I and II)

## 28–8–1994



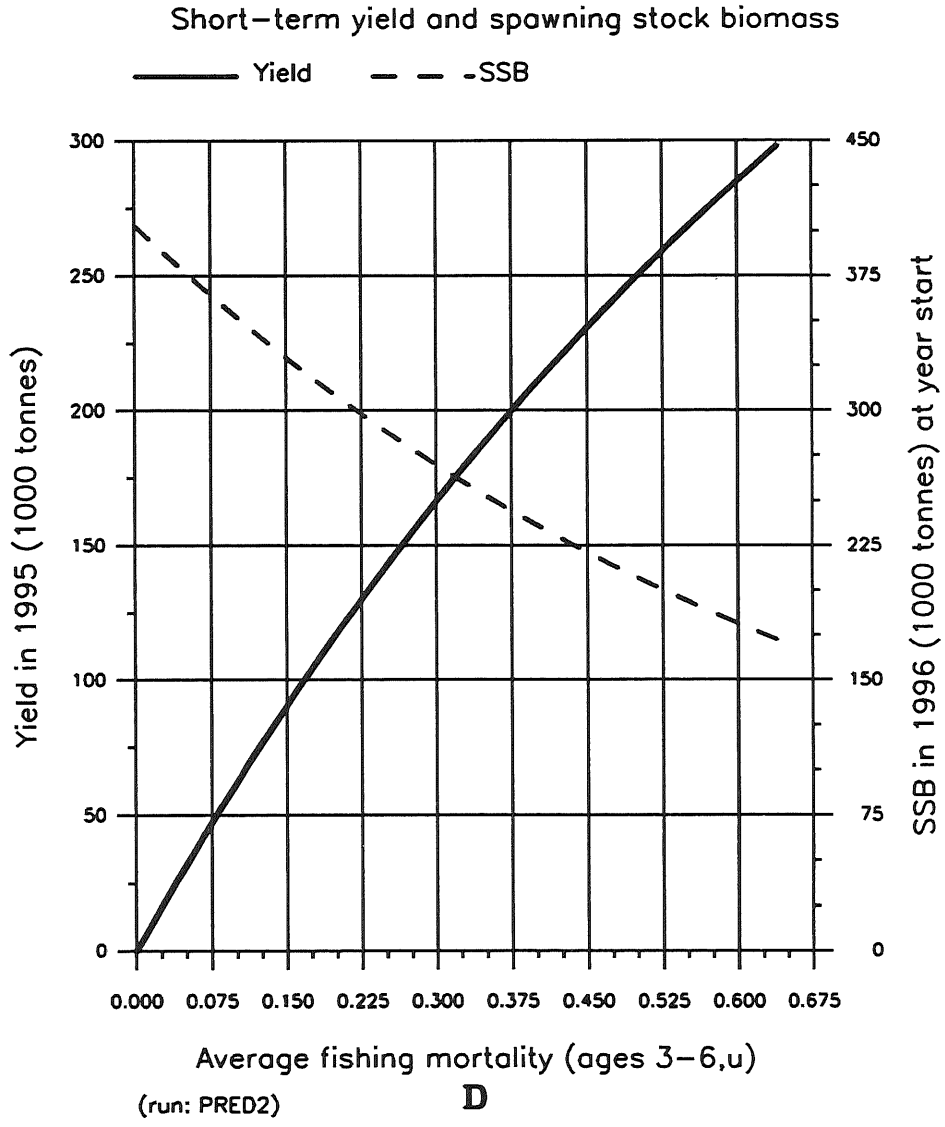
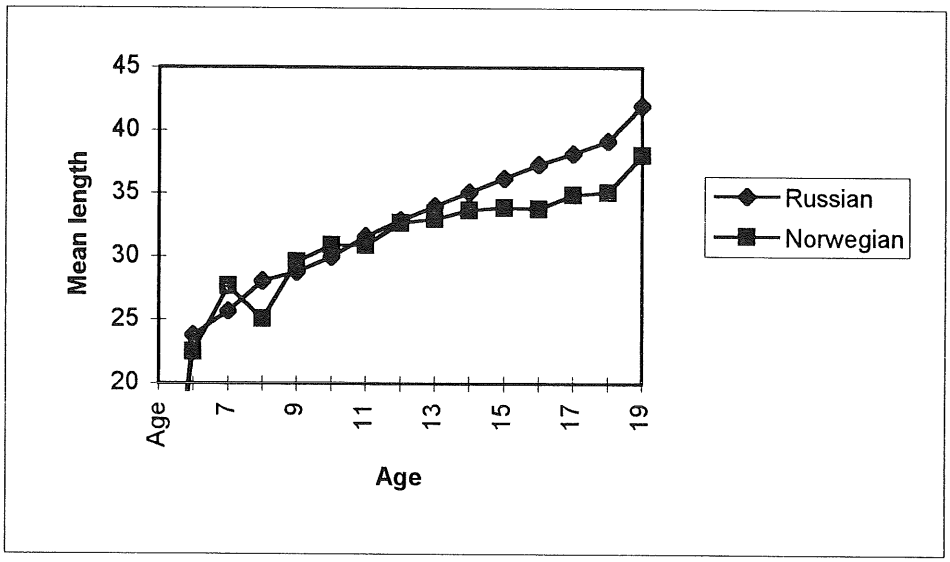



**Figure 6.1** Comparison of Russian and Norwegian mean-length-at-age and mean-weight-at-age for *Sebastes mentella*.



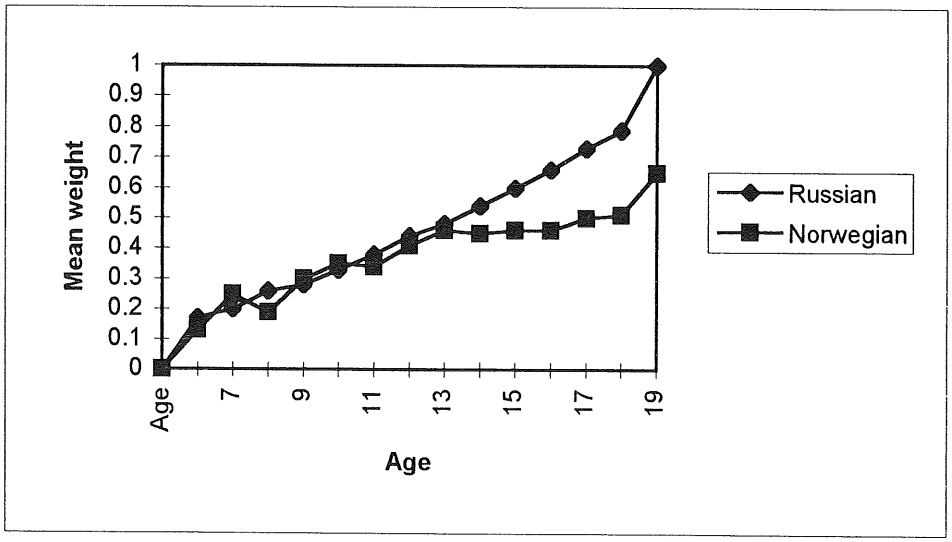



**Figure 6.2** *Sebastes mentella* in ICES Sub-areas I and II.

**Sebastes mentella in ICES Sub-areas I and II.**

Retrospective analysis of XSA

Input values: 2 years, 5 ages, and shrinkage = 2.0

| | | Starting year for the XSA-run | | | |
|---|---|---|---|---|---|
| Year | 1993 | 1992 | 1991 | 1990 | |
| 1975 | 0.44 | 0.44 | 0.44 | 0.44 | |
| 1976 | 0.67 | 0.67 | 0.67 | 0.67 | |
| 1977 | 0.6 | 0.6 | 0.6 | 0.6 | |
| 1978 | 0.27 | 0.27 | 0.27 | 0.28 | |
| 1979 | 0.27 | 0.27 | 0.27 | 0.28 | |
| 1980 | 0.25 | 0.25 | 0.25 | 0.25 | |
| 1981 | 0.31 | 0.31 | 0.31 | 0.31 | |
| 1982 | 0.44 | 0.44 | 0.44 | 0.44 | |
| 1983 | 0.68 | 0.68 | 0.68 | 0.69 | |
| 1984 | 0.81 | 0.81 | 0.81 | 0.84 | |
| 1985 | 0.67 | 0.68 | 0.67 | 0.76 | |
| 1986 | 0.29 | 0.3 | 0.29 | 0.36 | |
| 1987 | 0.12 | 0.13 | 0.12 | 0.16 | |
| 1988 | 0.17 | 0.18 | 0.17 | 0.25 | |
| 1989 | 0.2 | 0.21 | 0.19 | 0.24 | |
| 1990 | 0.29 | 0.31 | 0.25 | 0.28 | |
| 1991 | 0.33 | 0.36 | 0.29 | | |
| 1992 | 0.11 | 0.13 | | | |
| 1993 | 0.08 | | | | |

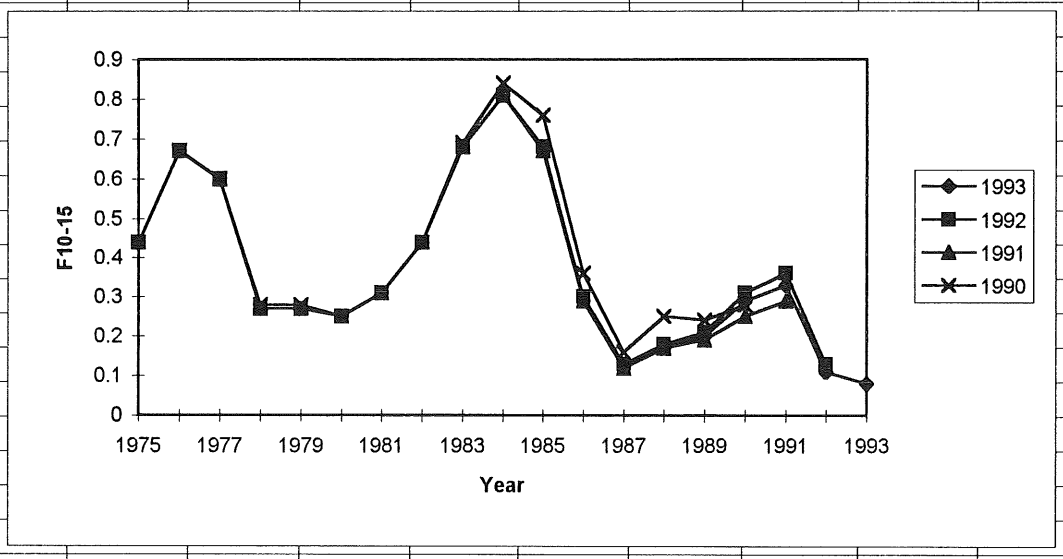
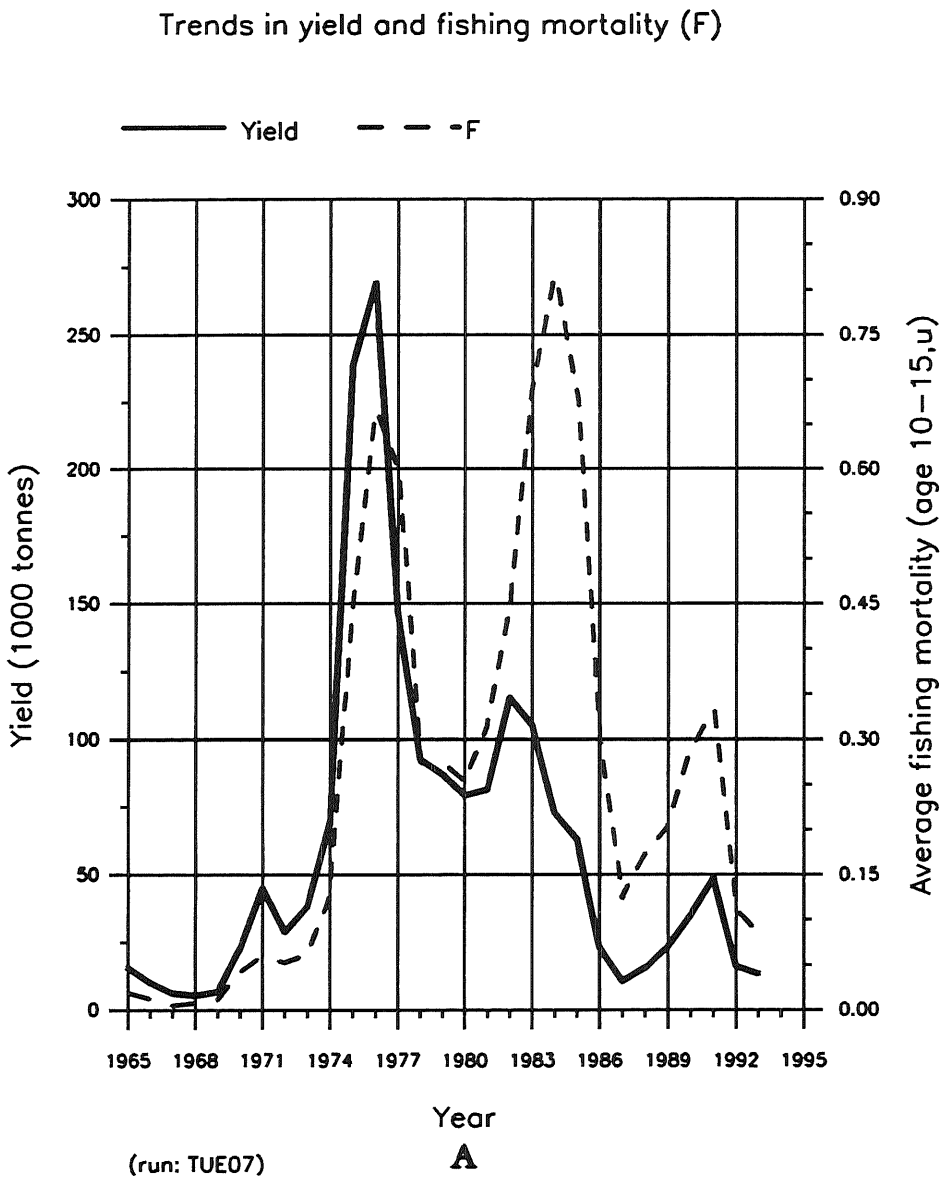


Figure 6.3.A and B

# FISH STOCK SUMMARY

## STOCK: Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

## 30–8–1994



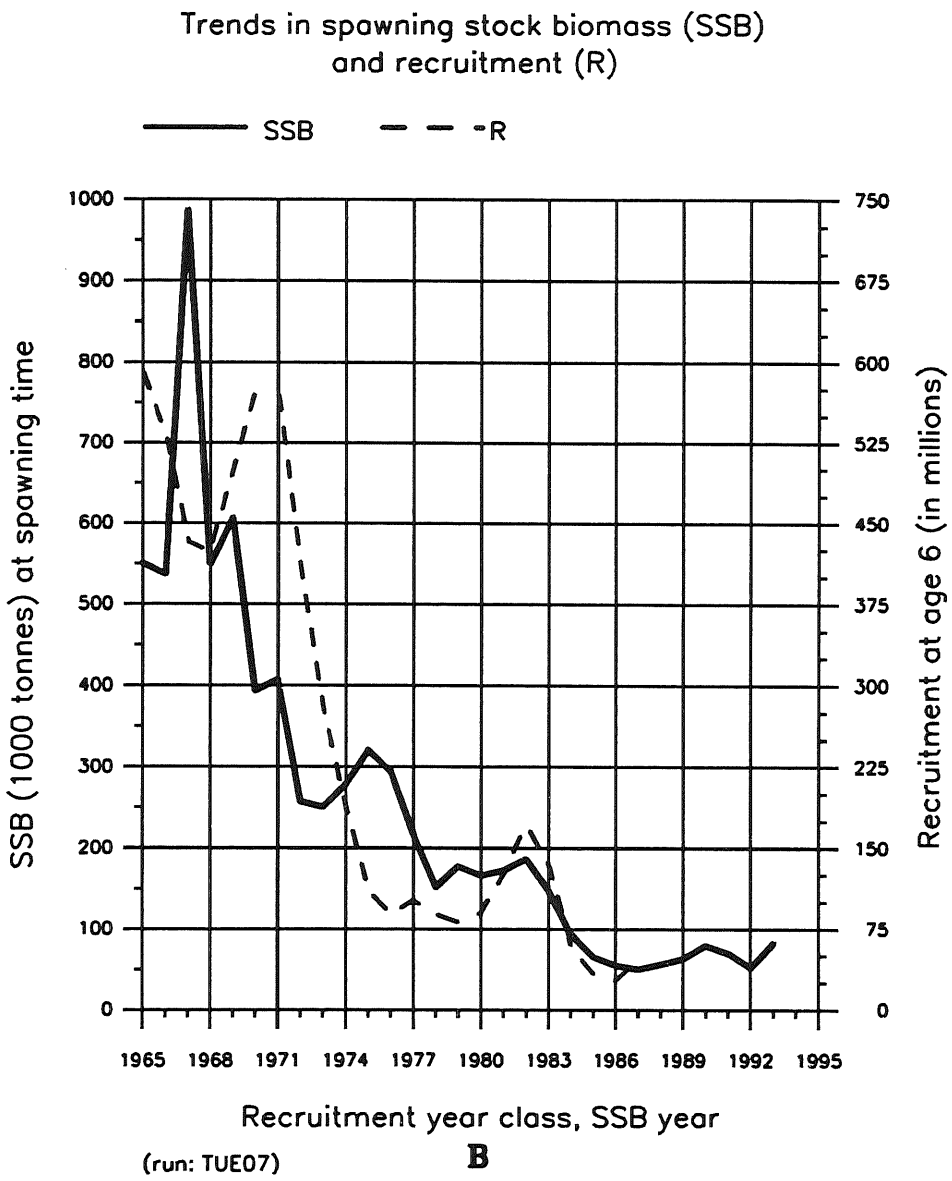
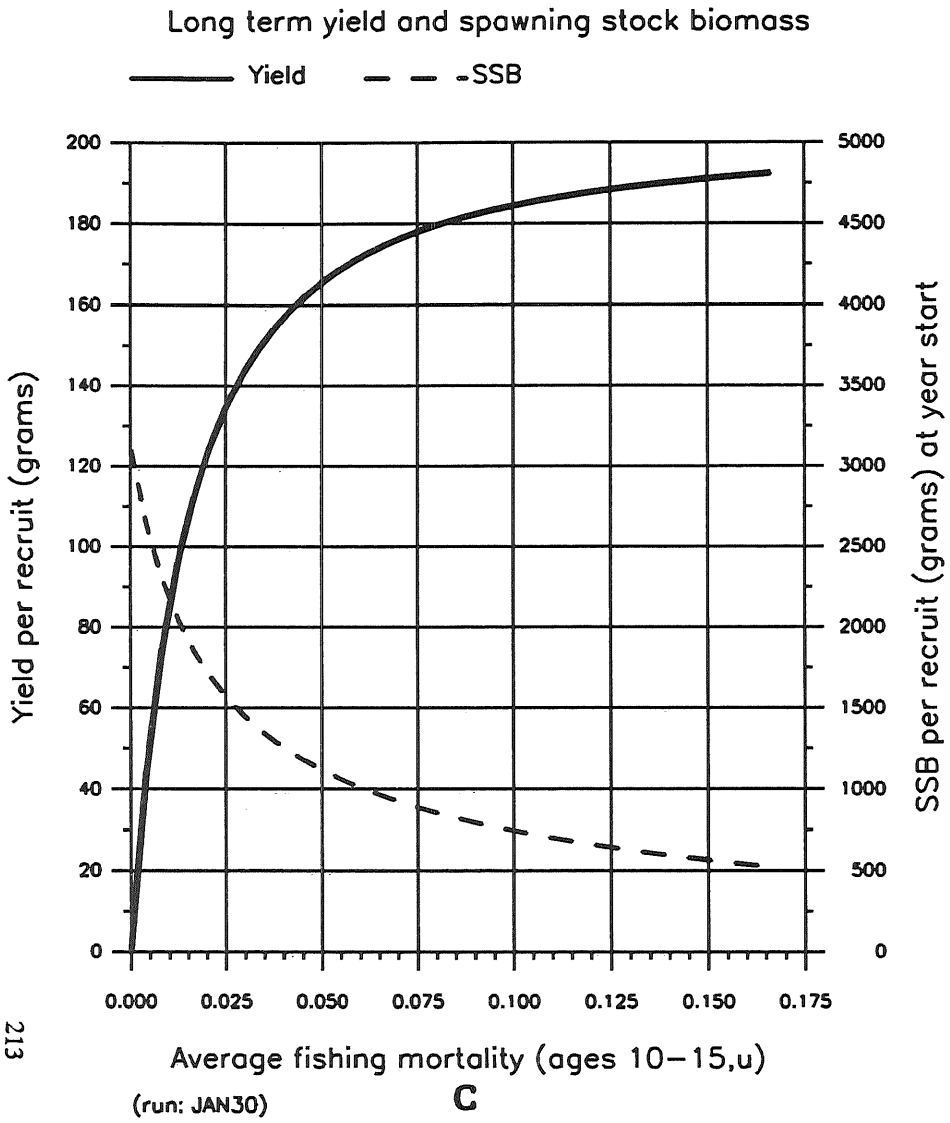



Figure 6.3.C and D

# FISH STOCK SUMMARY

## STOCK: Sebastes mentella in the Norwegian Sea, Spitzbergen and Bear Islan

## 30–8–1994



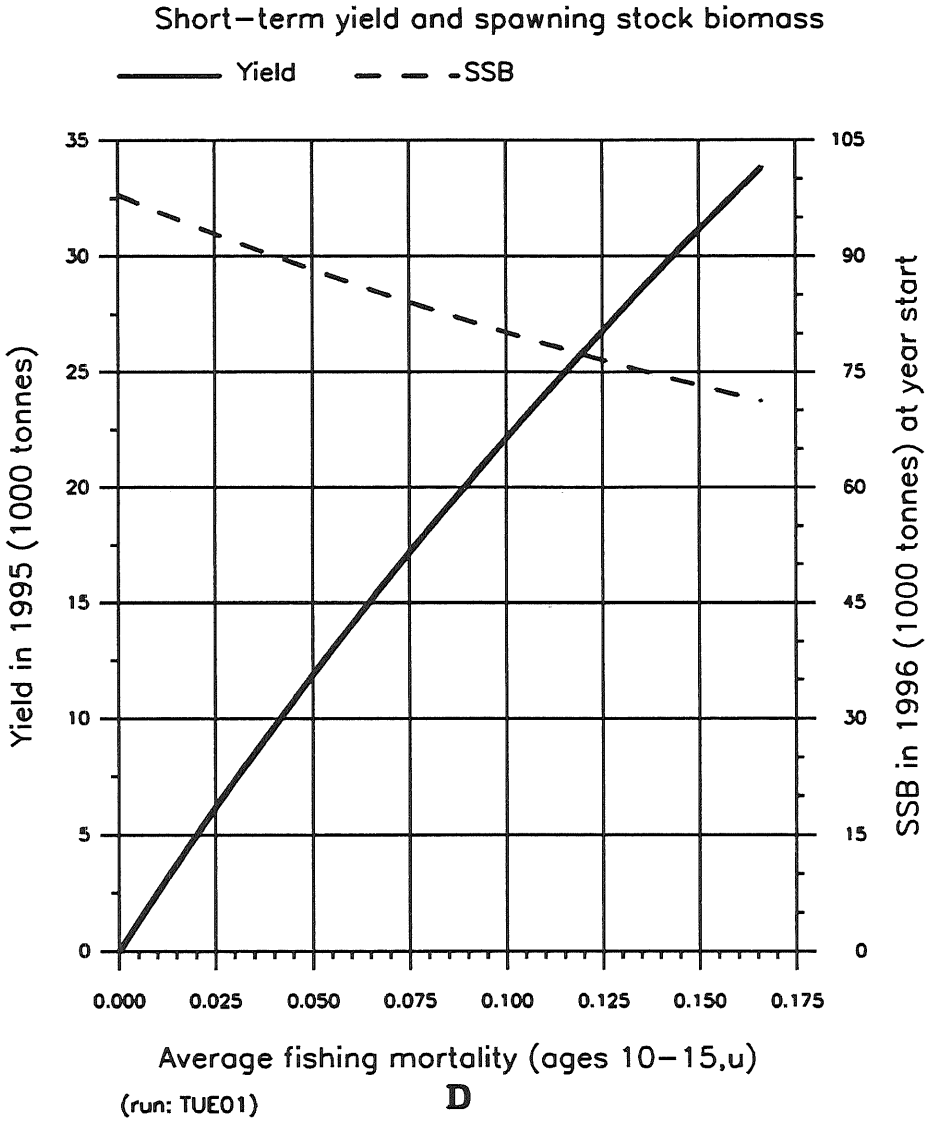



**Figure 6.4** *Sebastes mentella*. Stock and recruitment plot.

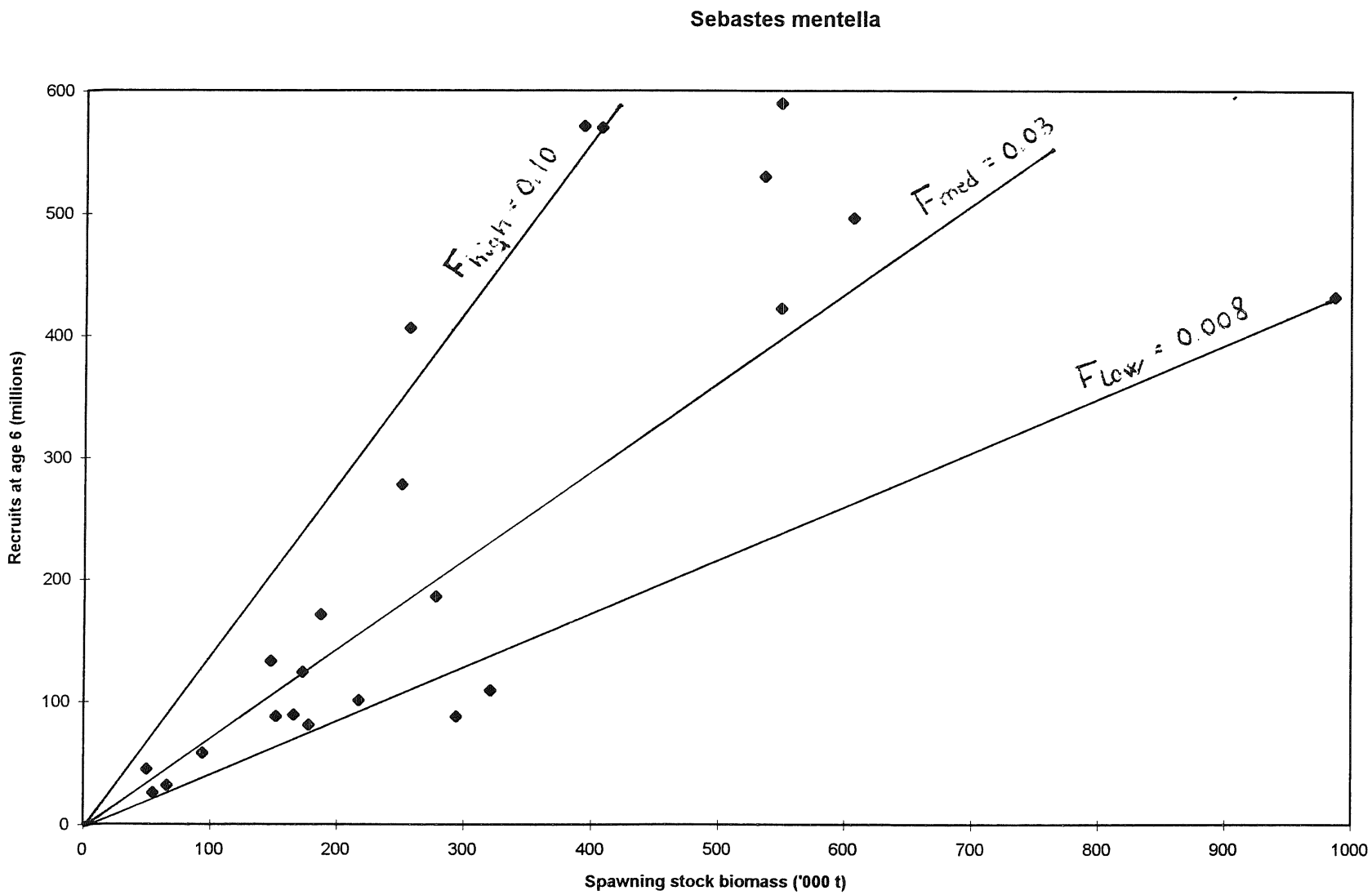
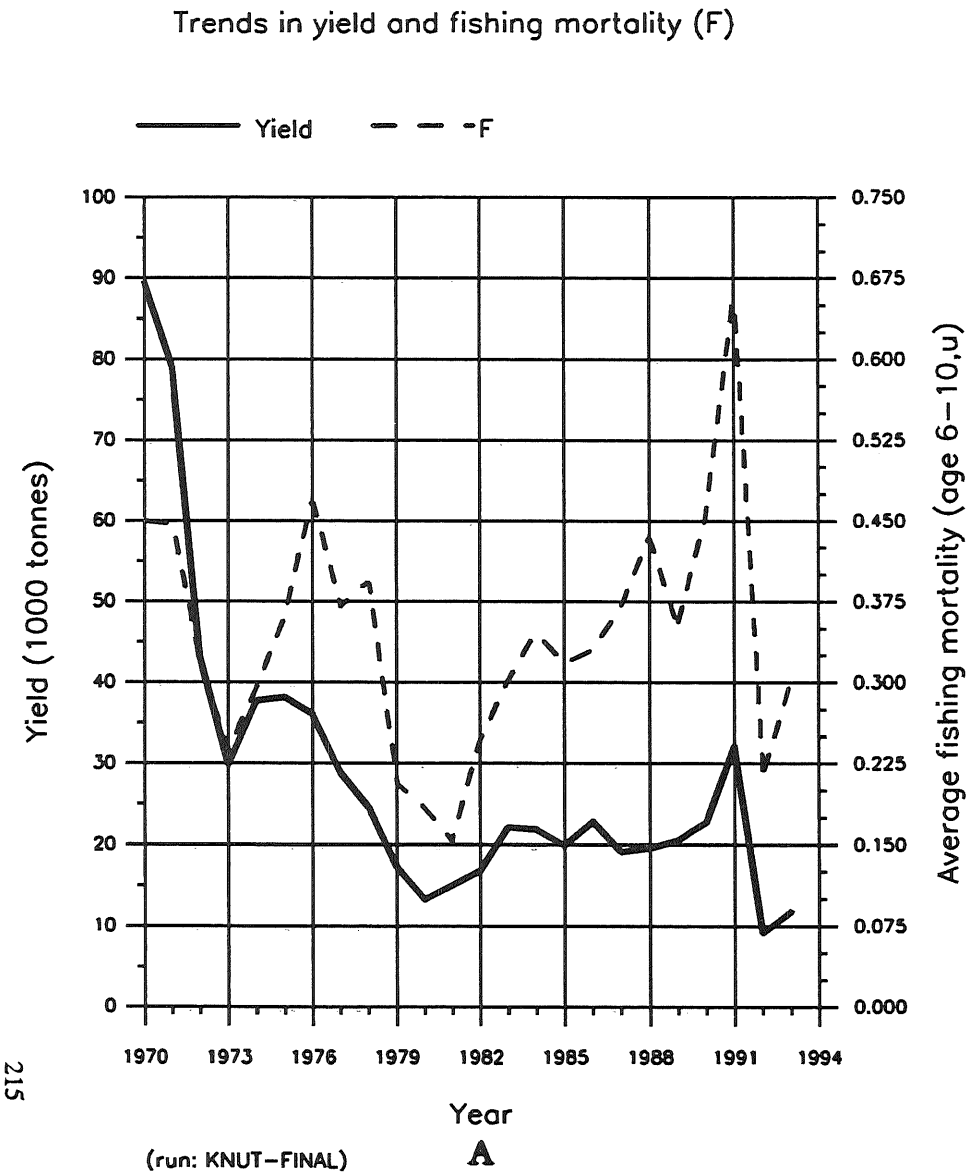


Figure 7.1.A and B

# FISH STOCK SUMMARY

## STOCK: Greenland Halibut in the North–East Arctic (Fishing Areas I and II

## 30–8–1994



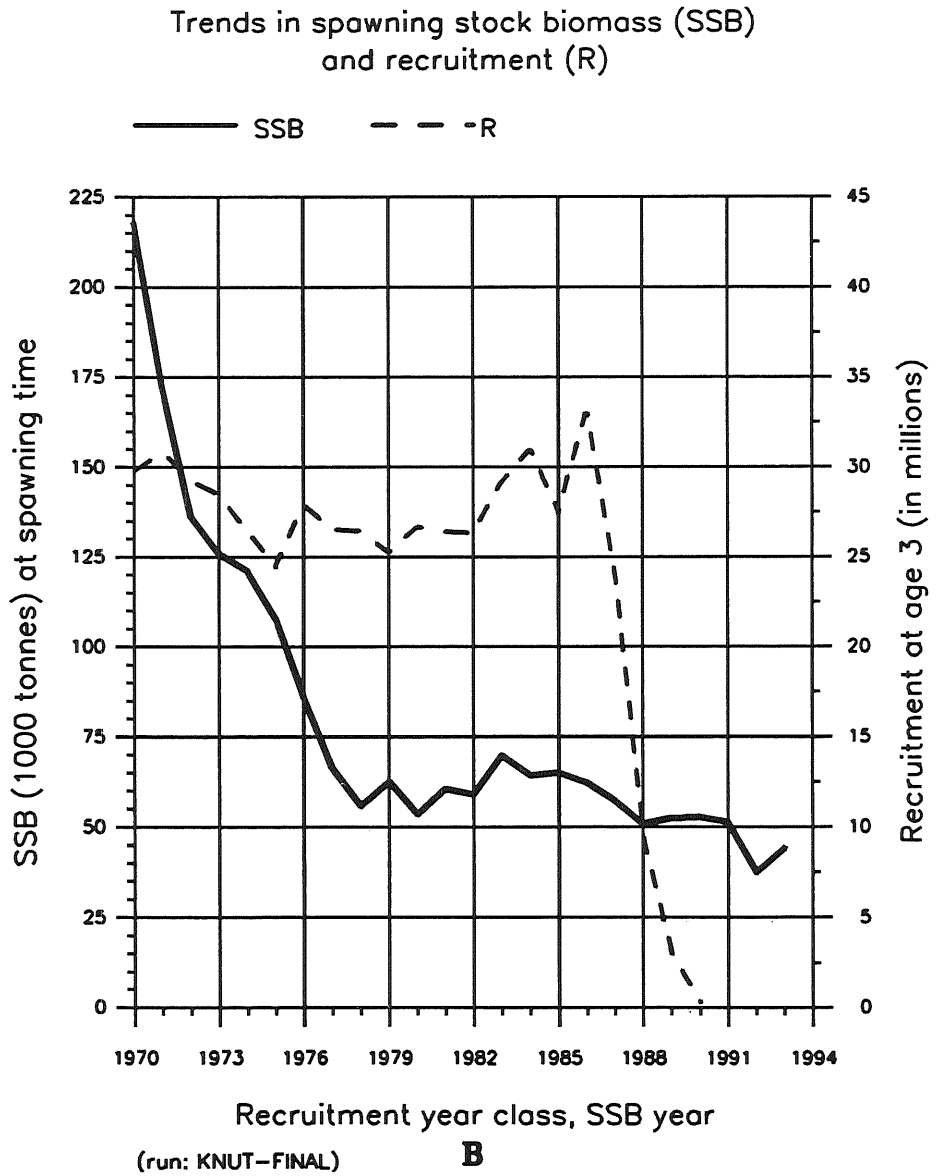
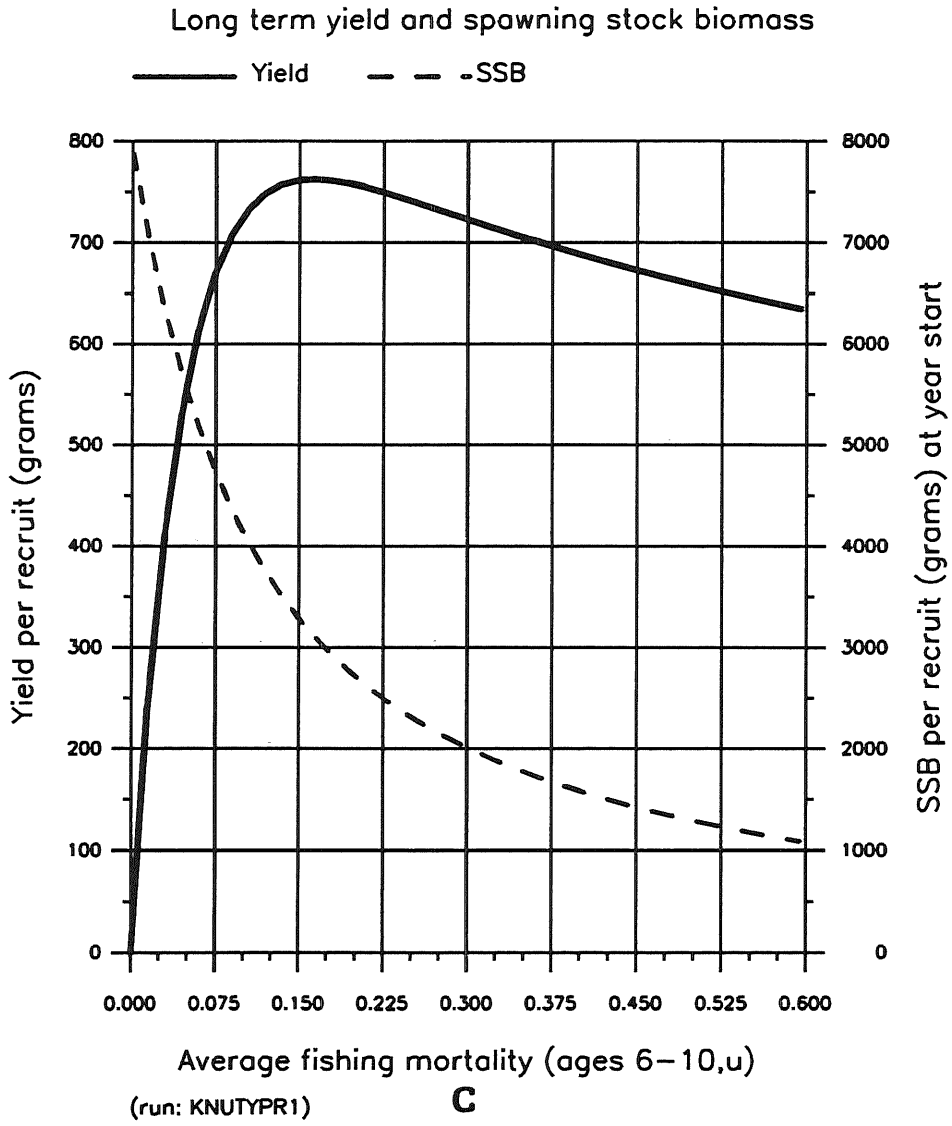



Figure 7.1.C and D

# FISH STOCK SUMMARY

## STOCK: Greenland Halibut in the North–East Arctic (Fishing Areas I and II

## 30–8–1994



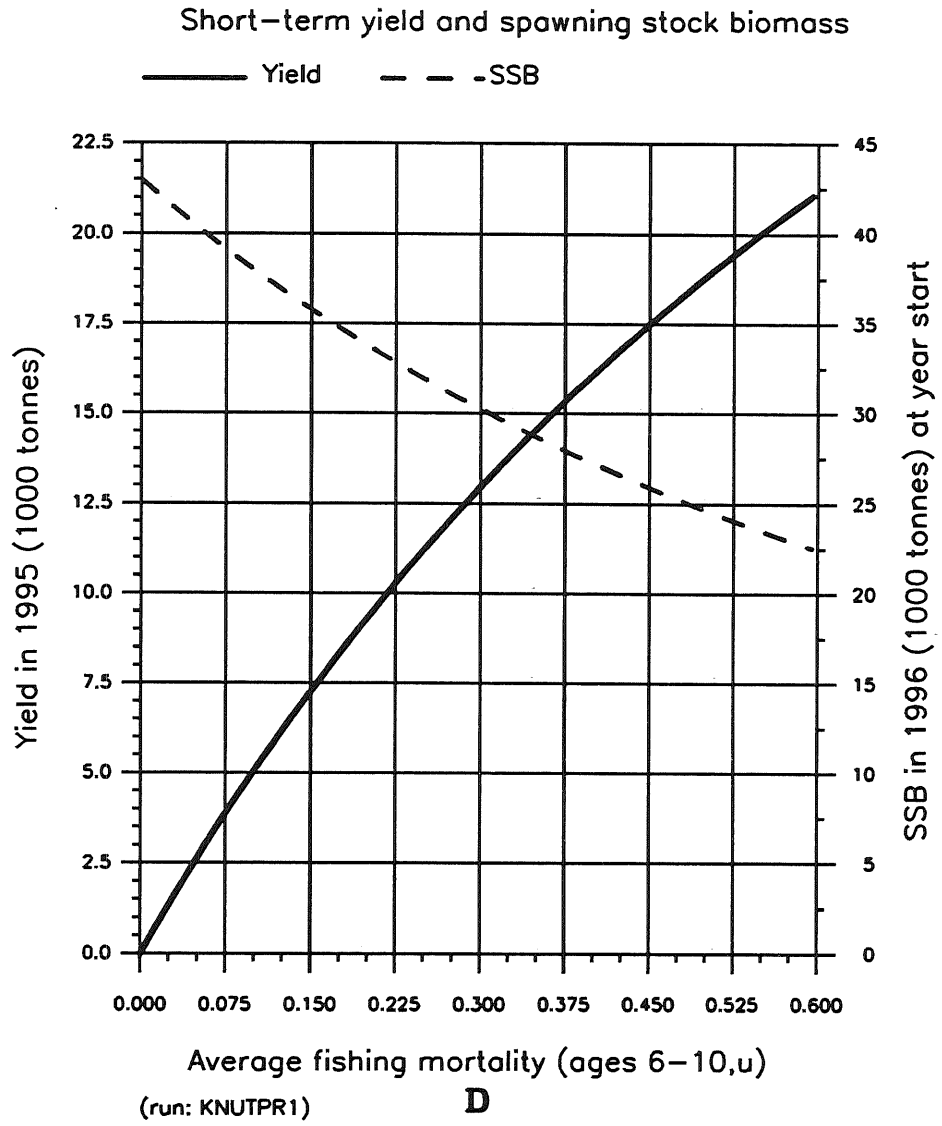
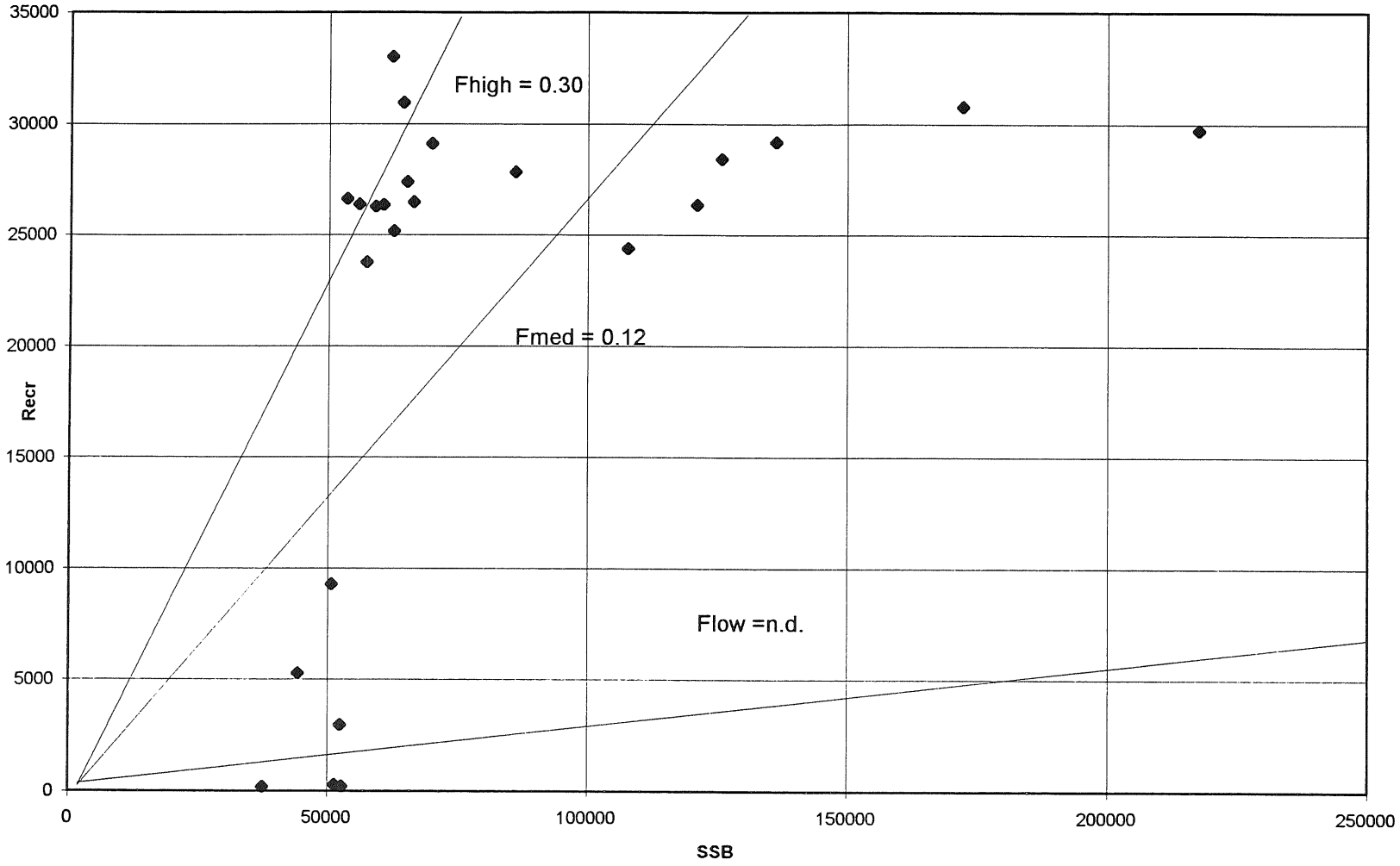



**Figure 7.2** North-East Arctic Greenland Halibut, SSB vers. Recruitment.



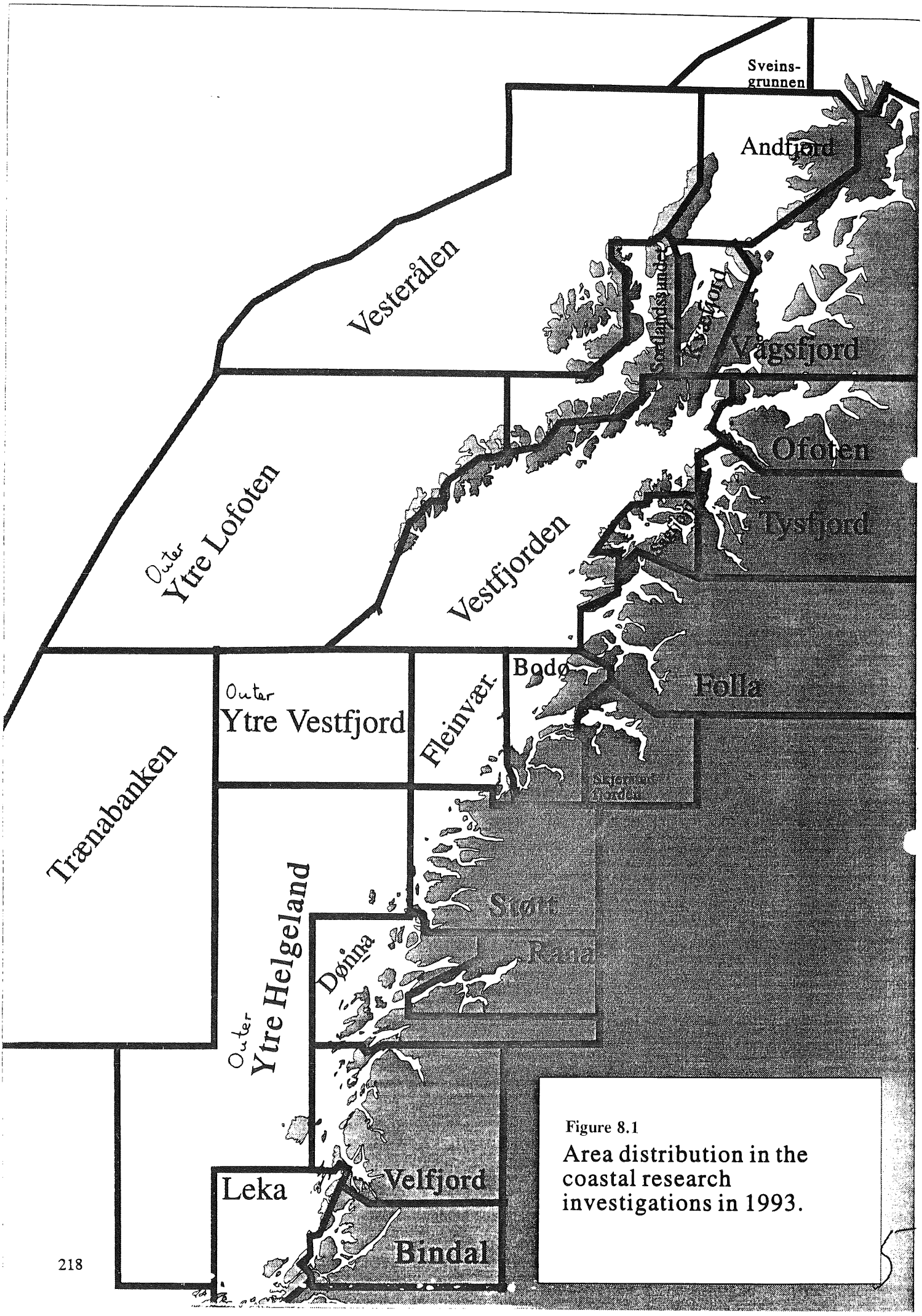



Figure 8.1
Area distribution in the coastal research investigations in 1993.

# 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. New TS and rock-hopper gear (1981–1988 back-calculated from bobbins gear).

| Year | Age | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| 1981 | 4 | 61 | 34 | 59 | 106 | 109 | 16 | 3 | 1 | 2 | 395 |
| 1982 | 2 | 4 | 40 | 42 | 40 | 29 | 29 | 2 | + | 0 | 188 |
| 1983 | 0 | 14 | 11 | 23 | 28 | 16 | 7 | 4 | 1 | + | 104 |
| 1984 | 1,735 | 175 | 42 | 16 | 12 | 8 | 3 | + | + | 0 | 1,991 |
| 1985 | 84 | 696 | 209 | 169 | 32 | 13 | 6 | 1 | + | + | 1,210 |
| 1986 | 958 | 503 | 602 | 154 | 73 | 8 | 2 | + | + | 0 | 2,300 |
| 1987 | 2 | 53 | 81 | 249 | 51 | 14 | 2 | 1 | + | 0 | 453 |
| 1988 | 1 | 22 | 54 | 38 | 76 | 10 | 2 | + | + | 0 | 203 |
| 1989 | 5 | 7 | 18 | 39 | 26 | 60 | 8 | 1 | + | 0 | 164 |
| 1990 | 235 | 40 | 16 | 26 | 31 | 27 | 48 | 3 | 1 | 0 | 427 |
| 1991 | 140 | 227 | 62 | 40 | 37 | 33 | 18 | 20 | 1 | 2 | 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 |
| 1994 | 787 | 565 | 349 | 411 | 207 | 58 | 12 | 3 | 1 | 1 | 2,394 |

**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 | |
| | | | | | Sub-area I and Division IIa[1] | | | | | |
| 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 |
| | | | | | Division IIb | | | | | |
| 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 |
| | | | | | Total | | | | | |
| 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 |

[1]Northern 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 gear[1].

| Year | Age | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| 1981 | 3.5 | 31.9 | 17.2 | 27.9 | 51.2 | 52.7 | 6.4 | 1.3 | 0.4 | 0.0 | 192.5 |
| 1982 | 0.6 | 2.7 | 30.6 | 33.7 | 31.0 | 21.6 | 21.0 | 1.9 | 0.3 | 0.0 | 143.4 |
| 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[2] | 423.0 | 304.8 | 313.8 | 195.3 | 91.1 | 20.4 | 9.2 | 5.7 | 2.9 | 2.9 | 1,369.1 |
| 1994[2] | 632.4 | 410.0 | 293.4 | 378.2 | 202.4 | 67.1 | 11.6 | 2.7 | 1.4 | 1.7 | 2,000.9 |

[1]1981-1988 back-calculated from bobbins gear.
[2] 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 gear[1].

| 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 |
| 1993 | 122.3 | 120.9 | 148.6 | 65.6 | 29.6 | 3.4 | 3.8 | 2.4 | 1.6 | 3.4 | 501.6 |

[1]1983-1988 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 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Total |
| 1989 | 437 | 1,569 | 2,098 | 6,658 | 1,626 | 192 | 24 | 2 | 0 | 12,606 |
| 1990 | 618 | 1,606 | 2,775 | 2,390 | 5,124 | 624 | 59 | 7 | 2 | 13,205 |
| 1991 | 2,662 | 2,534 | 3,183 | 3,528 | 2,360 | 4,468 | 391 | 19 | 1 | 19,146 |
| 1992 | 4,187 | 8,627 | 2,745 | 1,093 | 1,017 | 573 | 907 | 57 | 9 | 19,215 |
| 1993 | 3,057 | 6,243 | 5,691 | 2,217 | 724 | 461 | 306 | 528 | 50 | 19,277 |

**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 | 90.0 | 92.8 |
| 1994 | 12.0 | 18.5 | 30.5 | 44.8 | 55.0 | 64.6 | 73.5 | 84.0 | 89.4 | 96.4 |

**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 | 12 |
| 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 | - |
| 1994 | 12 | 59 | 261 | 797 | 1,452 | 2,273 | 3,369 | 5,062 | 7,060 | 8,214 | 8,685 | 8,600 |

**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 | 21 | 2 | 16 | 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[1] | 29 | 22 | 57 | 29 | 35 | 52 | 46 | 89 | 14 | 2 | 1 | 376 |
| 1991[1,3] | 33 | 44 | 75 | 89 | 51 | 53 | 61 | 45 | 43 | + | + | 494 |
| 1992[1] | 228 | 61 | 333 | 317 | 110 | 45 | 37 | 38 | 29 | 22 | 3 | 1,223 |
| 1993[1] | 9 | 10 | 45 | 215 | 243 | 136 | 43 | 14 | 14 | 8 | 11 | 783 |

[1]October-December.
[2]September-October.
[3]Revised.

**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 | | |
| | | | | | | Sub-area I | | | | | | |
| 1982 | 1.4 | 0.2 | 6.9 | 13.2 | 7.4 | 1.9 | 2.8 | 0.4 | - | - | - | 34.2 |
| 1983 | 4.3 | 8.0 | 5.1 | 4.6 | 5.4 | 5.9 | 2.7 | 0.7 | 1.2 | 0.1 | - | 38.0 |
| 1984 | 0.7 | 12.3 | 11.6 | 25.5 | 13.7 | 6.5 | 4.0 | 1.6 | 0.6 | 0.3 | - | 76.8 |
| 1985 | 3.3 | 2.9 | 51.3 | 35.2 | 53.1 | 25.2 | 4.4 | 1.8 | 0.8 | 0.1 | 0.1 | 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 | 6.8 | 4.8 | 12.7 | 5.3 | 6.0 | 9.4 | 8.2 | 14.6 | 2.2 | 0.2 | + | 70.2 |
| 1991[1] | 3.1 | 5.9 | 10.9 | 14.0 | 7.5 | 7.7 | 8.1 | 5.5 | 4.2 | 0.3 | 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 |
| 1993 | 1.7 | 1.1 | 7.8 | 67.9 | 89.5 | 47.2 | 16.0 | 4.6 | 4.2 | 2.0 | 3.2 | 245.3 |
| | | | | | | Division IIa | | | | | | |
| 1982 | 0.1 | + | 11.7 | 10.6 | 4.7 | 1.1 | 4.1 | 2.0 | 0.2 | 0.3 | 0.2 | 35.0 |
| 1983 | 0.7 | 0.4 | 0.3 | 1.5 | 6.4 | 5.0 | 2.1 | 1.3 | 1.2 | 0.1 | 0.2 | 19.2 |
| 1984 | 0.4 | 0.7 | 0.6 | 3.7 | 4.0 | 6.7 | 4.7 | 1.1 | 0.3 | 0.1 | 0.2 | 22.5 |
| 1985 | 0.2 | 0.2 | 1.4 | 3.7 | 9.5 | 12.6 | 6.4 | 2.5 | 0.6 | 0.1 | 0.1 | 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 | - | + | 0.3 | 1.1 | 1.6 | 2.2 | 1.9 | 4.4 | 0.9 | 0.1 | + | 12.5 |
| 1991[1] | 1.0 | 0.1 | 0.5 | 1.3 | 1.9 | 2.2 | 2.5 | 1.9 | 1.7 | 0.2 | 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 |
| 1993 | 0.2 | 0.1 | 0.1 | 3.5 | 9.9 | 13.1 | 4.5 | 1.3 | 1.2 | 0.7 | 0.8 | 35.4 |
| | | | | | | Division IIb | | | | | | |
| 1982 | 9.9 | 1.7 | 42.5 | 17.8 | 1.1 | 0.2 | 1.5 | 0.5 | - | - | - | 75.2 |
| 1983 | 9.7 | 14.9 | 5.0 | 9.4 | 11.0 | 2.6 | 0.7 | 0.8 | 0.7 | 0.1 | 0.1 | 55.0 |
| 1984 | 1.4 | 7.7 | 22.7 | 7.4 | 2.7 | 2.4 | 1.3 | 0.4 | 0.2 | 0.2 | - | 46.4 |
| 1985 | 9.1 | 9.4 | 45.2 | 32.3 | 32.8 | 11.5 | 5.3 | 1.8 | 0.3 | - | 0.1 | 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 | 0.1 | 0.7 | 1.3 | 2.3 | 2.9 | 3.7 | 3.9 | 8.6 | 1.6 | 0.3 | + | 25.4 |
| 1991[1] | 6.4 | 7.1 | 10.1 | 8.4 | 5.2 | 6.3 | 8.2 | 6.5 | 5.9 | 0.5 | 0.1 | 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 |
| 1993 | 4.7 | 5.9 | 23.8 | 60.3 | 44.6 | 24.7 | 5.6 | 3.2 | 3.4 | 2.5 | 3.6 | 182.3 |
| | | | | | | Total (Sub-area I and Divisions IIa and IIb) | | | | | | |
| 1982 | 3.7 | 0.6 | 18.1 | 14.1 | 5.1 | 1.3 | 2.6 | 0.7 | - | 0.1 | - | 46.3 |
| 1983 | 5.4 | 8.9 | 4.3 | 5.6 | 7.3 | 4.7 | 2.0 | 0.8 | 1.1 | 0.1 | - | 40.2 |
| 1984 | 0.9 | 9.2 | 14.2 | 16.2 | 8.6 | 5.0 | 3.1 | 1.1 | 0.4 | 0.3 | 0.1 | 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 | 4.0 | 3.1 | 7.8 | 3.8 | 4.4 | 6.6 | 6.0 | 11.3 | 1.8 | 0.2 | + | 49.0 |
| 1991[1] | 4.2 | 5.9 | 9.8 | 11.0 | 6.2 | 5.8 | 7.7 | 5.6 | 4.6 | 0.4 | 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 |
| 1993 | 2.8 | 2.8 | 13.1 | 64.7 | 59.7 | 33.4 | 9.1 | 3.4 | 3.3 | 2.1 | 2.9 | 197.4 |

[1]Revised.

**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 | 16.0 | 24.0 | 30.4 | 46.5 | 54.9 | 62.5 | 69.7 | 77.6 | 87.8 | 102.0 |
| 1991[1] | 11.5 | 22.4 | 30.6 | 43.0 | 55.9 | 64.6 | 72.8 | 78.5 | 87.9 | 101.8 |
| 1992 | 11.3 | 21.3 | 31.9 | 50.1 | 59.8 | 69.1 | 78.6 | 84.0 | 90.8 | 97.5 |
| 1993 | 12.1 | 17.4 | 29.1 | 43.4 | 52.7 | 64.3 | 73.9 | 81.2 | 89.1 | 91.8 |

[1]Revised.

**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 | 28 | 106 | 230 | 908 | 1,418 | 2,092 | 2,897 | 4,131 | 6,359 | 10,078 | 13,540 |
| 1991[1] | 26 | 93 | 260 | 743 | 1,629 | 2,623 | 3,816 | 4,975 | 7,198 | 11,165 | 15,353 |
| 1992 | 10 | 76 | 273 | 1,165 | 1,895 | 2,971 | 4,377 | 5,596 | 7,319 | 9,452 | 12,414 |
| 1993 | 11 | 46 | 211 | 717 | 1,280 | 2,293 | 3,509 | 4,902 | 6,621 | 7,339 | 8,494 |

[1]Revised.

**Table A12** Abundance indices of 0-group fish in the Barents Sea and adjacent waters in 1965–1993.

| 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 |
| 1993 | 910 | 240 | 171 | 156 | 162 | 11 | 55 |

**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 1965–1993.

| 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 | - | - | 2.51 | 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 |
| 1993 | 0.75 | 0.45 | 1.14 | 2.09 | 1.70 | 2.51 | 0.64 | 0.48 | 0.82 |

[1]Assessment for 1965–1984 made by Toresen (1985).

**Table A14** North-east Arctic COD. Abundance at age and weight at age from the Norwegian survey on the cod spawning grounds in Lofoten in March-April.

Abundance (millions)

| Year | Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1992 | 0.9 | 0.6 | 4.0 | 14.2 | 20.7 | 60.1 | 3.4 | | |
| 1993 | 1.3 | 6.7 | 9.0 | 14.1 | 20.0 | 24.3 | 40.2 | 5.1 | |
| 1994 | 0.4 | 21.1 | 25.5 | 8.4 | 7.1 | 7.6 | 3.5 | 13.3 | 1.9 |

Weight at age (kg)

| Year | Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1992 | 1.20 | 2.17 | 3.18 | 4.16 | 5.20 | 5.93 | 6.87 | | |
| 1993 | 1.40 | 1.73 | 2.62 | 3.94 | 5.43 | 6.15 | 7.45 | 8.91 | |
| 1994 | 1.61 | 2.32 | 3.17 | 4.90 | 6.00 | 6.79 | 7.43 | 7.64 | 7.60 |

**Table A15** North-East Arctic Cod. Consumption ('000 t) by North-East Arctic cod of various prey species 1984–1992, calculated using the same methodology as in Bogstad and Mehl (1992) but using a new model for gastric evacuation by dos Santos and Jobling (pers.comm.). Cod abundance data from 1993 VPA, assuming a natural mortality of 0.2 also on ages 1 and 2 and that the spawning stock is outside the Barents Sea for three months during the first half of the year.

| Year | Amphipods | Shrimp | Capelin | Herring | Cod | Haddock | Redfish | Other | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1984 | 31 | 541 | 1018 | 90 | 32 | 60 | 501 | 678 | 2951 |
| 1985 | 172 | 207 | 2284 | 238 | 50 | 57 | 303 | 1451 | 4762 |
| 1986 | 1654 | 195 | 1180 | 189 | 129 | 160 | 447 | 1195 | 5149 |
| 1987 | 1453 | 274 | 324 | 46 | 36 | 6 | 478 | 1343 | 3961 |
| 1988 | 1857 | 195 | 505 | 11 | 13 | 4 | 347 | 1051 | 3984 |
| 1989 | 1066 | 176 | 867 | 4 | 11 | 16 | 327 | 1228 | 3695 |
| 1990 | 187 | 229 | 2098 | 10 | 30 | 24 | 296 | 2154 | 5029 |
| 1991 | 65 | 213 | 3617 | 11 | 43 | 26 | 453 | 1402 | 5830 |
| 1992 | 65 | 368 | 3054 | 416 | 78 | 181 | 263 | 1220 | 5645 |

**Table A16** North-East Arctic COD. Number of cod eaten by cod in 1984–1992 (millions). From Bogstad and Mehl (1994).

| Year | Prey age | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 1984 | 546.2 | 59.7 | 1.3 |
| 1985 | 331.5 | 205.6 | 8.9 |
| 1986 | 666.2 | 438.1 | 273.6 |
| 1987 | 256.8 | 422.9 | 22.1 |
| 1988 | 617.7 | 35.0 | + |
| 1989 | 242.3 | 0.6 | - |
| 1990 | 163.5 | 44.0 | - |
| 1991 | 231.3 | 88.0 | 55.9 |
| 1992 | 1315.9 | 204.2 | 0.1 |

# APPENDIX II

**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 | 9 | 10 | |
| 1981 | 2.0 | 7.0 | 2.6 | 11.0 | 2.7 | 8.1 | 0.7 | 0.3 | 0.0 | 0.0 | 34.4 |
| 1982 | 2.5 | 1.4 | 2.0 | 2.4 | 2.9 | 7.3 | 3.6 | 0.3 | 0.0 | 0.0 | 22.4 |
| 1983 | 1,780.0 | 5.7 | 3.1 | 3.5 | 1.9 | 1.9 | 4.2 | 1.9 | 0.0 | 0.0 | 1,802.2 |
| 1984 | 3,450.0 | 592.0 | 16.9 | 2.1 | 1.0 | 0.3 | 0.4 | 0.4 | 0.0 | 0.0 | 4,063.1 |
| 1985 | 911.0 | 1,180.0 | 436.0 | 8.2 | 0.6 | 0.3 | 0.4 | 0.4 | 0.0 | 0.0 | 2,536.9 |
| 1986 | 416.0 | 312.0 | 385.0 | 166.0 | 6.7 | 0.7 | 0.2 | 0.2 | 0.0 | 0.0 | 1,286.8 |
| 1987 | 86.1 | 78.2 | 187.0 | 355.0 | 75.3 | 0.2 | 0.3 | + | 0.0 | 0.0 | 782.1 |
| 1988 | 28.6 | 15.0 | 30.3 | 83.0 | 155.0 | 23.8 | 0.3 | - | 0.0 | 0.0 | 336.0 |
| 1989 | 51.8 | 6.0 | 10.1 | 19.2 | 37.9 | 40.9 | 4.4 | - | 0.0 | 0.0 | 170.2 |
| 1990 | 356.0 | 49.2 | 4.8 | 4.9 | 7.7 | 14.3 | 18.4 | 2.6 | 0.0 | 0.0 | 457.9 |
| 1991 | 978.2 | 404.7 | 90.5 | 17.6 | 4.7 | 3.6 | 4.6 | 8.5 | 0.0 | 0.0 | 1,512.4 |
| 1992 | 821.9 | 1,168.8 | 351.1 | 89.9 | 6.2 | 1.3 | 2.0 | 7.8 | 0.0 | 0.0 | 2,449.0 |
| 1993[1] | 431.9 | 468.0 | 526.6 | 148.2 | 14.9 | 0.6 | 0.8 | 0.4 | 0.4 | 1.4 | 1,593.2 |
| 1994[1] | 369.9 | 156.5 | 316.8 | 572.7 | 76.0 | 4.9 | 0.3 | 0.2 | 0.2 | 1.0 | 1,498.5 |

1981–1988 back-calculated from bobbins gear to rockhopper gear.
[1] 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 | | |
| | | | | | | Sub-area 1 | | | | | | |
| 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 |
| 1993 | 5.5 | 8.1 | 69.2 | 371.5 | 78.4 | 10.2 | 1.4 | 0.7 | 0.8 | 1.8 | - | 547.7 |
| | | | | | | Division IIa | | | | | | |
| 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 |
| 1993 | 1.8 | 1.1 | 1.5 | 4.5 | 2.5 | 0.8 | 0.2 | 0.1 | 0.2 | 0.2 | | 12.8 |
| | | | | | | Division IIb | | | | | | |
| 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 |
| 1993 | 0.7 | 0.9 | 1.9 | 24.7 | 1.9 | 0.2 | + | + | + | + | | 30.4 |
| | | | | | | Total - Sub-area I and Divisions IIa and IIb | | | | | | |
| 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 |
| 1993 | 3.5 | 4.8 | 35.7 | 198.5 | 35.6 | 4.8 | 0.8 | 0.4 | 0.4 | - | - | 285.3 |

**Table B4** North-East Arctic HADDOCK. Results from the Norwegian acoustic survey in the Barents Sea in January–March. Stock numbers in millions. New TS and rock-hopper gear (1981–1988 back-calculated from bobbins gear).

| Year | Age | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| 1981 | 4 | 11 | 5 | 22 | 63 | 19 | 1 | + | + | + | 125 |
| 1982 | 4 | 2 | 2 | 3 | 5 | 11 | 5 | + | + | + | 33 |
| 1983 | 0 | 3 | 22 | 3 | 2 | 1 | 3 | 2 | + | + | 16 |
| 1984 | 1,334 | 199 | 7 | 2 | 1 | + | + | + | + | + | 1,554 |
| 1985 | 1,168 | 788 | 284 | 8 | 1 | + | + | 1 | + | + | 2,250 |
| 1986 | 413 | 276 | 474 | 196 | 1 | + | + | + | + | + | 1,360 |
| 1987 | 58 | 20 | 60 | 199 | 55 | + | + | + | 0 | + | 392 |
| 1988 | 10 | 3 | 7 | 21 | 46 | 8 | + | + | 0 | + | 95 |
| 1989 | 29 | 4 | 6 | 10 | 19 | 21 | 2 | + | 0 | + | 92 |
| 1990 | 273 | 36 | 4 | 3 | 5 | 9 | 12 | 2 | + | + | 344 |
| 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 | + | 3 | 2,137 |
| 1994 | 538 | 182 | 257 | 663 | 114 | 12 | + | + | + | 1 | 1,768 |

**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] | 240 | 368 | 143 | 65 | 11 | 4 | 7 | 21 | 17 | 2 | + | 878 |
| 1992[1] | 199 | 245 | 758 | 218 | 35 | 3 | 4 | 7 | 6 | + | + | 1,475 |
| 1993[1] | 20 | 26 | 199 | 1,076 | 228 | 31 | 5 | 2 | 3 | 2 | 3 | 1,595 |

[1]October–December.
[2]September–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 | 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 |
| Norway | | | | | | | | | | |
| 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 | - | - | - |
| 1994 | 14.8 | 21.5 | 29.7 | 38.7 | 47.4 | 54.2 | 57.4 | - | - | - |
| | 0+ | 1+ | 2+ | 3+ | 4+ | 5+ | 6+ | 7+ | 8+ | 9+ |
| Russia | | | | | | | | | | |
| 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 |
| 1993 | 15.3 | 21.7 | 28.7 | 38.3 | 48.3 | 54.3 | 60.9 | 64.2 | 63.2 | 65.0 |

**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 |
| Norway | | | | | | | | | | |
| 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 | - | - | - |
| 1994 | 25 | 91 | 251 | 555 | 1,026 | 1,578 | 1,813 | - | - | - |
| | 0+ | 1+ | 2+ | 3+ | 4+ | 5+ | 6+ | 7+ | 8+ | 9+ |
| Russia | | | | | | | | | | |
| 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 | 3,092 |
| 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 |
| 1993 | 31 | 96 | 217 | 535 | 1,077 | 1,493 | 2,094 | 2,509 | 2,374 | 2,621 |

# APPENDIX III

**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[2] | 49.5 | 108.5 | 9.0 | 4.5 | 6.5 | 178.0 |
| 1987[2] | 4.5 | 54.0 | 118.5 | 4.4 | 4.5 | 185.9 |
| 1988 | 40.0 | 56.7 | 46.3 | 17.3 | 1.4 | 161.7 |
| 1989 | 61.0. | 69.8 | 41.6 | 24.6 | 30.0 | 226.9 |
| 1990 | 256.0 | 80.3 | 37.0 | 18.0 | 18.1 | 405.4 |
| 1991 | 220.3. | 260.3 | 11.6 | 9.9 | 17.9 | 520.0 |
| 1992 | 411.4 | 687.9 | 144.4 | 15.6 | 22.2 | 1,281.5 |
| 1993 | 146.3 | 348.7 | 234.5 | 35.5 | 11.3 | 776.3 |

[1]Only northern part of area covered, the year excluded from VPA tuning.
[2]Incomplete area coverage. The years excluded from VPA tuning.

# APPENDIX IV

**Table D1** REDFISH in Sub-areas I and II in 1991.
Nominal catch (t) of *S. marinus* and *S. mentella* by countries in Sub-area I and Divisions IIa and IIb.

| Sub-area I | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Norway | 1,993 | 8 | 2,001 |
| Russia | 92 | 420 | 512 |
| Total | 2,085 | 428 | 2,513 |

| Sub-area IIa | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Faroe Islands | 152[2] | 487[2] | 639 |
| France | 719[2] | 72[2] | 791 |
| Germany | 678 | - | 678 |
| Norway | 13,835 | 32,810 | 46,645 |
| Portugal | - | 159[2] | 159 |
| UK (Engl. & Wales) | 228[2] | 19[2] | 247 |
| UK (Scotland) | 47[2] | 4[2] | 51 |
| Russia | 534 | 7,596 | 8,130 |
| Total | 16,193 | 41,147 | 57,340 |

| Sub-area IIb | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Faroe Islands | - | 5[1] | 5[1] |
| France | - | 13[1] | 13[1] |
| Germany | 303 | - | 303 |
| Greenland | - | 23 | 23 |
| Norway | 44 | 774 | 818 |
| Portugal | - | 7 | 7 |
| Spain | - | 1 | 1 |
| UK (Engl. & Wales) | - | 38[2] | 38 |
| UK (Scotland) | - | 13[2] | 13 |
| Russia | 426 | 6,286 | 6,712 |
| Total | 773 | 7,160 | 7,933 |
| Total (I+IIa+IIb) | 19,051 | 48,735 | 67,786 |

[1]As reported to Norwegian authorities.
[2]Split on species according the reports to Norwegian authorities.

**Table D2** REDFISH in Sub-areas I and II in 1992.
Nominal catch (t) of *S. marinus* and *S. mentella* by countries in Sub-area I and Divisions IIa and IIb.

| Sub-area I | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Norway | 2,295 | 596 | 2,891 |
| Russia | 174 | 408 | 582 |
| Total | 2,469 | 1,004 | 3,473 |

| Sub-area IIa | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Faroe Islands | 35[2] | 23[2] | 58 |
| France | 1,294[2] | 7[2] | 1,301 |
| Germany | 211 | - | 211 |
| Greenland | 614 | - | 614[3] |
| Norway | 11,185 | 10,420 | 21,605 |
| Portugal | - | 824[2] | 824 |
| UK (Engl. & Wales) | 192[2] | 25[2] | 217 |
| UK (Scotland) | 18[2] | - | 18 |
| Russia | 404 | 1,096 | 1,500 |
| Total | 13,953 | 12,395 | 26,348 |

| Sub-area IIb | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| France | - | 5[1] | 5[1] |
| Germany | 319 | - | 319 |
| Greenland | 9[2] | - | 9 |
| Norway | 2 | 397 | 399 |
| Portugal | 5[2] | 148[2] | 153 |
| Spain | 2 | 14 | 16 |
| UK (Engl. & Wales) | 33[2] | 197[2] | 230 |
| UK (Scotland) | - | 16[2] | 16 |
| Russia | 180 | 2,073 | 2,253 |
| Total | 550 | 2,850 | 3,400 |
| Total (I+IIa+IIb) | 16,972 | 16,249 | 33,221 |

[1]As reported to Norwegian authorities.
[2]Split on species according the reports to Norwegian authorities.
[3]Includes IIb.

**Table D3** REDFISH in Sub-areas I and II in 1993.
Nominal catch (t) of *S. marinus* and *S. mentella* by countries in Sub-area I and Divisions IIa and IIb.

| Sub-area I | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Faroe Islands | 24[2] | 2[2] | 26 |
| Norway | 1,283 | 70 | 1,353 |
| Russia | 237 | 422 | 659 |
| Total | 1,544 | 494 | 2,038 |

| Sub-area IIa | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Faroe Islands | 115[2] | 11[2] | 126 |
| France | 239[1] | 4[1] | 243[1] |
| Germany | 468 | 35 | 503 |
| Greenland | 14[2] | 1[2] | 15[4] |
| Norway | 11,519 | 7,253 | 18,772 |
| Portugal | 62[1] | 524[1] | 586[1] |
| UK (Engl. & Wales) | 431[2] | 2[2] | 433 |
| UK (Scotland) | 1[2] | - | 1 |
| Russia | 654 | 3,705 | 4,359 |
| Total | 13,503 | 11,535 | 25,038 |

| Sub-area IIb | *S. marinus* | *S. mentella* | Total |
|---|---|---|---|
| Canada | - | 8[1] | 8[1] |
| Denmark | - | 4[2] | 4 |
| France | - | 35[1] | 35[1] |
| Germany | 177 | - | 177 |
| Norway | + | 164 | 164 |
| Portugal | - | 483[1] | 483[1] |
| Spain | 8[3] | 57[3] | 65 |
| UK (Engl. & Wales) | 10[2] | 291[2] | 301 |
| UK (Scotland) | - | - | - |
| Russia | 32 | 259 | 291 |
| Total | 227 | 1,301 | 1,528 |
| Total (I+IIa+IIb) | 15,274 | 13,330 | 28,604 |

[1]As reported to Norwegian authorities.
[2]Split on species according the reports to Norwegian authorities.
[3]Split on species according to the 1992 catches.
[4]Includes IIb.

**Table D.4** *Sebastes mentella*. Maturity ogives from Russian 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 D5** 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 | poor |
| 1993 | 162 | - |

[1] On the basis of the abundance of age groups 1+ to 6+ (ref. Table D6).

**Table D6** *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 input for the tuning and recruitment estimation (ref. Table 6.13b).

| 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 | 0.6 | - |
| 1984 | - | 10.0 | 2.0 | - | 5.0 | 18.3 | 19.0 | 2.2 | 2.4 | 0.2 | - | - |
| 1985 | 107.0 | 7.0 | - | 1.0 | 5.2 | 16.2 | 1.7 | 1.7 | 0.6 | - | - | - |
| 1986 | 2.0 | - | 1.0 | 1.8 | 8.4 | 3.6 | 2.1 | 1.2 | - | - | - | - |
| 1987 | - | 3.0 | 37.9 | 1.3 | 8.0 | 4.1 | 2.0 | - | - | - | - | - |
| 1988 | 4.0 | 58.1 | 4.3 | 13.3 | 25.8 | 3.9 | - | - | - | - | - | - |
| 1989 | 8.7 | 9.0 | 17.0 | 23.4 | 4.6 | - | - | - | - | - | - | - |
| 1990 | 2.5 | 6.3 | 6.1 | 1.0 | - | - | - | - | - | - | - | - |
| 1991 | 0.3 | 1.0 | 0.5 | - | - | - | - | - | - | - | - | - |
| 1992 | 0.6 | + | - | - | - | - | - | - | - | - | - | - |
| 1993 | - | - | - | - | - | - | - | - | - | - | - | - |

# APPENDIX V

**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+ | |
| 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 | 1,896 | 36,630 |
| 1985 | 1.6 | 884 | 3,921 | 4,294 | 6,674 | 8,793 | 8,622 | 3,920 | 1,817 | 525 | 39,450 |
| 1986 | 0.1 | 49 | 1,005 | 1,967 | 7,314 | 4,671 | 1,754 | 2,301 | 372 | 37 | 19,470 |
| 1987 | 1.0 | 630 | 1,014 | 3,076 | 4,409 | 4,786 | 3,141 | 964 | 364 | 116 | 18,500 |
| 1988 | 2.5 | 818 | 4,298 | 6,191 | 6,696 | 12,289 | 2,396 | 6,015 | 338 | 1,277 | 39,300 |
| 1989[1,3] | 1.4 | 712 | 3,232 | 8,158 | 7,493 | 7,069 | 2,374 | 1,753 | 353 | 744 | 31,888 |
| 1990[1] | 0.4 | 115 | 336 | 5,050 | 7,130 | 7,730 | 4,490 | 2,330 | 918 | 544 | 28,643 |
| 1991[1] | 0.1 | 71 | 877 | 3,080 | 6,720 | 9,270 | 5,450 | 2,800 | 1,660 | 524 | 30,452 |
| 1992[1] | | 33 | 30 | 338 | 1,190 | 3,520 | 4,420 | 2,280 | 1,280 | 474 | 13,565 |
| 1993[1] | | 25 | 60 | 51 | 1,049 | 2,369 | 2,056 | 2,772 | 1,114 | 665 | 10,161 |

[1] New standard trawl equipment (rockhopper gear and 40 meter sweep length).
[2] In millions.
[3] Revised.

**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+ | |
| 1988 | 141 | 426 | 226 | 258 | 810 | 1858 | 2997 | 1800 | 869 | 402 | 203 | 166 | 201 | 58 | 104 | 10518 |
| 1989 | 457 | 508 | 647 | 478 | 786 | 1680 | 3890 | 2856 | 1287 | 610 | 149 | 19 | 75 | 0 | 55 | 13493 |
| 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 |
| 1994 | 0 | 0 | 16 | 99 | 118 | 957 | 1,631 | 2,379 | 1,473 | 800 | 307 | 264 | 25 | 0 | 0 | 8,069 |

**Table E3** GREENLAND HALIBUT in Sub-areas I and II. Results of the Russian bottom-trawl survey in the Svalbard and Barents 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 |
| 1993 | I-III | 0.2 | 3.2 | 8.0 | 12.1 | 4.5 | 1.9 | 1.3 | 0.8 | 32.0 |
| | I-IV | 0.5 | 5.4 | 13.1 | 20.7 | 8.2 | 3.3 | 2.2 | 1.1 | 54.5 |

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 1983–1994.

| Age years | 1984[1] | 1985[1] | 1986[2] | 1987[2] | 1988[1] | 1989[2] | 1990[2] | 1992[3] | 1994[4] | 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 | 0.34 | 0.23 |
| 6 | 0.68 | 0.43 | 0.49 | 0.46 | 0.40 | 0.66 | 0.52 | 0.22 | 0.47 | 0.49 |
| 7 | 0.70 | 0.64 | 0.52 | 0.70 | 0.57 | 0.74 | 0.66 | 0.26 | 0.63 | 0.66 |
| 8 | 0.76 | 0.77 | 0.62 | 0.74 | 0.63 | 0.68 | 0.75 | 0.34 | 0.71 | 0.78 |
| 9 | 0.80 | 0.92 | 0.80 | 0.91 | 0.67 | 0.81 | 0.71 | 0.55 | 0.77 | 0.89 |
| 10 | 0.89 | 0.97 | 0.88 | 0.96 | 0.89 | 0.92 | 0.77 | 0.95 | 0.97 | 0.95 |
| 11 | 0.96 | 0.99 | 1.00 | 1.00 | 1.00 | 0.94 | 0.93 | 0.83 | 0.93 | 0.99 |
| 12 | 0.96 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.96 | 0.99 |
| 13 | 0.96 | 1.00 | 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 | 1.00 |
| 15 | 1.00 | 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.
[4] The specimens analysed were sampled in November–January.

**Table E5** GREENLAND HALIBUT. Abundance indices on age from the Norwegian trawl survey for shrimp at Svalbard. July–August 1988–1992 and June 1993. Numbers in thousands.

| Year | Age | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9+ | |
| 1988[1] | 4,163 | 14,278 | 8,259 | 8,354 | 2,594 | 6+ 144 | | | | 37,792 |
| 1989[2] | 4,653 | 9,777 | 9,943 | 4,855 | 4,057 | 1,054 | 542 | 83 | 372 | 35,336 |
| 1990 | 247 | 1,569 | 8,324 | 9,800 | 6,910 | 2,148 | 295 | 245 | 175 | 29,713 |
| 1991 | 25 | 577 | 2,465 | 4,969 | 5,362 | 2,541 | 1,380 | 158 | 278 | 17,755 |
| 1992 | 95 | 57 | 505 | 1,780 | 2,914 | 1,129 | 713 | 333 | 200 | 7,726 |
| 1993[3] | 39 | 54 | 50 | 814 | 1,572 | 433 | 589 | 395 | 512 | 4,458 |

[1]The length distribution was split on age according to Macdonald and Pitcher (1979).

[2]An age-length key from the bottom trawl survey for cod at Svalbard in September 1989 was used to convert the indices from length to age.

[3]An age-length key from the bottom trawl survey for cod at Svalbard in September 1993 was used to convert the indices from length to age.