3 North-East Arctic Cod (Subareas 1 and 2)

3.1 Status of the fisheries

3.1.1 Historical development of the fisheries (Table 3.1)

From a level of about 900 000 t in the mid-1970s, total catch declined steadily to around 300 000 t in 1983—1985 (Table 3.1). Catches increased to above 500 000 t in 1987 before dropping to 212 000 t in 1990, the lowest level recorded in the post-war period. The catches increased rapidly from 1991 onwards, stabilized around 750 000 t in 1994—1997 but decreased to about 414 000 t in 2000. From 2000—2009, the reported catches were between 400 000 and 520 000 t, in addition there were unreported catches (see below). Catches have been above the long-term average in the last five years and were 849 000 tonnes in 2016. The fishery is conducted both with an international trawler fleet and with coastal vessels using traditional fishing gears. Quotas were introduced in 1978 for the trawler fleets and in 1989 for the coastal fleets. In addition to quotas, the fishery is regulated by a minimum catch size, a minimum mesh size in trawls and Danish seines, a maximum by-catch of undersized fish, closure of areas having high densities of juveniles and by seasonal and area restrictions.

3.1.2 Reported catches prior to 2017 (Tables 3.1–3.4, Figure 3.1)

Reported catch of cod in subarea I and Divisions IIa and IIb:

The provisional catch for 2016 reported to the working group is 849 422 t.

Reported catch figures used for the assessment of North-East Arctic cod:

The historical practice (considering catches between 62ºN and 67ºN for the whole year and catches between 67ºN and 69ºN for the second half of the year to be Norwegian coastal cod) has been used for estimating the Norwegian landings of North-East Arctic cod up to and including 2011 (Table 3.2). The catches of coastal cod calculated this way for the period 1960—2016 are given in Table 3.2 together with the coastal cod catches calculated based on otolith types (used in the coastal cod assessment as described in Section 2). For 2012-2016 the Norwegian catches have been analysed by an ECA-version designed for simultaneously providing estimates of catch numbers at age for each of the two stocks. By this procedure the amount of Norwegian catches calculated to be coastal cod in 2012, 2013, 2014, 2015 and 2016 is 35.2, 25.7, 33.6, 35.8 and 54.9 thousand tonnes. Table 3.2 includes ECA estimates of coastal cod for the whole period 1984—2016. The plan at the 2015 benchmark was for both stocks to use the ECA estimates for this whole period. As described in the coastal cod section (section 2) these tabulated ECA-results are still considered preliminary, and there is a need for further work on this before the whole time series is applied. The catch by area, are shown in Table 3.1, and further split into trawl and other gears in Table 3.3. The distribution of catches by areas and gears in 2016 was similar to 2015. The nominal landings by country are given in Table 3.4.

There is information on cod discards (see section 0.4) but it was not included in the assessment because this data are fragmented and different estimates are in contradiction with each other. Moreover the level of discards is relatively small in the recent period and inclusion of these estimates in the assessment should not change our perception on NEA cod stock size.

Updated information about conversion factors between round and gutted weight is given in section 3.12, but this information is not yet ready for use in assessment,

3.1.3 Unreported catches of Northeast Arctic cod (Tables 3.1)

In the years 2002—2008 certain quantities of unreported catches (IUU catches) have been added to the reported landings. More details on this issue are given in the Working group reports for that period.

There are no reliable data on level of IUU catches outside the periods 1990—1994 and 2002—2008, but it is believed that their level was not substantial enough to influence on historical stock assessment.

According to reports from the Norwegian-Russian analysis group on estimation of total catches the total catches of cod since 2009 were very close to officially reported landings.

3.1.4 TACs and advised catches for 2016 and 2017

The Joint Norwegian-Russian Fisheries Commission (JNRFC) agreed on a cod TAC of 894 000 t for 2016, and in addition 21 000 t Norwegian coastal cod. The total reported catch of 904 338 t in 2016 was) 10 662 t below the agreed TAC.

The advice for 2017 given by ACOM in 2016 was 805 000 t based on the agreed harvest control rule with the clause of having catch corresponding to −10% change compared to TAC 2016. The quota established by JNRFC for 2017 was equal to 890 000 tonnes, in accordance with the revised harvest control rule adopted by JNRFC in 2016 (section 3.7.3). In addition, the TAC for Norwegian Coastal Cod was set to the same value for 2017 as for 2016: 21 000 t.

3.2 Status of research

3.2.1 Fishing effort and CPUE (Table A1)

CPUE series of the Norwegian and Russian trawl fisheries are given in Table A1. The data reflect the total trawl effort, both for Norway and Russia. The Norwegian series is given as a total for all areas. Norwegian data for 2011-2016 were presented to the WG this year (WD 17). These are not necessarily compatible with data for 2007 and previous years.

3.2.2 Survey results - abundance and size at age (Tables 3.5, A2-A14)

Joint Barents Sea winter survey (bottom trawl and acoustics) Acronyms: BS-NoRu-Q1 (BTr) and BS-NoRu-Q1 (Aco)

The preliminary swept area estimates and acoustic estimates from the Joint winter survey on demersal fish in the Barents Sea in winter 2017 are given in Tables A2 and A3. More details on this survey are given in Mehl *et al*. (WD 03). The total area covered was less than in 2016, due to incomplete coverage of the Russian EEZ.

Before 2000 this survey was made without participation from Russian vessels, while in 2001—2005 and 2008—2016 Russian vessels have covered important parts of the Russian zone. In 2006—2007 the survey was carried out only by Norwegian vessels. In

2007 and 2016 the Norwegian vessels were not allowed to cover the Russian EEZ. Coverage in 2017 was incomplete due to lack of Russian participation. The method for adjustment for incomplete area coverage in 2007 is described in the 2007 report. Table 3.5 shows areas covered in the time series and the additional areas implied in the method used to adjust for missing coverage in the Russian Economic Zone. In 5 of the 6 adjusted years (including 2017) the adjustments were not based on area ratios, but the "index ratio by age" was used. This means that the index by age for the covered area was scaled by the observed ratio between total index and the index for the same area observed in the years prior to the survey. The adjustments for 2017 was based on average index rations by age for 2014-2016.

Regarding the older part of this time series it should be noted that the survey prior to 1993 covered a smaller area (Jakobsen *et al*. 1997), and the number of young cod (particularly 1- and 2-year old fish) was probably underestimated. Other changes in the survey methodology through time are described by Jakobsen et al. (1997), while the surveys for the years 2007—2012 and 2013—2016 are reported in Mehl et al. (2013, 2014, 2015, 2016). Note that the change from 35 to 22 mm mesh size in the codend in 1994 is not corrected for in the time series. This mainly affects the age 1 indices.

The new method for calculating bottom trawl indices is described in Mehl et al. (2017). Revisions of the acoustic indices from this survey will be available before AFWG 2018. Then the time series for weight at age and maturity at age will be revised accordingly.

With the recent expansion of the cod distribution it is likely that in recent years the coverage in the February survey (BS-NoRu-Q1 (BTr) and BS-NoRu-Q1 (Aco)) has been incomplete, in particular for the younger ages. This could cause a bias in the assessment, but the magnitude is unknown. The 2014-2017 surveys covered considerably larger areas than earlier winter surveys, and showed that most age groups of cod (particularly ages 1 and 2) were distributed far outside the standard survey area. The survey estimates within the standard area were used for the tuning data. If a wider coverage is continued in coming years, improved tuning data might be obtained.

Lofoten acoustic survey on spawners Acronym: Lof-Aco-Q1

The estimated abundance indices from the Norwegian acoustic survey off Lofoten and Vesterålen (the main spawning area for this stock) in March/April are given in Table A4. A description of the survey, sampling effort and details of the estimation procedure can be found in Korsbrekke (1997). The 2017 survey gave a biomass about two thirds of that estimated in the 2016 survey; 636 thousand tonnes. The concentrations were very dense in some areas.

Russian autumn survey Acronym: RU-BTr-Q4

Abundance estimates from the Russian autumn survey (November-December) are given in Table A9 (acoustic estimates) and Table A10 (bottom trawl estimates). The entire bottom trawl time series was in 2007 revised backwards to 1982 (Golovanov *et al*., 2007, WD3), using the same method as in the revision presented in 2006, which went back to 1994. The new swept area indices reflect Northeast Arctic cod stock dynamics more precisely compared to the previous one - catch per hour trawling. The Russian autumn survey in 2006 was carried out with reduced area coverage. Divisions 2a and 2b were adequately investigated in the survey in contrast to Sub-area 1, where the survey covered approximately 40% of the long-term average area coverage. The Subarea 1 survey indices were calculated based on actual covered area (40 541 sq. miles). The 2007 AFWG decided to use the final year class indices without any

correction because of satisfactory internal correspondence between year class abundances at age 2—9 years according to the 2006 survey and ones due to the previous surveys.

This survey was, however, not conducted in 2016, but may be carried out in 2017.

Joint Ecosystem survey Acronym: Eco-NoRu-Q3 (Btr)

Swept area bottom trawl estimates from the joint Norwegian-Russian ecosystem survey in August-September for the period 2004-2016 are given in Table A14. This survey covers the entire distribution area of cod. The new index values were calculated at first in 2010 (AFWG 2010, WD 20). This time series have been tested as a new tuning fleet in XSA during the benchmark meeting in 2015 (WKARCT 2015). Benchmark recommended using this index in NEA cod assessment. However, the calculation method for this series is in review.

In 2014 this survey had an essential problem with area coverage in the north-west region because of difficult ice conditions. In the area covered by ice in 2014 a substantial part of population was distributed during 2013 survey. So, based on those observations AFWG decided in 2015 to exclude 2014 year from that tuning series in current assessment. In 2016 there was incomplete coverage in the international waters and close to the Murman coast. An adjustment for this incomplete coverage was made based on interpolation from adjacent areas (WD 12). At this time of the year, usually a relatively small part of the cod stock is found in the area which was not covered in 2016.

Survey results – length and weight at age (Tables A5–A8, A11–A12)

Length at age is shown in Table A5 for the Norwegian survey in the Barents Sea in winter, in Table A7 for the Lofoten survey and in Table A11 for the Russian survey in October-December. Weight at age is shown in Table A6 for the Norwegian survey in the Barents Sea in winter, in Table A8 for the Lofoten survey and in Table A12 for the Russian survey in October-December.

The Joint winter survey in 2017 shows stable size-at-age values (Table A6).

3.2.3 Age reading

The joint Norwegian-Russian work on cod otolith reading has continued, with regular exchanges of otoliths and age readers (see chapter 0.6). The results of fifteen years of annual comparative age readings are described in Yaragina *et al*. (2009b). Zuykova *et al*. (2009) re-read old otoliths and found no significant difference in contemporary and historical age determination and subsequent length at age. However, age at first maturation in the historical material as determined by contemporary readers is younger than that determined by historical readers. Taking this difference into account would thus have effect on the spawning stock-recruitment relationship and thus on the biological reference points. The overall percentage agreement for the 2013-2014 exchange was 81.9-85.1% (WD 01 2016). The main reason for cod ageing discrepancies between Russian and Norwegian specialists remains the same, representing the latest summer growth zone, and different interpretations of the false zones. Some decrease in the percentage agreement in 2012-2014 is likely to be connected with more old fish being present in the samples, and reflected the 2012-2014 catch age/length composition. It is observed that the percent agreement between age readers decreases as fish age increases.

The trend with bias in NEA cod age determination registered for some years of the period 1992-2014 between experts of both countries is a solid argument to continue comparative cod age reading between PINRO and IMR to monitor the situation. The German participant has expressed an intention to join the age reading cooperation in future.

3.3 Data used in the assessment

3.3.1 Catch at age (Tables 3.6)

For 2016, age compositions from all areas were available from Russia, Spain, Germany (area 2a only), Poland (area 2a only) and Norway. Unsampled catches were distributed on age by using data from Russian trawl in Sub-area 1 and Division 2a, and by using data from Norwegian trawl in Division 2b. The catch at age data was calculated using Intercatch (Table 3.6).

Catch-at-age data have for many years been used until age 13+ but now there are two abundant generations at the stock which become close to plus group and it was decided to increase age range for catch data until age 15+. The data for ages 13, 14 and 15+ were taken from the AFWG 2010 report and in the Intercatch data base for later years. Catch in numbers at age up to 15+ was made available during the IBP meeting.

There is still a concern about the biological sampling from the Norwegian fishery that may have become critically low. In 2016 the sampling was low for trawl catches in coastal areas in ICES area 2a, thus samples for trawl here were merged with other similar gears when calculating age compositions. Also the split between NEA cod and coastal cod may have been affected by the sampling coverage, and possibly the amount of coastal cod catch is overestimated.

Length distributions from the Russian fishery were made by observers onboard fishing vessels in reasonably sufficient quantity in all areas. However, biological sampling from the trawl fishery has been relatively low, especially in Division 2a.

3.3.2 Weight at age (Tables 3.7 –3.9, A2, A4, A6, A8, A12).

Catch weights

For 2016, the mean weight at age in the catch (Table 3.8) was obtained from Intercatch as a weighted average of the weight at age in the catch for Norway, Russia, Spain and Germany (Table 3.7). The weight at age in the catch for all countries is given in Table 3.9. Since the 2000 working group the assessment has applied 13 as plus group. The weight at age 13, 14 and 15 in the catch for 1946-1982, needed for this year assessment due to extended age range, was taken from AFWG 2001 (ICES CM 2001/ACFM:19). For the 2017 assessment, it was decided to use the following procedure for weight at age calculations for recent period (1983-onwards): Observations were used for ages up to 11. However, because of very noisy values observed for older fish, weight at age 12-15 was set to constant values in this period. Weight at age 12 was equal to the mean for 1983-2015; the mean increment for ages 12-13, 13-14 and 14-15+ groups in the 1983-2015 period were used to calculate weight at age 13, 14, and 15.

Stock weights

For ages 1—11 stock weights at age at the start of year y ($W_{a,y}$) for 1983—2016 (Table 3.9) were calculated as follows:

$$W_{a,y} = 0.5(W_{rus,a-1,y-1} + (\frac{N_{nbar,a,y}W_{nbar,a,y} + N_{lof,a,y}W_{lof,a,y}}{N_{nbar,a,y} + N_{lof,a,y}}))$$

where

$W_{rus,a-1,y-1}$: Weight at age a-1 in the Russian survey in year y-1 (Table A12)

$N_{nbar,a,y}$: Abundance at age a in the Norwegian Barents Sea acoustic survey in year y (Table A2)

$W_{nbar,a,y}$: Weight at age a in the Norwegian Barents Sea acoustic survey in year y (Table A6)

$N_{lof,a,y}$: Abundance at age a in the Lofoten survey in year y (Table A4)

$W_{lof,a,y}$: Weight at age a in the Lofoten survey in year y (Table A8)

Ecosystem survey data on length and weight at age are not used because of longer distance between survey time and beginning of the year (assessment using numbers at 1 January).

This year, the same procedure was used for weight at age in stock calculations for retro period (1946-1982) assuming that weight at age in stock was equal to weight at age in catch. Weight at age 12-15 was fixed for recent period (1983-onwards). Average values of Fleet 15 (BS-NoRu-Q1 (BTr)) data available at the moment for older age groups (12-15) were used for calculations of average weight at age in stock in this period.

3.3.3 Natural mortality including cannibalism (Table 3.12)

A natural mortality (M) of 0.2 + cannibalism was used. Cannibalism is assumed to only affect natural mortality of ages 3-6. In addition, cannibalism was taken into account.

The method used for calculation of the prey consumption by cod described by Bogstad and Mehl (1997) is used to calculate the consumption of cod by cod (Table 3.12) for use in cod stock assessment. The consumption is calculated based on cod stomach content data taken from the joint PINRO-IMR stomach content database (methods described in Mehl and Yaragina 1992). On average about 9000 cod stomachs from the Barents Sea have been analysed annually in the period 1984—2016.

These data are used to calculate the per capita consumption of cod by cod for each half-year (by prey age groups 0—6 and predator age groups 1-11+). It was assumed that the mature part of the cod stock is found outside the Barents Sea for three months during the first half of the year. Thus, consumption by cod in the spawning period was omitted from the calculations.

An iterative procedure was applied to include the per capita consumption data in the SAM run. It is described in details in Stock Annex.

For the cod assessment data from annual sampling of cod stomachs has been used for estimating cannibalism, since the 1995 assessment. The argument has been raised that the uncertainty in such calculations are so large that they introduce too much noise in the assessment. A rather comprehensive analysis of the usefulness of this was presented in Appendix 1 in the 2004 AFWG report. The conclusion was that it improves the assessment.

The data on cod cannibalism for the historical period (1946—1983) was included in assessment during the benchmark to make the VPA time series consistent (WKARCT 2015). These estimates were based on hindcasted values of NEA cod natural mortality

at ages 3—5 using PINRO data base on food composition from cod stomach for the historical period (Yaragina et al. WD07 WKARCT 2015).

3.3.4 Maturity at age (Tables 3.10 and 3.11)

Historical (pre 1982) Norwegian and Russian time series on maturity ogives were reconstructed by the 2001 AFWG meeting (ICES CM 2001/ACFM:19). The Norwegian maturity ogives were constructed using the Gulland method for individual cohorts, based on information on age at first spawning from otoliths. For the time period 1946—1958 only the Norwegian data were available. The Russian proportions mature at age, based on visual examinations of gonads, were available from 1959.

Since 1982 Russian and Norwegian survey data have been used (Table 3.10). For the years 1985—2016, Norwegian maturity at age ogives have been obtained by combining the Barents Sea winter survey and the Lofoten survey. Russian maturity ogives from the autumn survey as well as from commercial fishery for November-February are available from 1984 until present. The Norwegian maturity ogives tend to give a higher percent mature at age compared to the Russian ogives, which is consistent with the generally higher growth rates observed in cod sampled by the Norwegian surveys. The approach used is consistent with the approach used to estimate the weight at age in the stock (described in Section 3.3.2). The percent mature at age for the Russian and Norwegian surveys have been arithmetically averaged for all years, except 1982—1983 when only Norwegian observations were used and 1984 when only Russian observations were used.

Russian data for the autumn survey 2016 were not available as the survey was not conducted. In WD10, correction factors to allow for this when calculating the maturity at age in 2017 were calculated, based on historical differences between Norwegian and Russian data. These correction factors were then applied to the Norwegian data for 2017.

Some Russian data on maturity were sampled in November-December 2016 on board of fishing vessels by observers (1378 sp.). They show lower portions of mature specimens at age in comparison with Norwegian 2017 survey data, especially for ages 7 and 8. These opposite tendencies have to be investigated further.

The proportions of mature cod for age 13-15 was set to 1 for the period 1984-present, while for the period 1946-1983) data were taken from the AFWG 2001 report (ICES CM 2001/ACFM:19).

3.4 Benchmark and change of assessment model

The range of ages in the stock has been expanding and this has caused some problems with the age range used in the stock assessment. One of the basic goals of the Inter-Benchmark meeting in April 2017 (ICES 2017) was to investigate if and how information on stock dynamics at older ages (biological, survey, and fishery data) may be included into the analytical stock assessment.

At the inter-benchmark meeting it was decided to use SAM as the main assessment model for this stock and to use an extended age range in the tuning series. The internal consistency of cohorts was used to determine the upper limit of the age range. One important argument for choosing SAM was better retrospective performance and independence of SAM model of assumption on form of relationship between stock abundance and survey indexes.

3.5 Assessment using SAM (Tables 3.13, A13)

The following survey data series were used:

Fleet code	Name	Place	Season	Age	Years
Fleet 15	Joint bottom trawl survey	Barents Sea	Feb-Mar	4-12	1981-2017
Fleet 16	Joint acoustic survey	Barents Sea+Lofoten	Feb-Mar	4-12	1985-2017
Fleet 18	Russian bottom trawl surv.	Total area	Oct-Dec	3-12	1982-2015
Fleet 007	Ecosystem surv.	Total area	Aug-Sep	3-12	2004-2016

Note that the surveys that are conducted during winter (FLT 15 and 16) are allocated to the time of the year when they are carried out, previously they were allocated the end of the previous year, as that was the only possibility for using them when running XSA.

The tuning fleet file is shown in Table 3.13. Note that the joint acoustic survey (sum of Barents Sea and Lofoten acoustic survey indices) is given in Table A13.

Survey indices for Fleet 15 have been multiplied by a factor 100, while survey indices for Fleets 007, 16 and 18 have been multiplied by a factor 10. This was done to keep the dynamics of the surveys even for very low indices, because some models (e.g. XSA) adds 1.0 to the indices before the logarithm is taken.

3.5.1 SAM settings (Table 3.14)

The SAM settings, adopted at the IBP (ICES C.M. 2017/ACOM:29), are shown in Table 3.14.

3.5.2 SAM diagnostics (Figure 3.2a,b,c)

Residuals for the final SAM run are shown in Fig 3.2a, while retrospective plots of F, SSB and recruitment are shown in Figure 3.2b. Figure 3.2c shows the catchability by survey and age group.

3.5.3 Results (Table 3.15–3.18, Figure 3.1)

The fishing mortalities and population numbers are given in Tables 3.15 and 3.16. M values (M=0.2+cannibalism mortality) are given in Table 3.17. For ages 3—5 the M matrix in 1946—1983 also includes M2 since the benchmark meeting in 2015 (WKARCT 2015).

Summaries of landings, fishing mortality, stock biomass, spawning stock biomass and recruitment since 1946 are given in Table 3.18 and Figure 3.1.

3.6 Results of the assessment

3.6.1 Fishing mortalities and stock biomass (Tables 3.18, 3.20)

The estimated $F_{5\text{-}10}$ in 2016 is 0.334, which is below F_{pa} (Table 3.18). Fishing mortality has been fairly stable since 2008. The spawning stock biomass in 2017 is estimated to

be 1,836 kt (Table 3.20), which is high but lower than the peak in 2013 (2,693 kt). One should bear in mind that in the early part of the time series the fraction of mature fish was considerably lower.

Total stock biomass in 2017 is estimated to 2,822 kt which is somewhat above the long-term mean and well below the highest level observed (4,376 kt in 2013).

3.6.2 Recruitment (Table 1.9a)

At the 2008 AFWG meeting it was decided to use a hybrid model, which is an weighted arithmetic mean of different recruitment models (Section 1.4). It was agreed to use the same approach this year. The input data for those models are the following time series; survey data for ages 0, 1 and 2 (Russian autumn survey) and ages 1, 2 and 3 (Joint winter survey), 0-group from the ecosystem survey, capelin biomass, ice coverage, temperature and oxygen saturation at the Kola section, air temperature at the Murman coast. Prognosis from all the models, including the hybrid is presented in Table 1.9a. Since 2014 the hybrid model is based on objective weighting of different sub-models and includes the RCT3 model (see section 1.4 for details). The numbers at age 3 calculated by the hybrid method were: 566 million for the 2014 year class, 607 million for the 2015 year class and 543 million for the 2016 year class. The Russian autumn survey was not conducted in 2016 so those indices were not available for recruitment prediction in this year.

3.7 Reference points and harvest control rules

The current reference points for Northeast Arctic cod were estimated by SGBRP (ICES CM 2003/ACFM:11) and adopted by ACFM at the May 2003 meeting.

At the 46th session of JRNFC a new version of the management rule was adopted (see section 3.7.3). The TAC advice for 2018 is based on the management rule.

3.7.1 Biomass reference points

The values adopted by ACFM in 2003 are $\mathbf{B}_{lim}$ = 220 000 t, $\mathbf{B}_{pa}$ = 460 000 t. (ICES CM 2003/ACFM:11).

3.7.2 Fishing mortality reference points

The values adopted by ACFM in 2003 are $\mathbf{F}_{lim}$ = 0.74 and $\mathbf{F}_{pa}$ = 0.40. (ICES CM 2003/ACFM:11).

3.7.3 Harvest control rule

3.7.3.1 History

At the 31st session of The Joint Norwegian–Russian Fishery Commission (JRNFC) in autumn 2002, the Parties agreed on a new harvest control rule. This rule was applied for the first time when setting quotas for 2004. The rule was somewhat amended at the 33rd session of The Joint Norwegian–Russian Fishery Commission in autumn 2004. The amended rule was evaluated by ICES in 2005 and found to be precautionary.

"The Parties agreed that the management strategies for cod and haddock should take into account the following:

conditions for high long-term yield from the stocks

achievement of year-to-year stability in TACs

full utilization of all available information on stock development

On this basis, the Parties determined the following decision rules for setting the annual fishing quota (TAC) for Northeast Arctic cod (NEA cod):

estimate the average TAC level for the coming 3 years based on F_{pa}. TAC for the next year will be set to this level as a starting value for the 3-year period.

the year after, the TAC calculation for the next 3 years is repeated based on the updated information about the stock development, however the TAC should not be changed by more than +/- 10% compared with the previous year's TAC.

if the spawning stock falls below B_{pa}, the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from F_{pa} at B_{pa}, to F= 0 at SSB equal to zero. At SSB-levels below B_{pa} in any of the operational years (current year, a year before and 3 years of prediction) there should be no limitations on the year-to-year variations in TAC.

A review and discussion of this and other harvest control rule was made by the ICES SGMAS (ICES C. M. 2007/ACFM:04). They discovered that this HCR may give unexpected and possibly unwanted results if the assessment changes much from year to year in a situation when SSB is close to B_{pa}. This problem has, however, so far not been encountered in the application of the HCR.

At the 38th JNRFC meeting, an amendment was made to the rule, and it then read (new text in bold):

"On this basis, the Parties determined the following decision rules for setting the annual fishing quota (TAC) for Northeast Arctic cod (NEA cod):

-estimate the average TAC level for the coming 3 years based on F_{pa}. TAC for the next year will be set to this level as a starting value for the 3-year period.

-the year after, the TAC calculation for the next 3 years is repeated based on the updated information about the stock development, however the TAC should not be changed by more than +/- 10% compared with the previous year's TAC. **If the TAC, by following such a rule, corresponds to a fishing mortality (F) lower than 0.30 the TAC should be increased to a level corresponding to a fishing mortality of 0.30.**

-if the spawning stock falls below B_{pa}, the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from F_{pa} at B_{pa}, to F= 0 at SSB equal to zero. At SSB-levels below B_{pa} in any of the operational years (current year, a year before and 3 years of prediction) there should be no limitations on the year-to-year variations in TAC."

In 2014, JNRFC decided that from 2015 onwards, Norway and Russia can transfer to next year or borrow from last year 10% of the country's quota.

3.7.3.2 Current rule

JNRFC in 2015 asked ICES to explore the consequences of the following harvest control rules. This was done by WKNEAMP (ICES 2015, 2016). JNRFC in 2016 adopted one of the rules explored by WKNEAMP (Rule 6 in that report).

The new rule reads as follows:

The TAC is calculated as the average catch predicted for the coming 3 years using the target level of exploitation (F_{tr}).

The target level of exploitation is calculated according to the spawning stock biomass (SSB) in the first year of the forecast as follows:

- if SSB < B_{pa}, then F_{tr} = SSB / B_{pa} × F_{msy};

- if B_{pa} ≤ SSB ≤ 2×B_{pa}, then F_{tr} = F_{msy};

- if 2×B_{pa} < SSB < 3×B_{pa}, then F_{tr} = F_{msy} × (1 + 0.5 × (SSB - 2×B_{pa}) / B_{pa});

- if SSB ≥ 3×B_{pa}, then F_{tr} = 1.5 × F_{msy};

where F_{msy}=0.40 and B_{pa}=460 000 tonnes.

If the spawning stock biomass in the present year, the previous year and each of the three years of prediction is above B_{pa}, the TAC should not be changed by more than +/- 20% compared with the previous year's TAC. In this case, F_{tr} should however not be below 0.30.

3.8 Prediction

3.8.1 Prediction input (Table 3.19, Figure 3.3–3.6)

The input data to the short-term prediction with management option table (2017—2020) are given in Table 3.19. For 2017 stock weights and maturity were taken from surveys as described in Sections 3.3.2 and 3.3.4. Russian data for weight and maturity at age in autumn 2016 were not available as the survey was not conducted. In WD10, correction factors to allow for this when calculating the weight and maturity at age in 2017 were calculated, based on historical differences between Norwegian and Russian data. These correction factors were then applied to the Norwegian data for 2017.

W(a+1,y+1)=W(a,y) + Incr(a), where Incr(a) is a "medium term" average of Incr(a,y)= W(a+1,y+1)-W(a,y)

This method was introduced in the cod prediction in the 2003 working group. Since 2005 working group the 3 most recent values of annual increments have been used for predicting stock weights. For catch weights the last 10-year period for averaging the increments is used. Weight increment for ages older than 9 are fixed to the value calculated for age 9 because of low sampling and high variability observed for older ages. Figures 3.3 and 3.4 show how these predictions perform back in history.

Catch weights in 2017 onwards and stock weights in 2018 and onwards for age 3-11 are predicted by the method described by Brander (2002), where the latest observation of weights by cohort are used together with average annual increments to predict the weight of the cohort the following year. For age 12 and older constant weights at age in the stock and the catch were used, based on 1983-2015 averages as described in Section 3.3.2.

The maturity ogive for the years 2018—2020 was predicted by using the 2015—2017 average. The exploitation pattern in 2017 and later years was set equal to the previous 3 -years average according to the benchmark decision (WKARCT 2015).

Before the next year's working group, the method for prediction of weight at age in stock and catch and selection pattern for the oldest age groups (10+) should be reviewed, as we have more reliable data for those age groups in recent years and thus long time series averages are not necessarily the most relevant to use.

The stock number at age in 2017 was taken from the final SAM run (Table 3.16) for ages 4 and older. The recruitment at age 3 in the years 2017—2019 was estimated as described in section 3.6.2. Figure 3.5 shows the development in natural mortality due to cannibalism for cod (prey) age groups 1-3 together with the abundance of capelin in the period 1984—2016. There was no clear trend in natural mortality, and the average M values for the last 3 years are used to predict natural mortality of age groups 3—6 for years 2017—2019 (based on benchmark decision, WKARCT 2015).

For 2020, the 2019 values were used for all input data, except for recruitment, where the long-term arithmetic mean (748 million at age 3) was used.

The assessment shows a stable F from 2009 to 2016. The fishing effort also was relatively stable (Figure 3.6) at the same time but shows an increase in 2014-2015 which is not reflected in the fishing mortality. In accordance to the benchmark decision (WKARCT 2015) the last year's assessment F in terminal year 2016 is considered to be used for F in the intermediate year (2017). Table 3.19 shows input data to the predictions.

Results of prediction show that the catch in 2017 predicted using F_{sq} is 23 % less than the agreed TAC. The previous decision to use F_{sq} was based on the observation that it gives more correct prediction of TSB in the beginning of TAC year (ICES CM 2013/ACFM:05) and was adopted by the benchmark in 2015. This conclusion is not necessarily valid when SAM used as assessment model and a further research is needed on that issue.

3.8.2 Prediction results (Tables 3.20 – 3.21)

The catches corresponding to F_{sq} in 2017 is 688 kt (Table 3.20). This is well below the TAC for 2017 (890 kt). The resulting SSB in 2018 is 1,505 kt, lower than in 2017 but still at a high level. Table 3.20 shows the short-term consequences over a range of F-values in 2018. The detailed outputs corresponding to F_{sq} in 2017 and the F corresponding to the HCR and F_{pa} in 2018 is given in Table 3.21. Summarised results are shown in the text table below.

Since SSB in 2018 is above 3*Bpa=1380 kt, F=0.60 is used in the 3-year prediction, giving catches of 900, 651 and 553 kt in 2018, 2019 and 2020, respectively. The average of this is 701 kt. However, the limit of 20% annual change in catch in the HCR from year to year applies in this case and gives 712 kt (20% reduction from 890 kt).

Rationale	Catches (2018)	Basis	F (2018)	SSB (2019)	%SSB change*)	%TAC change**)
Management plan	712	FMP (HCR)	0.44	1187	-21	-20
MSY approach/ Precautionary Limits	654	FMSY / Fpa	0.40	1238	-18	-27
Zero catch	0	0	0	1837	+22	-100

Flim	1048	Flim	0.74	898	-40	+18
Status quo	562	Fsq	0.33	1320	-12	-37

Weights in '000 t.

***) SSB 2019 relative to SSB 2018.**

****) Catch 2018 relative to TAC 2017.**

This catch forecast covers all catches. It is then implied that all types of catches are to be counted against this TAC. It also means that if any overfishing is expected to take place, the above calculated TAC should be reduced by the expected amount of overfishing.

3.9 Comparison with last year's assessment

The text tables below compares this year's estimates with last year's estimates (both to the XSA assessment made by ACOM and used as a basis for the advice, and the XSA AFWG assessment) for the year 2016 of numbers at age (millions), total biomass, spawning biomass (thousand tonnes), as well as reference F for the year 2015.

AFWG 2016

		N(2016)												
Assessment year (specification)	F(2015)	age3	age4	age5	age6	age7	age8	age9	age10	age11	age12	TSB (2016)	SSB (2016)	F (2016)
2016 WG	0.269	766*	377	533	302	187	104	42	60	58	30	3974	1911	0.269**
2017 WG	0.32	180	220	310	188	127	80	47	65	50	19	3035	1770	0.334
Ratio 2017 WG/ 2016 WG	1.19	0.24	0.58	0.58	0.62	0.68	0.77	1.13	1.09	0.86	0.61	0.76	0.93	1.24

***estimated by recruitment models **assuming F_{sq}**

ACOM 2016

		N(2016)												
Assessment year (specification)	F(2015)	age3	age4	age5	age6	age7	age8	age9	age10	age11	age12	TSB (2016)	SSB (2016)	F (2016)
2016 WG SALY	0.3855	766*	374	470	274	171	92	37	38	19	7	2947	1070	0.3855**
2017 WG	0.32	180	220	310	188	127	80	47	65	50	19	3035	1770	0.334
Ratio 2017 WG/ 2016 WG	0.83	0.24	0.59	0.66	0.69	0.74	0.87	1.28	1.73	2.63	2.56	1.03	1.65	0.87

***estimated by recruitment models **assuming F_{sq}**

The number at age in 2016 from this year's assessment for ages 3-8 are well below both assessment last year. For ages 9-12 last year's AFWG assessment corresponds reasonably well with this year's assessment while last year's ACOM assessment is much lower than this year's assessment.

3.10 Additional assessment methods

All models use the same tuning data, but FLT 15 and FLT 16 are shifted one year and one age group in XSA, but not in SAM and TISVPA.

3.10.1 XSA

Same settings as last year, now with but with catchability dependent on stock size for all ages and considerably extended tuning age range compared to last year. The model is run for ages 3-13+, while other models are runs for 3-15+.

3.10.2 TISVPA (Tables 3.22–3.24)

The TISVPA (Triple Instantaneous Separable VPA) model (Vasilyev, 2005; 2006) represents fishing mortality coefficients (more precisely – exploitation rates) as a product of three parameters: f(year)*s(age)*g(cohort). The generation-dependent parameters, which are estimated within the model, are intended to adapt traditional separable representation of fishing mortality to situations when several year classes may have peculiarities in their interaction with fishing fleets caused by different spatial distribution, higher attractiveness of more abundant schools to fishers, or by some other reasons.

The model was first presented and tested at the ICES Working Group on Methods of Fish Stock Assessments (WGMG 2006) and was used for data exploration and stock assessment for several ICES stocks, including North-East Atlantic mackerel, blue whiting, Norwegian spring-spawning herring.

To NEA cod stock TISVPA model was applied at AFWG in 1998 and at benchmark group for arctic stocks (WKARCT) in 2015. At Inter-Benchmark protocol working group (IBPArcticCod) in 2017 it was decided to continue to use TISVPA as a supplementary model.

This year the TISVPA model was applied to NEA cod using the same data as SAM except that natural mortality values from cannibalism were taken from the XSA runs. During AFWG 2017 the results of exploratory runs using the TISVPA model were presented and discussed (WD#19). The results generally support the results of SAM model giving an estimate of SSB in 2017 of about 2 million tonnes.

3.10.3 Model comparisons

Figure 3.7 compares the results of SAM, XSA and TISVPA, showing F, SSB, TSB and recruitment. F and TSB is very similar for all models. SSB in recent years is quite a bit lower in XSA than in the two other models, while recruitment in recent years is considerably lower in SAM than in the two other models.

3.11 Comments to the assessment

The WG realizes that imprecise input data, in particular the catch-at-age matrix, and incomplete spatial coverage in surveys could be a main obstacle to producing precise stock assessments, regardless of which model is used.

For several surveys, adjustments were made for the last data year due to incomplete spatial coverage. Also for one survey there was incomplete area coverage and missing surveys in the last year. The Russian bottom trawl survey in October–December (RU-BTr-Q4) was not carried out in 2016.

The assessment model was changed from XSA to SAM this year following an InterBenchmark meeting in April 2017 (ICES C. M. 2017/ACOM:29). Also there was a change in the recruitment model. These changes led to a considerable downwards

adjustment of the 2008 and later cohorts while the abundance of the 2007 and older cohorts was revised upwards.

3.12 New and revised data sources

This section describes some data sources, which could be included in the assessment in the future.

3.12.1 Consistency between NEA cod and coastal cod catch data (Table 3.2)

Consistency between the catch data used for NEA cod and coastal cod should also be ensured. The catch figures used in the coastal cod assessment are not equal to the difference between the total cod catch and the catch used in the NEA cod assessment (Table 3.2). These discrepancies will be adjusted when the ECA-results for the period 1984—2016 are re-evaluated (Table 3.2, and section 2.2.1).

3.12.2 Discard and bycatch data (Tables 3.25–3.26)

Work on updating discard and bycatch data series (Table 3.25, 3.26) is ongoing but new data were not available in time for AFWG 2017. At WKARCT in 2015 it was, however, decided not to include those data in the catch at age matrix. Table 3.26 (taken from Ajiad *et al*., WD2, 2008) presents by-catch in the Norwegian shrimp fishery by cod age (previously this has been given by cod length). The by-catch mainly consists of age 1 and 2 fish, but the bycatch is generally small compared to other reported sources of mortality: catches, discards and the number of cod eaten by cod. From 1992 onwards, by-catches of age 3 and older fish are negligible, because use of sorting grids was made mandatory. However, in 1985, by-catches of age 5 and 6 cod were about one third of the reported catches for those age groups. The year class for which the by-catches were highest, was the 1983 year class (total by-catch of age 2 and older fish of about 60 million, compared to a stock estimate of about 1000 million at age 3).

3.12.3 Conversion factors

Until 1989-1990, Norway used seasonal conversion factors (weight) between headed+gutted fish and round fish of 1.6 during winter and 1.4 the rest of the year. This factor was set to 1.50 in Norwegian fishery from 1992 onwards and this factor was also agreed by JNRFC from 2000 onwards so it is now constant for all fisheries at all times of year although in reality there is a larger factor in winter season when the fishery is dominated by mature fish with gonads. In recent years a larger proportion of the total fishery in this period is on cod > 70 cm which has higher conversion factor than smaller cod (WD 15).

In January-April 2015 investigations on conversion factors were made in Norwegian fisheries with all gears along the Norwegian coast and also up to Bear Island (WD 15). In total 332 samples of 10 fish/50kg were taken. The final weighted conversion factors were 1.31 and 1.67 for the products gutted with head and gutted without head (round cut), respectively.

These conversion factors are significantly higher (11-12%) than the official factors for these products at 1.18 and 1.50. Investigations made at other times of the year indicate that for ocean-going fleets (trawl and autoline) the conversion factor is below 1.5 for the rest of the year and that an overall conversion factor of 1.5 for these

fleets seems appropriate. However, if the conversion factors given in WD 15 for cod had been used for cod caught with coastal fishing gears in the winter season, the quantity fished within this fleet segment would have been in the order of 20 000 tonnes higher per year than that indicated by the official fisheries statistics for the years 2012-2014. For these gears the fishery in the rest of the year in small compared to the January-April fishery and thus this will not be compensated by the conversion factor used for the rest of the year, as is the case for trawl and autoline.

Table 3.1 North-East Arctic COD. Total catch (t) by fishing areas and unreported catch

Year		Sub-area 1	Division 2.a	Division 2.b	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	172 532	86 483	130 000	513 234
1993		195 771	269 383	66 457	50 000	581 611
1994		353 425	306 417	86 244	25 000	771 086
1995		251 448	317 585	170 966		739 999
1996		278 364	297 237	156 627		732 228
1997		273 376	326 689	162 338		762 403
1998		250 815	257 398	84 411		592 624
1999		159 021	216 898	108 991		484 910
2000		137 197	204 167	73 506		414 870
2001		142 628	185 890	97 953		426 471
2002		184 789	189 013	71 242	90 000	535 045
2003		163 109	222 052	51 829	115 000	551 990

Year		Sub-area 1	Division 2.a	Division 2.b	Unreported catches	Total catch
2004		177 888	219 261	92 296	117 000	606 445
2005		159 573	194 644	121 059	166 000	641 276
2006		159 851	204 603	104 743	67 100	537 642
2007		152 522	195 383	97 891	41 087	486 883
2008		144 905	203 244	101 022	15 000	464 171
2009		161 602	207 205	154 623		523 431
2010		183 988	271 337	154 657		609 983
2011		198 333	328 598	192 898		719 829
2012		247 938	331087	148 638		727 663
2013		360 673	421678	183 858		966 209
2014		320 347	468 934	197 168		986 449
2015		272 405	375 328	216 651		864 384
2016	1	321 347	351 468	176 607		849 422

Data provided by Working Group members

1 Provisional figures

Table 3.2. Landings of Norwegian Coastal Cod in Sub-areas 1 and 2, 10^3 tons

Year	Coastal cod catch used in NCC–assess	Coastal cod catch from ECA–model	Norwegian catches of cod in areas 06+07 whole yr plus q3&4 in areas 00+05	Norwegian catches of cod removed from the NEAC–assessment
v1960–70			38.6	38.6
1971–79			no data	no data
1980			40	40
1981			49	49
1982			42	42
1983			38	38
1984	74.8	63.5	33	33
1985	75.5	62.5	28	28
1986	68.9	56.0	26	26
1987	61	48.2	31	31
1988	59.3	54.9	22	22
1989	40.3	41.2	17	17
1990	28.1	20.9	24	24
1991	24.8	24.8	25	25
1992	41.7	38.2	35	35
1993	52.6	50.4	44	44
1994	54.6	51.6	48	48
1995	57.2	65.0	39	39
1996	61.8	41.6	32	32
1997	63.3	51.0	36	36
1998	51.6	30.5	29	29
1999	40.7	35.8	23	23
2000	36.7	34.8	19	19
2001	29.7	27.2	14	14
2002	41	36.4	20	20
2003	34.6	35.4	19	19
2004	24.5	33.6	14	14
2005	22.4	29.3	13	13
2006	26.1	39.3	15	15
2007	23.8	29.2	13	13
2008	25.8	35.5	13	13
2009	24.8	30.0	15	15
2010	22.9	40.2	13.5	13.5
2011	28.6	36.6	18.8	18.8
2012	31.9	35.5	17.7	35.2
2013	22.5	30.1	16.8	25.7
2014	23.2	33.6	15.5	33.6
2015	39.4	35.8	13.2	35.8
2016	44.6	54.9	10.0	54.9

'Table 3.3 North-East Arctic COD. Total nominal catch ('000 t) by trawl and other gear for each

	Sub-area 1		Division 2.a		Division 2.b	
Year	Trawl	Others	Trawl	Others	Trawl	Others
1967	**238**	**84.8**	**38.7**	**90**	**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	-
1973	459	33.7	39.4	172.4	88.2	-
1974	677	46.5	41	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	-
1978	360.4	57.9	117	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	21	-
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	88	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	84	40	1.2
1992	103.7	20.5	79.7	92.8	85.6	0.9
1993	165.1	30.7	155.5	113.9	66.3	0.2
1994	312.1	41.3	165.8	140.6	84.3	1.9
1995	218.1	33.3	174.3	143.3	160.3	10.7
1996	248.9	32.7	137.1	159	147.7	6.8
1997	235.6	37.7	150.5	176.2	154.7	7.6
1998	219.8	31	127	130.4	82.7	1.7
1999	133.3	25.7	101.9	115	107.2	1.8
2000	111.7	25.5	105.4	98.8	72.2	1.3
2001	119.1	23.5	83.1	102.8	95.4	2.5
2002	147.4	37.4	83.4	105.6	69.9	1.3
2003	146	17.1	107.8	114.2	50.1	1.8
2004	154.4	23.5	100.3	118.9	88.8	3.5
2005	132.4	27.2	87	107.7	115.4	5.6

2006	141.8	18.1	91.2	113.4	100.1	4.6
2007	129.6	22.9	84.8	110.6	91.6	6.3
2008	123.8	21.1	94.8	108.4	95.3	5.7
	Sub-area 1		**Division 2.a**		**Division 2.b**	
Year	**Trawl**	**Others**	**Trawl**	**Others**	**Trawl**	**Others**
2009	130.1	31.5	102	105.2	142.1	11.4
2010	151.1	32.9	130	141.4	149.2	5.4
2011	158.1	38.4	163.5	167	181	11.9
2012	212.1	35.9	172.7	158.4	133.8	14.9
2013	308.5	52.2	216.9	204.7	159.7	24.1
2014	268.8	51.5	246.8	222.1	177.9	19.3
2015	224.3	48.1	192.2	183.2	197.7	19.0
2016 [1]	285.5	35.8	181.7	169.8	156.3	20.3

Data provided by Working Group members

[1] **Provisional figures**

Table 3.4 North-East Arctic COD. Nominal catch(t) by countries. (Sub-area I and Divsions IIa and IIb combined, data provided by Working group members

Table 3.4 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	26 285	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	2	3 337	3 911	168 460	6 217	6 120	182 315	**Iceland** 1 209	383 234
1993	17 435	3 572	5 389	5 887	221 051	8 800	11 336	244 860	9 374	3 907	531 611
1994	22 826	1 962	6 882	8 283	318 395	14 929	15 579	291 925	36 737	28 568	746 086
1995	22 262	4 912	7 462	7 428	319 987	15 505	16 329	296 158	34 214	15 742	739 999
1996	17 758	5 352	6 529	8 326	319 158	15 871	16 061	305 317	23 005	14 851	732 228
1997	20 076	5 353	6 426	6 680	357 825	17 130	18 066	313 344	4 200	13 303	762 403
1998	14 290	1 197	6 388	3 841	284 647	14 212	14 294	244 115	1 423	8 217	592 624
1999	13 700	2 137	4 093	3 019	223 390	8 994	11 315	210 379	1 985	5 898	484 910
2000	13 350	2 621	5 787	3 513	192 860	8 695	9 165	166 202	7 562	5 115	414 870
2001	12 500	2 681	5 727	4 524	188 431	9 196	8 698	183 572	5 917	5 225	426 471
2002	15 693	2 934	6 419	4 517	202 559	8 414	8 977	184 072	5 975	5 484	445 045
2003	19 427	2 921	7 026	4 732	191 977	7 924	8 711	182 160	5 963	6 149	436 990
2004	19 226	3 621	8 196	6 187	212 117	11 285	14 004	201 525	7 201	6 082	489 445
2005	16 273	3 491	8 135	5 848	207 825	9 349	10 744	200 077	5 874	7 660	475 276
2006	16 327	4 376	8 164	3 837	201 987	9 219	10 594	203 782	5 972	6 271	470 527
2007	14 788	3 190	5951	4619	199 809	9 496	9298	186 229	7316	5 101	445 796
2008	15 812	3 149	5 617	4 955	196 598	9 658	8 287	190 225	7 535	7 336	449 171
2009	16 905	3 908	4 977	8 585	224 298	12 013	8 632	229 291	7 380	7 442	523 431
2010	15 977	4 499	6 584	8 442	264 701	12 657	9 091	267 547	11 299	9 185	609 983
2011	13 429	1 173	7 155	4 621	331 535	13 291	8 210	310 326	12 734	17 354 [4]	719 829
2012 [5]	17523	2841	8520	8 500	315 739	12814	11166	329 943	9536	11 081	727 663
2013	13833	7858	7885	8 010	438 734	15042	12536	432 314	14734	15 263	966 209
2014	33298	8149	10864	6 225	431 846	16378	14762	433 479	18205	13 243	986 449
2015	26568	7480	7055	6 427	377 983	19905	11778	381 188	16120	9 880	864 384
2016 [1]	24084	7946	8607	6 336	348 949	14640	13583	394 107	16031	15 139	849 422

[1] Provisional figures.
[2] USSR prior to 1991.
[3] Includes Baltic countries.
[4] Includes unspecified EU catches.
[5] Revised figures.

Table 3.5. Barents Sea winter survey. Area covered ('000 square nautical miles) and areas implied in the method used to adjust for missing coverage in Russian Economic Zone. In 4 of the 5 adjusted years the adjustments were not based on area ratios, but the "index ratio by age" was used. This means that the index by age (for the area outside REZ) was scaled by the observed ratio between total index and the index outside REZ observed in the years prior to the survey.

Year	Area covered	Additional area implied in adjustment	Adjustment method
1981–92	88.1		
1993	137.6		
1994	143.8		
1995	186.6		
1996	165.3		
1997	87.5	78.0	Index ratio by age
1998	99.2	78.0	Index ratio by age
1999	118.3		
2000	162.4		
2001	164.1		
2002	156.7		
2003	146.6		
2004	164.6		
2005	178.9		
2006	169.1	18.1	Partly covered strata raised to full strata area
2007	122.2	56.7	Index ratio by age
2008	164.4		
2009	170.9		
2010	159.9		
2011	173.1		
2012	150.5	16.7	Index ratio by age
2013	202.1		
2014	207.8		
2015	195.7		
2016	172.8		
2017	146.9	37.5	Index ratio by age

Table 3.6. Northeast Arctic cod. Catch numbers-at-age (Thous)

YEAR_ AGE	3	4	5	6	7	8	9	10	11	12	13	14	+GP	TOTALNUM
1946	4008	10387	18906	16596	13843	15370	59845	22618	10093	9573	5460	1927	750	189376
1947	710	13192	43890	52017	45501	13075	19718	47678	31392	9348	9330	4622	4103	294576
1948	140	3872	31054	55983	77375	21482	15237	9815	30041	7945	4491	3899	4205	265539
1949	991	6808	35214	100497	83283	29727	13207	5606	8617	13154	3657	1895	2167	304823
1950	1281	10954	29045	45233	62579	30037	19481	9172	6019	4133	6750	1662	1450	227796
1951	24687	77924	64013	46867	37535	33673	23510	10589	4221	1288	1002	3322	611	329242
1952	24099	120704	113203	73827	49389	20562	24367	15651	8327	3565	647	467	1044	455852
1953	47413	107659	112040	55500	22742	16863	10559	10553	5637	1752	468	173	156	391515
1954	11473	155171	146395	100751	40635	10713	11791	8557	6751	2370	896	268	123	495894
1955	3902	37652	201834	161336	84031	30451	13713	9481	4140	2406	867	355	128	550296
1956	10614	24172	129803	250472	86784	51091	14987	7465	3952	1655	1292	448	166	582901
1957	17321	33931	27182	70702	87033	39213	17747	6219	3232	1220	347	299	173	304619
1958	31219	133576	71051	40737	38380	35786	13338	10475	3289	1070	252	40	141	379354
1959	32308	77942	148285	53480	18498	17735	23118	9483	3748	997	254	161	98	386107
1960	37882	97865	64222	67425	23117	8429	7240	11675	4504	1843	354	102	226	324884
1961	45478	132655	123458	51167	38740	17376	5791	6778	5560	1682	910	280	108	429983
1962	42416	170566	167241	89460	28297	21996	7956	2728	2603	1647	392	280	103	535685
1963	13196	106984	205549	95498	35518	16221	11894	3884	1021	1025	498	129	157	491574
1964	5298	45912	97950	58575	19642	9162	6196	3553	783	172	387	264	131	248025
1965	15725	25999	78299	68511	25444	8438	3569	1467	1161	131	61	79	197	229081
1966	55937	55644	34676	42539	37169	18500	5077	1495	380	403	77	9	70	251976
1967	34467	160048	69235	22061	26295	25139	11323	2329	687	316	225	40	14	352179
1968	3709	174585	267961	107051	26701	16399	11597	3657	657	122	124	70	46	612679
1969	2307	24545	238511	181239	79363	26989	13463	5092	1913	414	121	23	46	574026
1970	7164	10792	25813	137829	96420	31920	8933	3249	1232	260	106	39	35	323792
1971	7754	13739	11831	9527	59290	52003	12093	2434	762	418	149	42	25	170067
1972	35536	45431	26832	12089	7918	34885	22315	4572	1215	353	315	121	40	191622
1973	294262	131493	61000	20569	7248	8328	19130	4499	677	195	81	59	55	547596
1974	91855	437377	203772	47006	12630	4370	2523	5607	2127	322	151	83	62	807885
1975	45282	59798	226646	118567	29522	9353	2617	1555	1928	575	231	15	37	496126
1976	85337	114341	79993	118236	47872	13962	4051	936	558	442	139	26	53	465946
1977	39594	168609	136335	52925	61821	23338	5659	1521	610	271	122	92	54	490951
1978	78822	45400	88495	56823	25407	31821	9408	1227	913	446	748	48	51	339609
1979	8600	77484	43677	31943	16815	8274	10974	1785	427	103	59	38	45	200224
1980	3911	17086	81986	40061	17664	7442	3508	3196	678	79	24	26	8	175669
1981	3407	9466	20803	63433	21788	9933	4267	1311	882	109	37	3	1	135440
1982	8948	20933	19345	28084	42496	8395	2878	708	271	260	27	5	5	132355
1983	3108	19594	20473	17656	17004	18329	2545	646	229	74	58	20	5	99741
1984	6942	14240	18807	20086	15145	8287	5988	783	232	153	49	12	8	90732
1985	24634	45769	27806	19418	11369	3747	1557	768	137	36	31	32	8	135312
1986	28968	70993	78672	25215	11711	4063	976	726	557	136	28	34	14	222093
1987	13648	137106	98210	61407	13707	3866	910	455	187	227	21	59	20	329823
1988	9828	22774	135347	54379	21015	3304	1236	519	106	69	43	14	5	248639
1989	5085	17313	32165	81756	27854	5501	827	290	41	13	1	11	16	170873
1990	1911	7551	12999	17827	30007	6810	828	179	59	15	6	5	2	78199
1991	4963	10933	16467	20342	19479	25193	3888	428	48	12	1	1	2	101757
1992	21835	36015	27494	23392	18351	13541	18321	2529	264	82	3	9	1	161837
1993	10094	46182	63578	33623	14866	9449	6571	12593	1749	377	63	22	1	199168
1994	6531	59444	102548	59766	32504	10019	6163	3671	7528	995	121	19	4	289313
1995	4879	42587	115329	98485	32036	7334	3014	1725	1174	1920	222	41	1	308747
1996	7655	28782	80711	100509	54590	10545	2023	930	462	230	809	84	1	287331

YEAR_AGE	3	4	5	6	7	8	9	10	11	12	13	14	+GP	TOTALNUM
1997	12827	36491	69633	83017	65768	28392	4651	1151	373	213	144	238	1	302899
1998	31887	88874	48972	40493	34513	26354	6583	965	197	69	42	22	53	279024
1999	7501	77714	92816	31139	15778	15851	8828	1837	195	40	34	8	30	251771
2000	4701	33094	93044	47210	12671	6677	4787	1647	321	71	11	1	14	204249
2001	5044	35019	62139	62456	22794	5266	1773	1163	343	85	6	7	22	196117
2002	2348	31033	76175	67656	42122	11527	1801	529	223	120	21	9	6	233570
2003	7263	20885	64447	71109	36706	14002	2887	492	142	97	21	43	1	218095
2004	2090	38226	50826	68350	50838	18118	6239	1746	295	127	39	16	8	236918
2005	5815	19768	113144	61665	44777	20553	6285	2348	562	100	21	24	7	275069
2006	8548	47207	33625	78150	31770	15667	7245	1788	737	210	26	45	155	225173
2007	25473	43817	62877	26303	34392	11240	4080	1381	505	285	44	13	35	210445
2008	8459	51704	40656	35072	14037	20676	5503	1794	715	229	42	26	13	178926
2009	4866	38711	83998	46639	20789	8417	8920	1957	872	987	76	21	20	216273
2010	1778	16193	53855	75853	36797	17062	4784	4325	3034	913	189	49	35	214867
2011	1418	8033	32472	70938	73875	21116	11708	5058	3237	600	434	12	0	228901
2012	2695	10462	16646	40372	70014	48315	12326	5214	1926	1124	317	70	24	209505
2013	2903	13659	22752	21020	54231	74451	47124	9143	2963	694	449	89	145	249623
2014	5234	19226	38407	36633	29901	56109	47540	22738	3717	1169	313	210	157	261354
2015	4315	31383	41181	51209	33745	22530	23609	24553	16071	2510	468	134	254	251962
2016	2076	11291	50231	43609	35265	23417	14592	20105	15862	4781	871	249	308	222657

Table 3.7. North-east Arctic COD. Weights at age (kg) in landings from various countries

Norway

Year	Age													
	2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1983	0.41	0.82	1.32	2.05	2.82	3.94	5.53	7.7	9.17	11.46	16.59	16.42	16.96	24.46
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	0.34	0.99	1.43	2.14	3.27	4.68	6.05	7.73	9.86	11.87	14.16	14.17	13.52	15.33
1986	0.3	0.67	1.34	2.04	3.14	4.6	5.78	6.7	7.52	9.74	10.68	12.86	9.59	16.31
1987	0.24	0.48	0.88	1.66	2.72	4.35	6.21	8.78	9.78	12.5	13.75	15.12	10.43	19.95
1988	0.36	0.56	0.83	1.31	2.34	3.84	6.5	8.76	9.97	11.06	14.43	19.02	12.89	10.16
1989	0.53	0.75	0.9	1.17	1.95	3.2	4.88	7.82	9.4	11.52	11.47		19.47	14.68
1990	0.4	0.81	1.22	1.59	2.14	3.29	4.99	7.83	10.54	14.21	17.63	7.97	14.64	
1991	0.63	1.37	1.77	2.31	3.01	3.68	4.63	6.06	8.98	12.89	17		14.17	16.63
1992	0.41	1.1	1.79	2.45	3.22	4.33	5.27	6.21	8.1	10.51	11.59		15.81	6.52
1993	0.3	0.83	1.7	2.41	3.35	4.27	5.45	6.28	7.1	7.82	10.1	16.03	19.51	17.68
1994	0.3	0.82	1.37	2.23	3.35	4.27	5.56	6.86	7.45	7.98	9.53	12.16	11.45	19.79
1995	0.44	0.78	1.26	1.87	2.8	4.12	5.15	5.96	7.9	8.67	9.2	11.53	17.77	21.11
1996	0.29	0.9	1.15	1.67	2.58	4.08	6.04	6.62	7.96	9.36	10.55	11.41	9.51	24.24
1997	0.35	0.78	1.14	1.56	2.25	3.48	5.35	7.38	7.55	8.3	11.15	8.64	12.8	
1998	0.38	0.68	1.03	1.64	2.23	3.24	4.85	6.88	9.18	9.84	15.78	14.37	13.77	15.58
1999	0.46	0.88	1.16	1.65	2.4	3.12	4.26	6	6.52	10.64	14.05	12.67	9.2	17.22
2000	0.31	0.65	1.23	1.8	2.54	3.58	4.49	5.71	7.54	7.86	12.71	14.71	15.4	20.26
2001	0.3	0.77	1.18	1.83	2.75	3.64	4.88	5.93	7.43	8.9	10.22	11.11	13.03	18.85
2002	0.31	0.9	1.4	1.9	2.6	3.55	4.6	5.8	7.4	9.56	8.71	12.92	8.42	17.61
2003	0.55	0.88	1.39	2.01	2.63	3.59	4.83	5.57	7.262	9.36	9.52	9.52	10.68	21.66
2004	0.54	1.08	1.41	1.95	2.69	3.46	4.77	6.72	7.9	8.66	12.21	14.02	16.5	11.37
2005	0.58	0.92	1.38	1.86	2.61	3.54	4.57	6.41	8.24	9.89	11.04	14.08	11.81	20.08
2006	0.51	0.97	1.45	2.06	2.71	3.56	4.57	5.53	6.61	7.53	8.55	8.44	9.82	12.31
2007	0.53	1.07	1.7	2.37	3.26	4.36	5.45	6.71	8.08	8.56	9.75	11.72	12.72	15.58
2008	0.65	1.12	1.7	2.44	3.32	4.41	5.61	6.84	8.25	9.31	10.54	12.45	13.59	21.15
2009	0.56	0.98	1.47	2.1	2.83	3.9	5.06	5.76	7.31	7.79	7.81	10.68	11.83	14.76
2010	0.55	0.95	1.46	2.06	2.93	4.02	5.4	6.44	7.19	8.43	9.11	10.46	11.39	15.55
2011	0.53	1.09	1.5	2.06	2.85	3.7	5.01	6.26	7.33	8.34	9.87	13.23		
2012		0.83	1.32	1.92	2.65	3.52	4.71	6.34	8.11	9.92	11.31	13.45	15.75	
2013	0.43	0.95	1.4	2	2.64	3.44	4.51	5.67	7.29	8.8	10.33	11.38	12.56	
2014	0.59	1.07	1.55	2.15	2.8	3.7	4.57	5.78	6.97	8.35	9.46	10.99	12.28	15.49
2015	0.64	0.96	1.42	1.96	2.57	3.3	4.13	5.49	6.46	7.18	8.63	10.37	12.24	14.6
2016	0.59	0.96	1.46	1.99	2.71	3.57	4.56	5.78	6.82	8.08	9.33	10.01	11.68	14.79

Table 3.7. North-east Arctic COD. Weights at age (kg) in landings from various countries (continued)

Russia (trawl only)															
Year				Age											
		2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1983		0.65	1.05	1.58	2.31	3.39	4.87	6.86	8.72	10.40	12.07	14.43			
1984		0.53	0.88	1.45	2.22	3.21	4.73	6.05	8.43	10.34	12.61	14.95			
1985		0.33	0.77	1.31	1.84	2.96	4.17	5.94	6.38	8.58	10.28				
1986		0.29	0.61	1.14	1.75	2.45	4.17	6.18	8.04	9.48	11.33	12.35	14.13		
1987		0.24	0.52	0.88	1.42	2.07	2.96	5.07	7.56	8.93	10.80	13.05	18.16		
1988		0.27	0.49	0.88	1.32	2.06	3.02	4.40	6.91	9.15	11.65	12.53	14.68		
1989		0.50	0.73	1.00	1.39	1.88	2.67	4.06	6.09	7.76	9.88				
1990		0.45	0.83	1.21	1.70	2.27	3.16	4.35	6.25	8.73	10.85	13.52			
1991		0.36	0.64	1.05	2.03	2.85	3.77	4.92	6.13	8.36	10.44	15.84	19.33		
1992		0.55	1.20	1.44	2.07	3.04	4.24	5.14	5.97	7.25	9.28	11.36			
1993		0.48	0.78	1.39	2.06	2.62	4.07	5.72	6.79	7.59	11.26	14.79	17.71		
1994		0.41	0.81	1.24	1.80	2.55	2.88	4.96	6.91	8.12	10.28	12.42	16.93		
1995		0.37	0.77	1.21	1.74	2.37	3.40	4.71	6.73	8.47	9.58	12.03	16.99		
1996		0.30	0.64	1.09	1.60	2.37	3.42	5.30	7.86	8.86	10.87	11.80			
1997		0.30	0.57	1.00	1.52	2.18	3.30	4.94	7.15	10.08	11.87	13.54			
1998		0.33	0.68	1.06	1.60	2.34	3.39	5.03	6.89	10.76	12.39	13.61	14.72		
1999		0.24	0.58	0.98	1.41	2.17	3.26	4.42	5.70	7.27	10.24	14.12			
2000		0.18	0.48	0.85	1.44	2.16	3.12	4.44	5.79	7.49	9.66	10.36			
2001		0.12	0.31	0.62	1.00	1.53	2.30	3.31	4.57	6.55	8.11	9.52	11.99		
2002		0.20	0.60	1.05	1.46	2.14	3.27	4.47	6.23	8.37	10.06	12.37			
2003		0.23	0.63	1.06	1.78	2.40	3.41	4.86	6.28	7.55	11.10	13.41	12.12	14.51	
2004		0.30	0.57	1.09	1.55	2.37	3.20	4.73	6.92	8.41	9.77	11.08			
2005		0.33	0.65	0.98	1.50	2.10	3.08	4.31	5.81	8.42	10.37	13.56	14.13		
2006		0.27	0.68	1.05	1.49	2.25	3.16	4.54	5.90	8.59	10.31	12.31			
2007		0.23	0.67	1.12	1.66	2.25	3.31	4.57	6.27	8.20	10.02	12.36	12.4		
2008		0.28	0.64	1.16	1.74	2.65	3.58	4.74	5.73	7.32	8.07	9.52	12.5		
2009		0.31	0.64	1.09	1.58	2.11	3.19	4.80	6.58	7.97	9.84	11.51			
2010		0.25	0.57	1.00	1.64	2.28	3.14	4.53	5.98	8.03	9.71	10.70	13.5		
2011		0.25	0.62	1.05	1.56	2.18	2.95	4.33	6.21	8.04	10.13	12.25	15.2		
2012		0.29	0.60	1.07	1.66	2.25	2.95	4.17	6.23	8.58	11.08	12.24	14.1	15.2	16.39
2013		0.33	0.63	1.05	1.54	2.26	3.09	4.08	5.47	7.37	9.59	12.57	15.5	17.1	
2014		0.32	0.61	1.05	1.61	2.26	3.15	4.00	5.24	7.13	9.46	11.18	14.5		
2015		0.30	0.60	0.97	1.49	2.11	3.13	4.64	5.78	7.13	9.53	12.12	16.7	17.4	
2016		0.26	0.55	0.97	1.53	2.20	3.19	4.50	6.12	7.97	9.55	10.95	14.3	14.7	17.25
Germany (Division IIa and IIb)															
Year				Age											
		2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1994			0.68	1.04	2.24	3.49	4.51	5.79	6.93	8.16	8.46	8.74	9.48	15.25	
1995			0.44	0.84	1.50	2.72	3.81	4.46	4.81	7.37	7.69	8.25	9.47		
1996			0.84	1.15	1.64	2.53	3.58	4.13	3.90	4.68	6.98	6.43	11.32		
1997			0.43	0.92	1.42	2.01	3.15	4.04	5.16	4.82	3.96	7.04	8.80		
1998		0.23	0.73	1.17	1.89	2.72	3.25	4.13	5.63	6.50	8.57	8.42	11.45	8.79	
1999	[1]		0.85	1.45	2.00	2.65	3.47	4.16	5.45	6.82	5.90		8.01		
2000	[2]	0.26	0.73	1.36	2.04	2.87	3.67	4.88	5.78	7.05	8.45	8.67	9.33	6.88	
2001		0.38	0.80	1.21	1.90	2.74	3.90	4.99	5.69	7.15	7.32	11.72	9.11	6.60	
2002		0.35	1.00	1.31	1.80	2.53	3.64	4.38	5.07	6.82	9.21	7.59	13.18	19.17	19.20
2003		0.22	0.44	1.04	1.71	2.31	3.27	4.93	6.17	7.773	9.61	9.99	12.29	13.59	
2004	[2]	0.22	0.73	1.01	1.75	2.58	3.33	4.73	6.32	7.20	8.45	9.20	11.99	10.14	13.11
2005	[3]	0.57	0.77	1.13	1.66	2.33	3.36	4.38	5.92	6.65	7.26	10.01	11.14		
2006	[2]	0.71	0.91	1.39	1.88	2.56	3.77	5.33	6.68	9.14	10.89	11.51	16.83	18.77	
2007	[3]	0.59	1.35	1.79	2.51	3.53	4	4.95	6.55	7.54	9.71	11.40	11.57	23.34	15.61
2008	[3]	0.23	0.51	1.14	1.76	2.57	3.15	4.4	5.43	7.18	8.39	10.15	10.03	10.99	14.26
2009	[3]	0.35	0.6	1.19	1.83	2.96	4.08	5.61	6.97	8.55	9.13	10.54	13.34	10.30	17.06
2010	[3]	0.36	0.67	0.93	1.71	2.46	3.21	4.93	6.75	7.80	8.70	8.53	10.17	12.36	14.11
2011	[1]			1.75	3.09	3.3	3.28	4.13	4.99	6.61	7.91	9.38	10.79	14.67	14.91
2013	[3]			1.03	1.37	1.87	2.65	3.45	4.49	7.26	11.42	12.86	13.07		
2014	[4]		0.68	0.96	1.39	1.69	3.06	4.07	5.65	8.15	10.36	13.07	13.52		
2015	[4]	0.82	1.05	1.67	2.33	3.56	4.5	5.41	6.2	6.39					
2016	[1]		1.38	2.6	3.55	4.81	6.33	7.61	8.9	9.26	10.83	13.41	16.84	17.03	17.76

[1] Division IIa only
[2] IIa and IIb combined
[3] I,IIa and IIb combined
[4] Division IIb only

Table 3.7. North-east Arctic COD. Weights at age (kg) in landings from various countries (continued)

Spain (Division IIb)															
Year				Age											
		2	3	4	5	6	7	8	9	10	11	12	13	14	15+
1994		0.43	1.08	1.38	2.32	2.47	2.68	3.46	5.20	7.04	6.79	7.20	8.04	10.46	15.35
1995		0.42	0.51	0.98	1.99	3.41	4.95	5.52	8.62	9.21	11.42	9.78	8.08		
1996			0.66	1.12	1.57	2.43	3.17	3.59	4.44	5.48	6.79	8.10			
1997	[1]	0.51	0.65	1.22	1.68	2.60	3.39	4.27	6.67	7.88	11.34	13.33	10.03	8.69	
1998		0.47	0.74	1.15	1.82	2.44	3.32	3.71	5.00	7.26					
1999	[1]	0.21	0.69	1.06	1.69	2.50	3.32	4.72	5.76	6.77	7.24	7.63			
2000	[1]	0.23	0.61	1.24	1.75	2.47	3.12	4.65	6.06	7.66	10.94	11.40	7.20		
2001		0.23	0.64	1.25	1.95	2.86	3.55	4.95	6.46	8.50	11.07	13.09			
2002		0.16	0.55	1.00	1.48	2.17	3.29	4.47	5.35	8.29	12.23	9.01	12.16	15.2	
2003			0.58	1.05	1.70	2.33	3.33	4.92	6.24	9.98	13.07	14.74	14.17		
2004	[1]	0.31	0.56	0.80	1.28	1.96	2.59	3.72	5.36	5.28	7.41		11.43		
2005	[1]		0.63	1.14	1.85	2.48	3.43	4.25	5.38	8.41	11.19	15.04	16.93		
2006		0.30	0.61	0.99	1.46	2.04	2.55	3.39	3.50	4.70	6.36				
2007		0.42	0.60	1.20	1.76	2.40	3.18	3.96	5.19	6.61	9.48	7.65	12.65	15.74	19.66
2009	[1]	0.12	0.45	0.95	1.60	2.18	3.36	4.52	6.04	7.30	9.42	10.35	11.47	12.54	
2010	[2]	0.18	0.56	1.11	1.73	2.36	3.36	5.14	6.88	8.64	9.65	6.83			
2011	[1]		0.45	0.90	1.26	1.84	2.55	4.08	5.61	8.17	8.14	7.31	8.91		
2012	[2]		0.40	0.84	1.29	1.96	2.78	3.71	4.99	7.42		7.19	9.32		
2013		0.17	0.72	1.06	1.63	2.36	3.14	3.90	4.36	6.55					
2014		0.24	0.43	0.74	1.27	1.85	2.60	3.56	4.51	5.52	7.18	9.42	9.26	13.16	15.05
2015	[2]		0.40	0.80	1.19	1.79	2.45	3.38	4.41	5.85	6.64	7.48	6.77		
2016	[3]	0.11	0.38	0.76	1.20	1.72	2.50	3.39	4.96	7.11	8.56				
[1] IIa and IIb combined															
[2] I,IIa and IIb combined															
[3] I and IIb combined															
Iceland (Sub-area I)															
1994		0.42	0.85	1.44	2.77	3.54	4.08	5.84	6.37	7.02	7.48	7.37			
1995			1.17	0.91	1.60	2.28	3.61	4.73	6.27			6.26			
1996			0.36	0.99	1.55	2.83	3.79	4.81	5.34	7.25	7.68	9.08	8.98	10.52	
1997		0.42	0.43	0.76	1.60	2.40	3.45	4.40	5.74	6.15		8.28	10.52	9.89	
UK (England & Wales)															
1995	[1]			1.47	2.11	3.47	5.57	6.43	7.17	8.12	8.05	10.2	10.1		
1996	[2]			1.55	1.81	2.42	3.61	6.3	6.47	7.83	7.91	8.93	9.38	10.9	
1997	[2]			1.93	2.17	3.07	4.17	4.89	6.46		12.3	8.44			
[1] Division IIa and IIb															
[2] Division IIa															
Poland (Division IIb)															
2006		0.18	0.51	0.89	1.55	2.23	3.6	5.28	6.95	8.478	11	10.8	15.6	18.9	
2008			0.49	0.90	1.45	2.24	2.79	3.82	4.68	5.015	6.45	7.02	7.22	5.99	6.91
2009				1.02	1.72	2.65	3.81	5.23	6.91	8.862	11.1	13.6	16.5		
2010				1.39	1.66	2.29	2.98	3.92	5.18	6.313	6.66	8.72	9.05		
2011				0.99	1.50	2.17	3.15	4.43	7.45	7.28					
2016	[1]		0.84	1.59	2.29	2.81	3.91	4.78	5.61	6.709	7.89	8.54	11.6	13.7	16.09
[1] Division IIa															

Table 3.8. Northeast Arctic COD. Catch weights at age (kg)

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YEAR_AGE	3	4	5	6	7	8	9	10	11	12	13	14	+GP
1946	0.35	0.59	1.11	1.69	2.37	3.17	3.98	5.05	5.92	7.2	8.15	8.13	9.25
1947	0.32	0.56	0.95	1.5	2.14	2.92	3.65	4.56	5.84	7.42	8.85	8.79	10
1948	0.34	0.53	1.26	1.93	2.46	3.36	4.22	5.31	5.92	7.09	8.43	8.18	9.43
1949	0.37	0.67	1.11	1.66	2.5	3.23	4.07	5.27	5.99	7.08	8.22	8.26	8.7
1950	0.39	0.64	1.29	1.7	2.36	3.48	4.52	5.62	6.4	7.96	8.89	9.07	10.27
1951	0.4	0.83	1.39	1.88	2.54	3.46	4.88	5.2	7.14	8.22	9.39	9.5	9.52
1952	0.44	0.8	1.33	1.92	2.64	3.71	5.06	6.05	7.42	8.43	10.19	10.13	10.56
1953	0.4	0.76	1.28	1.93	2.81	3.72	5.06	6.34	7.4	8.67	10.24	11.41	11.93
1954	0.44	0.77	1.26	1.97	3.03	4.33	5.4	6.75	7.79	10.67	9.68	9.56	11.11
1955	0.32	0.57	1.13	1.73	2.75	3.94	4.9	7.04	7.2	8.78	10.08	11.02	12.11
1956	0.33	0.58	1.07	1.83	2.89	4.25	5.55	7.28	8	8.35	9.94	10.25	11.56
1957	0.33	0.59	1.02	1.82	2.89	4.28	5.49	7.51	8.24	9.25	10.61	10.82	12.07
1958	0.34	0.52	0.95	1.92	2.94	4.21	5.61	7.35	8.67	9.58	11.63	11	13.83
1959	0.35	0.72	1.47	2.68	3.59	4.32	5.45	6.44	7.17	8.63	11.62	11.95	13
1960	0.34	0.51	1.09	2.13	3.38	4.87	6.12	8.49	7.79	8.3	11.42	11.72	13.42
1961	0.31	0.55	1.05	2.2	3.23	5.11	6.15	8.15	8.68	9.6	11.95	13.18	13.42
1962	0.32	0.55	0.93	1.7	3.03	5.03	6.55	7.7	9.27	10.56	12.72	13.48	14.44
1963	0.32	0.61	0.96	1.73	3.04	4.96	6.44	7.91	9.62	11.31	12.74	13.19	14.29
1964	0.33	0.55	0.95	1.86	3.25	4.97	6.41	8.07	9.34	10.16	12.89	13.25	14
1965	0.38	0.68	1.03	1.49	2.41	3.52	5.73	7.54	8.47	11.17	13.72	13.46	14.12
1966	0.44	0.74	1.18	1.78	2.46	3.82	5.36	7.27	8.63	10.66	14.15	14	15
1967	0.29	0.81	1.35	2.04	2.81	3.48	4.89	7.11	9.03	10.59	13.83	14.15	16.76
1968	0.33	0.7	1.48	2.12	3.14	4.21	5.27	6.65	9.01	9.66	14.85	16.3	17
1969	0.44	0.79	1.23	2.03	2.9	3.81	5.02	6.43	8.33	10.71	14.21	15	17
1970	0.37	0.91	1.34	2	3	4.15	5.59	7.6	8.97	10.99	14.07	14.61	16
1971	0.45	0.88	1.38	2.16	3.07	4.22	5.81	7.13	8.62	10.83	12.95	14.25	15.97
1972	0.38	0.77	1.43	2.12	3.23	4.38	5.83	7.62	9.52	12.09	13.67	13.85	16
1973	0.38	0.91	1.54	2.26	3.29	4.61	6.57	8.37	10.54	11.62	13.9	14	15.84
1974	0.32	0.66	1.17	2.22	3.21	4.39	5.52	7.86	9.82	11.41	13.24	13.7	14.29
1975	0.41	0.64	1.11	1.9	2.95	4.37	5.74	8.77	9.92	11.81	13.11	14	14.29
1976	0.35	0.73	1.19	2.01	2.76	4.22	5.88	9.3	10.28	11.86	13.54	14.31	14.28
1977	0.49	0.9	1.43	2.05	3.3	4.56	6.46	8.63	9.93	10.9	13.67	14.26	14.91
1978	0.49	0.81	1.45	2.15	3.04	4.46	6.54	7.98	10.15	10.85	13.18	14	15
1979	0.35	0.7	1.24	2.14	3.15	4.29	6.58	8.61	9.22	10.89	14.34	14.5	15.31
1980	0.27	0.56	1.02	1.72	3.02	4.2	5.84	7.26	8.84	9.28	14.45	15	15.5
1981	0.49	0.98	1.44	2.09	2.98	4.85	6.57	9.16	10.82	10.77	13.93	15	16
1982	0.37	0.66	1.35	1.99	2.93	4.24	6.46	8.51	12.24	10.78	14.04	15	16
1983	0.84	1.37	2.09	2.86	3.99	5.58	7.77	9.29	11.55	11.42	12.8	14.18	15.55
1984	1.42	1.93	2.49	3.14	3.91	4.91	6.02	7.4	8.13	11.42	12.8	14.18	15.55
1985	0.94	1.37	2.02	3.22	4.63	6.04	7.66	9.81	11.8	11.42	12.8	14.18	15.55

1986	0.64	1.27	1.88	2.79	4.49	5.84	6.83	7.69	9.81	11.42	12.8	14.18	15.55
1987	0.49	0.88	1.55	2.33	3.44	5.92	8.6	9.6	12.17	11.42	12.8	14.18	15.55
1988	0.54	0.85	1.32	2.24	3.52	5.35	8.06	9.51	11.36	11.42	12.8	14.18	15.55
1989	0.74	0.96	1.31	1.92	2.93	4.64	7.52	9.12	11.08	11.42	12.8	14.18	15.55
1990	0.81	1.22	1.64	2.22	3.24	4.68	7.3	9.84	13.25	11.42	12.8	14.18	15.55
1991	1.05	1.45	2.15	2.89	3.75	4.71	6.08	8.82	11.8	11.42	12.8	14.18	15.55
1992	1.16	1.57	2.21	3.1	4.27	5.19	6.14	7.77	10.12	11.42	12.8	14.18	15.55
1993	0.81	1.52	2.16	2.79	4.07	5.53	6.47	7.19	7.98	11.42	12.8	14.18	15.55
1994	0.82	1.3	2.06	2.89	3.21	5.2	6.8	7.57	8.01	11.42	12.8	14.18	15.55
1995	0.77	1.2	1.78	2.59	3.81	4.99	6.23	8.05	8.74	11.42	12.8	14.18	15.55
1996	0.79	1.11	1.61	2.46	3.82	5.72	6.74	8.04	9.28	11.42	12.8	14.18	15.55
1997	0.67	1.04	1.53	2.22	3.42	5.2	7.19	7.73	8.61	11.42	12.8	14.18	15.55
1998	0.68	1.05	1.62	2.3	3.3	4.86	6.87	9.3	10.3	11.42	12.8	14.18	15.55
1999	0.63	1.01	1.54	2.34	3.21	4.29	6	6.73	10.08	11.42	12.8	14.18	15.55
2000	0.57	1.04	1.61	2.34	3.34	4.48	5.72	7.52	8.02	11.42	12.8	14.18	15.55
2001	0.66	1.05	1.62	2.51	3.51	4.78	6.04	7.54	9	11.42	12.8	14.18	15.55
2002	0.72	1.13	1.56	2.31	3.52	4.78	6.2	7.66	9.14	11.42	12.8	14.18	15.55
2003	0.67	1.12	1.83	2.5	3.58	5.04	6.36	8.2	10.71	11.42	12.8	14.18	15.55
2004	0.72	1.13	1.61	2.43	3.27	4.72	6.71	7.98	9.19	11.42	12.8	14.18	15.55
2005	0.69	1.08	1.57	2.21	3.26	4.44	6.23	8.19	9.72	11.42	12.8	14.18	15.55
2006	0.72	1.16	1.6	2.39	3.32	4.54	5.47	6.78	7.7	11.42	12.8	14.18	15.55
2007	0.74	1.21	1.83	2.51	3.82	5.04	6.58	8.08	8.94	11.42	12.8	14.18	15.55
2008	0.77	1.27	1.87	2.82	3.79	5.12	6.22	7.75	8.4	11.42	12.8	14.18	15.55
2009	0.75	1.17	1.74	2.42	3.86	5.35	6.43	8.01	8.67	11.42	12.8	14.18	15.55
2010	0.78	1.2	1.74	2.44	3.4	5.04	6.25	7.32	8.53	11.42	12.8	14.18	15.55
2011	0.78	1.31	1.72	2.37	3.2	4.62	6.18	7.47	8.57	11.42	12.8	14.18	15.55
2012	0.67	1.14	1.73	2.34	3.12	4.4	6.28	8.24	10.35	11.42	12.8	14.18	15.55
2013	0.71	1.17	1.67	2.36	3.19	4.22	5.58	7.31	9.08	11.42	12.8	14.18	15.55
2014	0.79	1.2	1.73	2.34	3.28	4.21	5.49	6.98	8.67	11.42	12.8	14.18	15.55
2015	0.78	1.09	1.55	2.18	3.14	4.46	5.61	6.62	7.34	11.42	12.8	14.18	15.55
2016	0.78	1.14	1.66	2.26	3.25	4.5	5.98	7.31	8.54	11.42	12.8	14.18	15.55

Table 3.9. Northeast Arctic COD. Stock weights at age (kg)

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Year_age	3	4	5	6	7	8	9	10	11	12	13	14	+gp
1946	0.35	0.59	1.11	1.69	2.37	3.17	3.98	5.05	5.92	7.2	8.146	8.133	9.253
1947	0.32	0.56	0.95	1.5	2.14	2.92	3.65	4.56	5.84	7.42	8.848	8.789	9.998
1948	0.34	0.53	1.26	1.93	2.46	3.36	4.22	5.31	5.92	7.09	8.43	8.181	9.433
1949	0.37	0.67	1.11	1.66	2.5	3.23	4.07	5.27	5.99	7.08	8.218	8.259	8.701
1950	0.39	0.64	1.29	1.7	2.36	3.48	4.52	5.62	6.4	7.96	8.891	9.07	10.271
1951	0.4	0.83	1.39	1.88	2.54	3.46	4.88	5.2	7.14	8.22	9.389	9.502	9.517
1952	0.44	0.8	1.33	1.92	2.64	3.71	5.06	6.05	7.42	8.43	10.185	10.134	10.563
1953	0.4	0.76	1.28	1.93	2.81	3.72	5.06	6.34	7.4	8.67	10.238	11.409	11.926
1954	0.44	0.77	1.26	1.97	3.03	4.33	5.4	6.75	7.79	10.67	9.68	9.557	11.106
1955	0.32	0.57	1.13	1.73	2.75	3.94	4.9	7.04	7.2	8.78	10.077	11.023	12.105
1956	0.33	0.58	1.07	1.83	2.89	4.25	5.55	7.28	8	8.35	9.944	10.248	11.564
1957	0.33	0.59	1.02	1.82	2.89	4.28	5.49	7.51	8.24	9.25	10.605	10.825	12.075
1958	0.34	0.52	0.95	1.92	2.94	4.21	5.61	7.35	8.67	9.58	11.631	11	13.832
1959	0.35	0.72	1.47	2.68	3.59	4.32	5.45	6.44	7.17	8.63	11.621	11.95	13
1960	0.34	0.51	1.09	2.13	3.38	4.87	6.12	8.49	7.79	8.3	11.422	11.719	13.424
1961	0.31	0.55	1.05	2.2	3.23	5.11	6.15	8.15	8.68	9.6	11.952	13.181	13.422
1962	0.32	0.55	0.93	1.7	3.03	5.03	6.55	7.7	9.27	10.56	12.717	13.482	14.44
1963	0.32	0.61	0.96	1.73	3.04	4.96	6.44	7.91	9.62	11.31	12.737	13.193	14.287
1964	0.33	0.55	0.95	1.86	3.25	4.97	6.41	8.07	9.34	10.16	12.886	13.251	14
1965	0.38	0.68	1.03	1.49	2.41	3.52	5.73	7.54	8.47	11.17	13.722	13.465	14.118
1966	0.44	0.74	1.18	1.78	2.46	3.82	5.36	7.27	8.63	10.66	14.148	14	15
1967	0.29	0.81	1.35	2.04	2.81	3.48	4.89	7.11	9.03	10.59	13.829	14.146	16.756
1968	0.33	0.7	1.48	2.12	3.14	4.21	5.27	6.65	9.01	9.66	14.848	16.3	17
1969	0.44	0.79	1.23	2.03	2.9	3.81	5.02	6.43	8.33	10.71	14.211	15	17
1970	0.37	0.91	1.34	2	3	4.15	5.59	7.6	8.97	10.99	14.074	14.611	16
1971	0.45	0.88	1.38	2.16	3.07	4.22	5.81	7.13	8.62	10.83	12.945	14.25	15.973
1972	0.38	0.77	1.43	2.12	3.23	4.38	5.83	7.62	9.52	12.09	13.673	13.852	16
1973	0.38	0.91	1.54	2.26	3.29	4.61	6.57	8.37	10.54	11.62	13.904	14	15.841
1974	0.32	0.66	1.17	2.22	3.21	4.39	5.52	7.86	9.82	11.41	13.242	13.704	14.291
1975	0.41	0.64	1.11	1.9	2.95	4.37	5.74	8.77	9.92	11.81	13.107	14	14.293
1976	0.35	0.73	1.19	2.01	2.76	4.22	5.88	9.3	10.28	11.86	13.544	14.311	14.284
1977	0.49	0.9	1.43	2.05	3.3	4.56	6.46	8.63	9.93	10.9	13.668	14.255	14.906
1978	0.49	0.81	1.45	2.15	3.04	4.46	6.54	7.98	10.15	10.85	13.177	14	15
1979	0.35	0.7	1.24	2.14	3.15	4.29	6.58	8.61	9.22	10.89	14.344	14.5	15.315
1980	0.27	0.56	1.02	1.72	3.02	4.2	5.84	7.26	8.84	9.28	14.448	15	15.5
1981	0.49	0.98	1.44	2.09	2.98	4.85	6.57	9.16	10.82	10.77	13.932	15	16
1982	0.37	0.66	1.35	1.99	2.93	4.24	6.46	8.51	12.24	10.78	14.041	15	16
1983	0.37	0.92	1.6	2.44	3.82	4.76	6.17	7.7	9.25	12.62	14.544	16.466	18.388
1984	0.42	1.16	1.81	2.79	3.78	4.57	6.17	7.7	9.25	12.62	14.544	16.466	18.388
1985	0.413	0.875	1.603	2.81	4.059	5.833	7.685	10.117	14.29	12.62	14.544	16.466	18.388
1986	0.311	0.88	1.47	2.467	3.915	5.81	6.58	6.833	11.004	12.62	14.544	16.466	18.388
1987	0.211	0.498	1.254	2.047	3.431	5.137	6.523	9.3	13.15	12.62	14.544	16.466	18.388
1988	0.212	0.404	0.79	1.903	2.977	4.392	7.812	12.112	13.107	12.62	14.544	16.466	18.388
1989	0.299	0.52	0.868	1.477	2.686	4.628	7.048	9.98	9.25	12.62	14.544	16.466	18.388
1990	0.398	0.705	1.182	1.719	2.458	3.565	4.71	7.801	8.956	12.62	14.544	16.466	18.388
1991	0.518	1.136	1.743	2.428	3.214	4.538	6.88	10.719	9.445	12.62	14.544	16.466	18.388
1992	0.44	0.931	1.812	2.716	3.895	5.176	6.774	9.598	12.427	12.62	14.544	16.466	18.388
1993	0.344	1.172	1.82	2.823	4.031	5.497	6.765	8.571	10.847	12.62	14.544	16.466	18.388
1994	0.235	0.753	1.42	2.413	3.825	5.416	6.631	7.63	8.112	12.62	14.544	16.466	18.388
1995	0.201	0.485	1.14	2.118	3.47	4.938	7.16	9.119	10.101	12.62	14.544	16.466	18.388

1996	0.195	0.487	0.971	2.054	3.527	5.503	7.767	10.159	10.669	12.62	14.544	16.466	18.388
1997	0.202	0.521	1.079	1.878	3.369	5.263	8.927	12.154	11.204	12.62	14.544	16.466	18.388
1998	0.217	0.533	1.161	1.939	2.945	4.574	7.423	10.367	11.738	12.62	14.544	16.466	18.388
1999	0.203	0.52	1.174	2.031	3.034	4.464	6.482	10.269	10.882	12.62	14.544	16.466	18.388
2000	0.194	0.465	1.208	1.972	3.048	4.096	5.724	7.457	9.582	12.62	14.544	16.466	18.388
2001	0.285	0.522	1.196	2.239	3.313	5.118	6.376	9.241	11.322	12.62	14.544	16.466	18.388
2002	0.251	0.605	1.189	2.138	3.333	4.766	6.859	9.333	10.186	12.62	14.544	16.466	18.388
2003	0.23	0.537	1.31	2.009	3.241	4.971	6.739	8.706	15.026	12.62	14.544	16.466	18.388
2004	0.25	0.546	1.087	2.035	2.921	4.384	6.254	8.543	9.735	12.62	14.544	16.466	18.388
2005	0.231	0.624	1.118	1.932	3.046	3.955	5.811	8.289	13.44	12.62	14.544	16.466	18.388
2006	0.256	0.602	1.201	2.009	3.114	4.427	6.03	8.037	9.928	12.62	14.544	16.466	18.388
2007	0.262	0.699	1.341	2.121	3.167	4.64	6.495	9.123	11.78	12.62	14.544	16.466	18.388
2008	0.286	0.734	1.37	2.367	3.29	4.82	6.548	8.483	8.902	12.62	14.544	16.466	18.388
2009	0.26	0.641	1.343	2.36	3.763	5.111	6.554	9.098	9.432	12.62	14.544	16.466	18.388
2010	0.257	0.589	1.183	2.052	3.181	4.8	6.759	7.859	10.008	12.62	14.544	16.466	18.388
2011	0.224	0.589	1.088	1.915	2.776	4.319	6.495	8.489	10.016	12.62	14.544	16.466	18.388
2012	0.21	0.561	1.108	1.76	2.775	4.056	6.117	8.718	11.676	12.62	14.544	16.466	18.388
2013	0.256	0.589	1.151	2.019	2.857	4.049	5.631	8.146	10.378	12.62	14.544	16.466	18.388
2014	0.22	0.588	1.146	1.827	2.835	3.828	5.142	6.953	9.015	12.62	14.544	16.466	18.388
2015	0.231	0.546	1.165	1.938	2.853	3.946	5.258	6.821	8.957	12.62	14.544	16.466	18.388
2016	0.229	0.53	1.037	1.805	2.712	3.964	5.537	7.073	8.648	12.62	14.544	16.466	18.388
2017	0.261	0.649	1.168	1.966	2.93	4.627	5.966	7.279	9.3	12.62	14.544	16.466	18.388

Table 3.10. North-East Arctic COD. Basis for maturity ogives (percent) used in the assessment. Norwegian and Russian data.

NORWAY

	PERCENTAGE MATURE							
	AGE							
YEAR	3	4	5	6	7	8	9	10
1982	0	5	10	34	65	82	92	100
1983	5	8	10	30	73	88	97	100

RUSSIA

	PERCENTAGE MATURE							
	AGE							
YEAR	3	4	5	6	7	8	9	10
1984	0	5	18	31	56	90	99	100
1985	0	1	10	33	59	85	92	100
1986	0	2	9	19	56	76	89	100
1987	0	1	9	23	27	61	81	80
1988	0	1	3	25	53	79	100	100
1989	0	0	2	15	39	59	83	100
1990	0	2	6	20	47	62	81	95
1991	0	3	1	23	66	82	96	100
1992	0	1	8	31	73	92	95	100
1993	0	3	7	21	56	89	95	99
1994	0	1	8	30	55	84	95	98
1995	0	0	4	23	61	75	94	97
1996	0	0	1	22	56	82	95	100
1997	0	0	1	10	48	73	90	100
1998	0	0	2	15	47	87	97	96
1999	0	0.2	1.3	9.9	38.4	74.9	94	100
2000	0	0	6	19.2	51.4	84	95.5	100
2001	0.1	0.1	3.9	27.9	62.3	89.4	96.3	100
2002	0.1	1.9	10.9	34.4	68.1	82.8	97.6	100
2003	0.2	0	11	29.2	65.9	89.6	95.1	100
2004	0	0.7	8	33.8	63.3	83.4	96.4	96.4
2005	0	0.6	4.6	24.2	61.5	84.9	95.3	98.1
2006	0	0	6.1	29.6	59.6	89.5	96.4	100
2007	0	0.4	5.7	20.8	60.4	83.5	96	100
2008	0	0.5	4	24.6	48.3	84.4	94.7	98.7
2009	0	0	6	28	66	85	97	100
2010	0	0.2	1.5	22.8	47	77.4	90.2	95.5
2011	0	0	2.2	20.7	50.4	73.7	90.6	95.6
2012	0.2	0	1.5	10.8	43.9	76.1	90.8	96.4
2013	0	0	0.6	10.6	41.8	70.6	89.8	96.9
2014	0	0	1.9	14.1	45.9	76	92	97.5
2015	0	0.2	0.2	7.9	27	60.8	83.4	93.7
2016	0	0	0.2	5.2	22.4	44.1	74.8	92.5
2017*	0	0	0.8	6.3	20.8	51.6	80.4	98.6

***Not used in inputs (instead WD 10 ratios used for further calculations)**

Table 3.10. North-East Arctic COD. Basis for maturity ogives (percent) used in the assessment. Norwegian and Russian data (continued)

NORWAY

	PERCENTAGE MATURE							
	AGE							
YEAR	3	4	5	6	7	8	9	10
1985	0.31	1.36	8.94	38.33	51.27	85.13	100	79.2
1986	2.92	7	7.85	18.85	49.72	66.52	35.59	80.09
1987	0	0.07	4.49	12.42	16.28	31.23	19.32	
1988	0	2.35	6.16	40.54	53.63	45.36	100	100
1989	1.52	0.67	3.88	30.65	70.36	82.02	100	100
1990	1.52	0.67	4.18	22	57.45	80.95	100	100
1991	0.1	3.4	13.93	38.03	75.52	90.12	95.39	100
1992	0.22	1.85	21.04	52.83	86.95	96.52	99.83	100
1993	0	2.6	10.37	52.6	84.8	97.25	99.3	99.73
1994	0.51	0.33	15.78	36.92	62.84	88.44	97.56	100
1995	0	0.62	8.19	51.48	63.75	81.11	98.01	99.34
1996	0.03	0	2.82	29.56	70.22	82.06	100	100
1997	0	0	1.48	17.91	73.31	93.01	99.12	100
1998	0.12	0.68	3.17	15.42	47.31	75.73	94.3	100
1999	0.42	0.16	1.6	27.46	70.48	94.57	98.99	100
2000	0	0.11	8.15	30.23	77.3	81.95	100	100
2001	0.49	0.51	9.03	43.81	62.52	74.36	94.13	100
2002	0.27	0.73	5.94	43.22	68.4	85.31	92.52	100
2003	0.02	0.18	6.5	35.97	68.56	87.97	96.3	100
2004	0.24	1.36	10.23	54.56	81.84	90.94	98.76	98.91
2005	0	0.27	9	55.16	81.77	93.51	98.03	100
2006	0	0.22	5.92	44.25	69.85	89.89	96.65	100
2007	0.12	0.33	8.7	47.88	84.29	91.68	99.11	100
2008	0	0.27	9.27	34.13	61.39	88.04	91.17	100
2009	0	0	9	46	85	86	98	99
2010	0	0.36	7.5	41.75	67.7	90.1	95.29	98.55
2011	0	0.2	5.2	48	77.7	89.7	97.3	97.2
2012	0	0	7.7	32.2	67.5	81	90.9	96.3
2013	0	0.3	1	20.2	55.3	80	91.8	99.3
2014	0	0.4	2	13.3	56.7	85	93.8	98.7
2015	0	0	1.9	10.9	29.2	79.1	93.1	99.6
2016	0.07	0.19	1.05	6.4	28.53	71.3	86.06	98.56
2017	0	0.2	0.5	18	54.8	81.4	95.9	100

Table 3.11. Northeast Arctic cod. Proportion mature at age

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YEAR_AGE	3	4	5	6	7	8	9	10	11	12	13	14	+GP
1946	0	0	0.01	0.03	0.06	0.11	0.18	0.44	0.65	0.86	0.96	0.96	1
1947	0	0	0.01	0.03	0.06	0.13	0.16	0.42	0.75	0.91	0.95	1	1
1948	0	0	0.01	0.03	0.07	0.13	0.25	0.47	0.73	0.91	0.97	1	1
1949	0	0	0.01	0.03	0.09	0.17	0.29	0.54	0.79	0.88	0.97	1	1
1950	0	0	0.01	0.03	0.09	0.23	0.35	0.52	0.79	0.95	0.97	1	1
1951	0	0	0.01	0.03	0.1	0.24	0.4	0.58	0.72	0.85	0.96	1	1
1952	0	0	0.01	0.03	0.08	0.22	0.41	0.63	0.82	0.92	0.97	1	1
1953	0	0	0.01	0.03	0.07	0.19	0.4	0.64	0.84	0.94	0.97	1	1
1954	0	0	0.01	0.03	0.08	0.16	0.37	0.68	0.87	0.93	0.96	1	1
1955	0	0	0.01	0.03	0.07	0.13	0.26	0.53	0.83	0.92	0.97	1	1
1956	0	0	0.01	0.03	0.06	0.12	0.14	0.41	0.67	0.91	0.96	1	1
1957	0	0	0.01	0.03	0.06	0.09	0.12	0.22	0.6	0.82	0.97	1	1
1958	0	0	0.01	0.03	0.06	0.1	0.1	0.3	0.5	0.82	0.97	1	1
1959	0	0	0.01	0.04	0.12	0.34	0.49	0.67	0.84	0.87	1	1	1
1960	0	0.01	0.03	0.06	0.1	0.19	0.45	0.69	0.77	0.85	0.99	1	1
1961	0	0	0.01	0.06	0.12	0.31	0.65	0.91	0.98	0.98	1	0.96	1
1962	0	0	0.01	0.05	0.15	0.34	0.61	0.81	0.92	0.97	1	0.932	1
1963	0	0.01	0.01	0.03	0.07	0.28	0.42	0.81	0.98	0.98	1	0.966	1
1964	0	0	0	0.03	0.13	0.37	0.66	0.89	0.95	0.99	1	1	1
1965	0	0	0	0.01	0.06	0.2	0.55	0.73	0.99	0.98	1	1	1
1966	0	0	0.01	0.02	0.06	0.22	0.35	0.74	0.94	0.94	1	1	1
1967	0	0	0	0.03	0.07	0.14	0.38	0.64	0.89	0.9	1	1	1
1968	0	0	0.03	0.05	0.09	0.19	0.39	0.58	0.82	1	1	1	1
1969	0	0	0	0.02	0.04	0.12	0.34	0.55	0.74	0.95	1	1	1
1970	0	0.01	0	0.01	0.07	0.23	0.58	0.81	0.89	0.91	1	1	1
1971	0	0	0.01	0.05	0.11	0.3	0.59	0.79	0.86	0.88	1	1	1
1972	0.01	0.02	0.02	0.01	0.1	0.34	0.64	0.81	0.94	1	1	1	1
1973	0	0	0	0.02	0.16	0.53	0.81	0.92	0.95	0.98	1	1	1
1974	0	0	0	0.01	0.03	0.21	0.5	0.96	1	0.96	1	1	1
1975	0	0	0.01	0.02	0.09	0.21	0.56	0.78	0.79	0.95	1	1	1

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YEAR_AGE	3	4	5	6	7	8	9	10	11	12	13	14	+GP
1976	0	0	0	0.05	0.12	0.29	0.45	0.84	0.83	1	0.9	1	1
1977	0	0	0.02	0.08	0.26	0.54	0.76	0.87	0.93	0.94	0.9	1	1
1978	0	0	0	0.02	0.13	0.44	0.71	0.77	0.81	0.89	0.8	1	1
1979	0	0	0	0.03	0.13	0.39	0.77	0.89	0.83	0.78	0.9	1	1
1980	0	0	0	0.02	0.13	0.35	0.65	0.82	1	0.9	0.9	1	1
1981	0	0	0.02	0.07	0.2	0.54	0.8	0.97	1	1	1	1	1
1982	0	0.05	0.1	0.34	0.65	0.82	0.92	1	1	1	1	1	1
1983	0.01	0.08	0.1	0.3	0.73	0.88	0.97	1	1	1	1	1	1
1984	0	0.05	0.18	0.31	0.56	0.9	0.99	1	1	1	1	1	1
1985	0	0.01	0.09	0.36	0.55	0.85	0.96	0.9	1	1	1	1	1
1986	0	0.05	0.08	0.19	0.53	0.71	0.62	0.9	1	1	1	1	1
1987	0	0.01	0.07	0.18	0.22	0.46	0.5	0.75	1	1	1	1	1
1988	0	0.02	0.05	0.33	0.53	0.62	1	1	1	1	1	1	1
1989	0.008	0.003	0.029	0.228	0.547	0.705	0.915	1	1	1	1	1	1
1990	0.008	0.013	0.051	0.21	0.522	0.715	0.905	0.975	1	1	1	1	1
1991	0.001	0.032	0.075	0.305	0.708	0.861	0.957	1	1	1	1	1	1
1992	0.001	0.014	0.145	0.419	0.8	0.943	0.974	1	1	1	1	1	1
1993	0	0.028	0.087	0.368	0.704	0.931	0.972	0.994	1	1	1	1	1
1994	0.003	0.007	0.119	0.335	0.589	0.862	0.963	0.99	1	1	1	1	1
1995	0	0.003	0.061	0.372	0.624	0.781	0.96	0.979	1	1	1	1	1
1996	0	0	0.019	0.258	0.631	0.82	0.975	1	1	1	1	1	1
1997	0	0	0.012	0.14	0.607	0.83	0.946	1	1	1	1	1	1
1998	0.001	0.003	0.026	0.152	0.472	0.814	0.957	0.98	1	1	1	1	1
1999	0.002	0.002	0.014	0.187	0.544	0.847	0.965	1	1	1	1	1	1
2000	0	0.001	0.071	0.247	0.643	0.83	0.978	1	1	1	1	1	1
2001	0.003	0.003	0.065	0.359	0.624	0.819	0.952	1	1	1	1	1	1
2002	0.002	0.013	0.084	0.388	0.683	0.841	0.951	1	1	1	1	1	1
2003	0.001	0.001	0.088	0.326	0.672	0.888	0.957	1	1	1	1	1	1
2004	0.001	0.01	0.091	0.442	0.726	0.872	0.976	0.977	1	1	1	1	1
2005	0	0.004	0.068	0.397	0.716	0.892	0.967	0.991	1	1	1	1	1

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YEAR_AGE	3	4	5	6	7	8	9	10	11	12	13	14	+GP
2006	0	0.001	0.06	0.369	0.647	0.897	0.965	1	1	1	1	1	1
2007	0	0.004	0.072	0.343	0.723	0.876	0.976	1	1	1	1	1	1
2008	0	0.004	0.062	0.282	0.538	0.863	0.928	0.994	1	1	1	1	1
2009	0	0	0.076	0.372	0.755	0.857	0.977	0.997	0.981	1	1	1	1
2010	0	0.003	0.045	0.323	0.573	0.838	0.927	0.97	0.974	0.986	1	1	1
2011	0	0.001	0.037	0.343	0.64	0.817	0.94	0.964	0.991	0.989	1	1	1
2012	0.001	0	0.046	0.215	0.557	0.786	0.909	0.964	0.99	0.989	1	1	1
2013	0	0.002	0.008	0.154	0.486	0.753	0.908	0.981	0.989	1	1	1	1
2014	0	0.002	0.019	0.137	0.513	0.805	0.929	0.981	0.998	1	1	1	1
2015	0	0.001	0.011	0.094	0.281	0.7	0.883	0.967	0.988	0.994	1	1	1
2016	0	0.001	0.006	0.058	0.255	0.577	0.804	0.955	0.986	1	1	1	1
2017	0	0.002	0.004	0.148	0.493	0.781	0.94	0.99	1	0.996	1	1	1

Table 3.12. Northeast Arctic COD. Total number of cod (thousands) consumed by cod, by year and prey age group.

	3	4	5	6
1984	82	0	0	0
1985	96	0	0	0
1986	60127	0	0	0
1987	12136	0	0	0
1988	1834	0	0	0
1989	0	0	0	0
1990	0	0	0	0
1991	614	0	0	0
1992	4403	0	0	0
1993	42339	765	198	0
1994	110113	37403	4836	206
1995	176300	55428	1810	66
1996	102583	34894	9344	292
1997	129450	9720	405	16
1998	167211	14397	478	66
1999	29470	3559	4	0
2000	28808	4614	581	6
2001	17090	7662	1219	1010
2002	29922	2535	244	2
2003	26142	0	0	0
2004	12635	5219	1483	253
2005	44737	3583	1763	101
2006	2804	382	14	0
2007	63007	3492	132	0
2008	81411	18767	1127	0
2009	71007	24319	5998	270
2010	47382	30987	21434	2860
2011	156407	40474	7575	837
2012	108306	50733	8753	0
2013	185398	19182	7980	1407
2014	192053	62978	6522	80
2015	75495	52889	22815	2249
2016	6517	20904	43222	10372

Table 3.13. North-East Arctic COD. Tuning data

North-East	Arctic	cod	(Sub-areas	I	and	II)			
104									
FLT15:	NorBarTrSur								
1981	2017								
1	1	0.085	0.189						
4	12								
1	2330	4000	3840	480	100	30	NA	NA	NA
1	2770	2360	1550	1600	140	20	NA	NA	NA
1	5234	4333	1696	582	321	97	NA	NA	NA
1	2830	2140	1170	410	40	10	NA	NA	NA
1	12600	1990	770	330	20	10	NA	NA	NA
1	14390	6410	830	190	30	NA	NA	NA	NA
1	39110	5430	1570	200	50	NA	NA	NA	NA
1	8050	17330	2050	360	50	NA	NA	NA	NA
1	7590	3780	9020	980	90	10	NA	NA	NA
1	3490	3460	2060	2720	160	40	NA	NA	NA
1	3370	2570	2150	1220	1270	60	NA	NA	NA
1	5770	1780	1280	770	430	270	NA	NA	NA
1	14010	7250	1580	620	390	220	NA	NA	NA
1	30760	15260	4680	813	259	132	55	52	11
1	24210	25230	7710	1790	233	113	55	59	19
1	11670	14070	11120	2480	279	37	16	8	8
1	6920	7500	6070	2680	495	63	68	46	0
1	16740	3170	2640	1750	826	79	52	65	0
1	18190	6130	1280	683	519	98	27	2	3
1	13000	11200	2700	473	182	123	36	10	3
1	19450	8160	3800	958	119	45	19	4	0
1	13770	10860	4650	1450	219	34	19	5	0
1	12540	9520	6660	1790	472	102	16	4	0
1	18610	5360	4320	3090	692	166	29	8	1
1	5480	10270	2240	1640	380	88	30	4	2
1	11400	2810	4330	1400	519	134	22	21	8
1	12730	6890	1370	2360	685	220	40	31	8
1	30000	11560	4080	1800	829	186	35	2	2
1	19610	21800	5820	1750	844	527	50	18	3
1	11490	15550	14450	3980	1120	370	164	57	5
1	5070	12990	13800	10310	1670	434	117	79	20
1	7030	3640	9390	13630	4960	938	233	87	60
1	11980	6400	4100	6500	7620	3360	221	283	41
1	8510	6790	4780	3260	4690	3170	936	101	97
1	17020	13570	9980	7120	2740	5280	1700	286	72
1	11230	15130	10900	6610	2660	1280	1500	643	96
1	3990	4870	5660	2780	1890	763	301	222	349
FLT16:	NorBarLofAcSur								
1985	2017								
1	1	0.085	0.26						
4	12								
1	1416	204	151	157	33	13	10	5	NA
1	1343	684	116	77	31	3	NA	4	NA
1	2049	502	174	14	30	7	NA	NA	NA
1	355	578	109	40	3	NA	1	NA	NA
1	344	214	670	166	32	5	2	NA	NA
1	206	262	269	668	73	6	3	NA	NA
1	346	293	339	367	500	37	2	2	NA
1	658	215	184	284	254	824	43	17	NA
1	1911	1131	354	255	252	277	442	49	NA
1	4045	2175	895	225	119	94	39	180	NA
1	1598	2166	1040	290	44	43	30	26	NA
1	705	872	891	446	65	11	4	9	NA
1	517	497	422	499	205	22	5	NA	NA
1	1826	424	338	340	247	49	7	2	NA
1	964	454	122	112	187	92	10	2	NA
1	1589	1457	493	129	69	52	12	6	NA
1	1716	816	573	198	24	8	6	3	NA
1	1122	1043	661	345	95	12	5	6	NA
1	1144	1315	1445	643	212	38	5	1	NA
1	928	327	451	468	222	88	22	2	NA
1	337	661	299	432	172	75	18	1	NA
1	591	157	381	169	155	88	24	3	NA
1	371	318	130	427	138	75	33	8	NA
1	3061	1410	754	246	329	58	28	17	NA
1	1783	1405	495	401	133	260	37	17	NA
1	1219	1759	1949	709	375	111	88	17	NA
1	291	824	1587	2843	656	226	61	78	5
1	527	381	828	2244	1547	309	108	48	20
1	850	710	575	1194	2249	1756	209	126	49
1	1178	918	679	529	1354	1751	977	142	66
1	1542	1193	996	965	362	1112	663	300	68
1	583	969	646	587	339	341	481	292	170
1	404	486	766	498	503	285	180	147	172

Table 3.13. North-East Arctic COD. Tuning data (continued)

FLT18:	RusSweptArea									
1982	2016									
1	1	0.9	1							
3	12									
1	1413	1525	721	198	551	174	37	19	15	1
1	520	642	506	358	179	252	94	NA	NA	NA
1	1189	700	489	357	154	69	61	17	15	6
1	1188	1592	1068	365	165	37	8	16	1	21
1	1622	1532	1493	481	189	42	2	6	NA	NA
1	557	3076	900	701	184	60	25	4	1	3
1	993	938	2879	583	260	47	24	NA	NA	NA
1	490	978	1062	1454	1167	299	112	47	18	7
1	167	487	627	972	1538	673	153	49	9	2
1	1077	484	532	583	685	747	98	14	3	NA
1	675	308	239	273	218	175	25	25	4	NA
1	1604	1135	681	416	354	87	3	7	1	1
1	1363	1309	1019	354	128	49	21	11	6	2
1	589	1065	1395	849	251	83	19	18	9	6
1	733	784	1035	773	348	132	19	5	12	2
1	1342	835	613	602	348	116	32	30	NA	NA
1	2028	1363	788	470	259	130	48	5	NA	1
1	1587	2072	980	301	123	94	42	4	NA	NA
1	1839	1286	1786	773	114	52	23	9	4	NA
1	1224	1557	1290	1061	304	50	14	5	25	13
1	980	1473	1473	896	600	182	29	8	1	1
1	1246	1057	1166	1203	535	241	40	9	3	NA
1	329	1576	880	1111	776	279	93	23	4	2
1	1408	631	1832	744	605	244	88	28	6	1
1	927	1613	777	1801	662	342	161	43	17	7
1	2579	1617	1903	846	1525	553	226	86	49	11
1	2203	3088	1635	1472	830	863	291	115	33	17
1	974	2317	3687	2016	1175	620	413	205	65	32
1	334	1070	2505	3715	1817	789	395	299	156	55
1	882	508	1432	3065	3300	917	439	176	175	70
1	815	1114	839	2122	3358	1878	432	195	46	57
1	747	1174	1177	884	2349	3132	1367	306	92	54
1	1399	1368	1725	1483	1111	1929	1297	383	93	35
1	657	1583	1742	1932	1610	925	1158	761	242	65
1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
FLT007:	Ecosystem									
2004	2016									
1	1	0.65	0.75							
3	12									
1	1477	4215	1502	798	402	101	22	5	1	1
1	2166	558	1009	280	156	57	12	5	1	NA
1	1861	2056	599	698	176	81	26	6	2	NA
1	5862	1592	791	246	269	60	22	9	1	2
1	6526	4834	1323	511	128	175	33	9	2	2
1	2023	2806	2896	1017	319	127	73	26	8	3
1	568	1770	3972	4249	1427	385	105	68	16	3
1	1236	1015	2402	3004	1784	323	77	18	13	6
1	2291	1464	700	1508	1652	845	127	44	16	14
1	2491	1836	1257	632	1182	1302	538	91	33	15
1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	1744	2252	1413	726	486	262	353	266	79	17
1	772	937	1216	701	444	272	138	132	54	17

Table 3.14 –SAM parameter settings

```
# Min Age (should not be modified unless data are modified accordingly)
 3
 # Max Age (should not be modified unless data are modified accordingly)
15
 # Max Age considered a plus group (0=No, 1=Yes)
1


# Coupling of correlation in observations
(NA,  NA,  NA,  NA,  NA,  NA,   NA,    NA,    NA,    NA,    NA,    NA),
(  -1, 0,  1,   2,   3,   4,   4,      4,     4,   -1,    -1,    -1),
( -1, 5,  6,   7,   8,   9,  10,       10,   10,   -1,    -1,    -1),
( 11, 12,  13,  14,  14,  14,  14,      14,   14,    -1,    -1,    -1),
( 15, 16,  17,  18,  19,  20,  20,      20,   20,    -1,    -1,    -1)


 # Coupling of OBSERVATION VARIANCES
(  0, 0, 0, 0, 0, 0, 0, 0, 0,  0,  0,  0,  0),
( -1, 1, 1, 1, 1, 1, 1, 1, 1,  1, -1, -1, -1),
( -1, 2, 2, 2, 2, 2, 2, 2, 2,  2, -1, -1, -1),
(  3, 3, 3, 3, 3, 3, 3, 3, 3,  3, -1, -1, -1),
(  4, 4, 4, 4, 4, 4, 4, 4, 4,  4, -1, -1, -1)


 # Stock recruitment model code (0=RW, 1=Ricker, 2=BH, ... more in time)
 0
 # Years in which catch data are to be scaled by an estimated parameter
 0
# Define Fbar range
 5          10
```

Table 3.15. Northeast Arctic cod. Fishing mortality

SAM
Sat Apr 22 18:09:33 2017

Year_age	3	4	5	6	7	8	9	10	11	12	13	14 +gp	FBAR5-10
1946	0.002	0.018	0.068	0.139	0.243	0.215	0.3	0.31	0.438	0.404	0.406	0.438	0.213
1947	0.002	0.02	0.086	0.195	0.361	0.32	0.449	0.479	0.721	0.681	0.704	0.787	0.315
1948	0.001	0.016	0.077	0.19	0.363	0.328	0.449	0.474	0.716	0.721	0.782	0.952	0.314
1949	0.002	0.028	0.122	0.268	0.438	0.373	0.474	0.506	0.755	0.759	0.818	1.038	0.364
1950	0.003	0.039	0.144	0.279	0.415	0.368	0.485	0.56	0.852	0.895	0.934	1.233	0.375
1951	0.009	0.086	0.249	0.381	0.472	0.399	0.496	0.562	0.787	0.841	0.89	1.196	0.426
1952	0.014	0.123	0.326	0.475	0.539	0.47	0.592	0.719	0.999	1.064	1.077	1.409	0.52
1953	0.015	0.115	0.27	0.373	0.4	0.353	0.437	0.539	0.713	0.725	0.713	0.895	0.395
1954	0.015	0.112	0.27	0.386	0.413	0.373	0.46	0.596	0.772	0.775	0.743	0.869	0.416
1955	0.015	0.111	0.292	0.463	0.51	0.486	0.56	0.7	0.89	0.871	0.79	0.849	0.502
1956	0.02	0.139	0.362	0.582	0.634	0.612	0.668	0.822	1.04	1.099	0.959	0.921	0.613
1957	0.02	0.131	0.31	0.484	0.531	0.533	0.574	0.716	0.903	0.933	0.826	0.748	0.525
1958	0.029	0.185	0.392	0.534	0.53	0.511	0.538	0.658	0.767	0.741	0.594	0.523	0.527
1959	0.033	0.202	0.421	0.535	0.517	0.508	0.544	0.666	0.74	0.701	0.597	0.547	0.532
1960	0.032	0.197	0.405	0.496	0.473	0.487	0.534	0.68	0.788	0.741	0.661	0.645	0.512
1961	0.037	0.235	0.509	0.619	0.581	0.618	0.702	0.851	0.959	0.909	0.828	0.781	0.647
1962	0.038	0.257	0.61	0.766	0.699	0.716	0.81	0.946	0.967	0.846	0.787	0.713	0.758
1963	0.032	0.224	0.596	0.826	0.824	0.876	0.992	1.13	1.158	0.936	0.869	0.749	0.874
1964	0.022	0.148	0.383	0.541	0.594	0.712	0.872	0.95	1.002	0.903	0.983	0.844	0.675
1965	0.022	0.133	0.319	0.428	0.473	0.588	0.738	0.783	0.776	0.71	0.905	0.822	0.555
1966	0.025	0.131	0.283	0.369	0.429	0.553	0.695	0.706	0.654	0.571	0.689	0.609	0.506
1967	0.026	0.135	0.277	0.35	0.428	0.591	0.777	0.797	0.75	0.627	0.723	0.574	0.537
1968	0.029	0.159	0.34	0.421	0.482	0.632	0.805	0.791	0.726	0.592	0.74	0.608	0.578
1969	0.035	0.183	0.416	0.543	0.652	0.86	1.07	1.018	0.912	0.688	0.78	0.618	0.76
1970	0.036	0.166	0.364	0.485	0.601	0.826	0.995	0.912	0.776	0.564	0.649	0.548	0.697
1971	0.032	0.128	0.261	0.342	0.455	0.704	0.908	0.84	0.732	0.531	0.588	0.491	0.585
1972	0.051	0.175	0.32	0.389	0.477	0.772	1.095	1.092	1.014	0.747	0.823	0.648	0.691
1973	0.088	0.255	0.404	0.436	0.462	0.642	0.856	0.845	0.807	0.613	0.672	0.527	0.607
1974	0.12	0.336	0.516	0.537	0.521	0.627	0.76	0.848	0.959	0.792	0.932	0.674	0.635
1975	0.106	0.301	0.508	0.582	0.59	0.678	0.733	0.72	0.885	0.768	0.871	0.592	0.635
1976	0.119	0.336	0.553	0.635	0.648	0.738	0.756	0.623	0.687	0.639	0.756	0.597	0.659
1977	0.125	0.382	0.654	0.754	0.77	0.891	0.974	0.793	0.829	0.726	0.935	0.833	0.806
1978	0.1	0.32	0.624	0.816	0.871	1.051	1.279	1.189	1.437	1.297	1.603	1.44	0.972
1979	0.056	0.194	0.411	0.62	0.708	0.838	1.058	1.052	1.282	1.234	1.519	1.732	0.781
1980	0.039	0.147	0.345	0.6	0.745	0.867	1.031	1.07	1.256	1.178	1.385	1.676	0.776
1981	0.032	0.127	0.308	0.588	0.793	0.935	1.024	0.939	1.014	0.904	0.852	0.877	0.764
1982	0.038	0.156	0.366	0.71	0.945	1.02	1.006	0.844	0.826	0.837	0.737	0.86	0.815
1983	0.03	0.137	0.329	0.624	0.927	1.04	0.959	0.783	0.697	0.692	0.651	0.885	0.777
1984	0.029	0.141	0.361	0.693	1.095	1.213	1.064	0.902	0.753	0.69	0.566	0.857	0.888
1985	0.035	0.162	0.4	0.716	0.981	1.078	0.849	0.711	0.614	0.534	0.408	0.735	0.789
1986	0.038	0.185	0.479	0.815	1.004	1.16	0.983	0.975	0.918	0.852	0.53	1.001	0.903
1987	0.042	0.199	0.534	0.916	1.094	1.214	1.097	1.248	1.316	1.335	0.744	1.469	1.017
1988	0.033	0.15	0.386	0.712	0.979	1.113	1.111	1.411	1.434	1.543	0.769	1.386	0.952
1989	0.024	0.108	0.261	0.481	0.667	0.803	0.761	0.921	0.919	0.978	0.542	1.339	0.649
1990	0.015	0.067	0.154	0.267	0.361	0.44	0.451	0.534	0.605	0.738	0.479	1.234	0.368
1991	0.016	0.078	0.178	0.29	0.352	0.376	0.356	0.345	0.337	0.392	0.266	0.829	0.316
1992	0.02	0.112	0.266	0.431	0.505	0.52	0.503	0.463	0.448	0.518	0.374	1.182	0.448
1993	0.016	0.105	0.29	0.506	0.621	0.661	0.701	0.68	0.724	0.849	0.706	1.819	0.577
1994	0.016	0.113	0.344	0.662	0.874	0.941	0.989	0.965	1.054	1.255	1.225	3.142	0.796
1995	0.016	0.115	0.343	0.636	0.845	0.921	0.967	0.961	1.007	1.143	1.29	3.332	0.779

Year_age	3	4	5	6	7	8	9	10	11	12	13	14 +gp		FBAR5-10
1996	0.019	0.136	0.382	0.644	0.791	0.915	0.903	0.949	0.967	1.11	1.172	2.797	2.797	0.764
1997	0.024	0.187	0.504	0.775	0.905	1.127	1.173	1.182	1.14	1.188	0.952	1.328	1.328	0.944
1998	0.026	0.21	0.546	0.804	0.874	1.095	1.17	1.27	1.118	1.179	0.872	0.924	0.924	0.96
1999	0.019	0.166	0.491	0.756	0.883	1.106	1.226	1.293	1.079	1.16	0.867	0.808	0.808	0.959
2000	0.012	0.112	0.359	0.608	0.779	0.98	1.078	1.129	0.844	0.883	0.572	0.589	0.589	0.822
2001	0.01	0.091	0.292	0.526	0.712	0.862	0.89	0.954	0.708	0.726	0.513	0.74	0.74	0.706
2002	0.009	0.085	0.273	0.501	0.712	0.836	0.796	0.799	0.598	0.619	0.421	0.688	0.688	0.653
2003	0.01	0.085	0.259	0.449	0.647	0.736	0.684	0.657	0.47	0.435	0.271	0.405	0.405	0.572
2004	0.011	0.094	0.287	0.502	0.775	0.929	0.898	0.89	0.649	0.535	0.281	0.358	0.358	0.714
2005	0.013	0.11	0.315	0.506	0.757	0.923	0.907	0.869	0.66	0.549	0.271	0.307	0.307	0.713
2006	0.015	0.115	0.299	0.453	0.645	0.806	0.846	0.852	0.754	0.727	0.431	0.521	0.521	0.65
2007	0.014	0.097	0.24	0.334	0.446	0.527	0.551	0.563	0.558	0.569	0.348	0.373	0.373	0.443
2008	0.009	0.062	0.153	0.229	0.317	0.376	0.396	0.407	0.437	0.447	0.278	0.252	0.252	0.313
2009	0.008	0.049	0.118	0.181	0.263	0.32	0.352	0.37	0.433	0.473	0.298	0.219	0.219	0.267
2010	0.006	0.04	0.098	0.156	0.243	0.331	0.376	0.43	0.511	0.504	0.351	0.22	0.22	0.272
2011	0.006	0.036	0.089	0.142	0.223	0.322	0.375	0.423	0.446	0.369	0.247	0.133	0.133	0.262
2012	0.006	0.038	0.092	0.139	0.201	0.282	0.333	0.377	0.38	0.296	0.198	0.109	0.109	0.237
2013	0.007	0.044	0.108	0.165	0.226	0.307	0.365	0.422	0.407	0.299	0.197	0.118	0.118	0.266
2014	0.01	0.058	0.143	0.215	0.27	0.33	0.371	0.444	0.427	0.305	0.191	0.116	0.116	0.296
2015	0.012	0.073	0.177	0.266	0.306	0.343	0.367	0.462	0.483	0.337	0.197	0.117	0.117	0.32
2016	0.012	0.074	0.184	0.283	0.324	0.357	0.377	0.479	0.498	0.355	0.208	0.122	0.122	0.334
FBAR	0.011	0.069	0.168	0.255	0.3	0.343	0.372	0.462	0.469	0.332	0.199	0.118		

Table 3.16. Northeast Arctic COD Stock number at age (Thous)

SAM Sat Apr 22 18:09:33 2017 Year_age	3	4	5	6	7	8	9	10	11	12	13	14	+gp	TOTAL
1946	1E+06	681266	383964	180672	85064	89689	241808	85649	36540	32420	18290	8032	2546	3267077
1947	619634	822876	495009	292224	132518	55810	59406	145897	50926	19663	17784	10003	5849	2727600
1948	407762	359450	554453	353833	198727	75882	34157	31126	74131	19459	8256	7122	6016	2130374
1949	578565	274719	268630	396935	234867	109923	44360	17747	16064	30216	7563	3102	4094	1986783
1950	877601	375721	221944	191026	236283	120377	60524	22797	8857	6191	11956	2686	2083	2138046
1951	2E+06	676046	291574	170046	117671	123696	67120	30089	10723	3034	2025	3965	1116	3958950
1952	2E+06	1E+06	417404	179099	104466	60315	66541	32986	14034	4131	1077	673	1258	4357464
1953	3E+06	1E+06	665240	232822	90081	53431	30994	29889	12959	4216	1158	303	375	4807879
1954	849884	1E+06	703177	399904	132385	49834	32341	16353	14288	5165	1692	469	227	3660989
1955	389185	557117	963665	425958	224405	72383	29261	17426	7156	5439	1952	659	239	2694846
1956	744525	251309	386615	563726	213428	110953	36032	13959	7244	2317	1917	737	314	2333077
1957	1E+06	406010	155165	211269	248456	90737	48966	15075	5102	2166	599	606	345	2600223
1958	1E+06	701427	246282	92007	106405	116275	42014	22712	6098	1691	720	200	372	2367508
1959	1E+06	541907	423025	135533	44891	51435	56633	19772	9638	2319	638	342	281	2611095
1960	1E+06	626455	286280	216046	66443	21996	25579	26494	8121	3861	950	279	310	2762955
1961	2E+06	701292	346457	147552	108918	34617	10996	12820	10853	2917	1547	413	248	2906212
1962	1E+06	797043	383723	163163	65724	51157	15283	4368	4679	3403	923	559	245	2740667
1963	840775	707446	443069	161848	60840	27225	21201	5556	1343	1524	1206	336	324	2272693
1964	484574	386134	371416	183628	55711	21100	9334	6696	1448	327	501	430	258	1521557
1965	906560	263119	244789	201636	86650	24624	8259	3133	2220	433	103	152	250	1741928
1966	2E+06	585651	179529	144189	107701	44542	11168	3185	1158	871	182	32	141	2978013
1967	1E+06	1E+06	407076	114023	81924	56909	20979	4556	1268	504	412	79	72	3240998
1968	186558	957910	888789	263272	71336	43830	25349	7819	1677	476	216	165	73	2447470
1969	111271	143449	658036	498681	143867	38801	19436	9230	2898	677	221	81	107	1626755
1970	213799	88542	95573	343625	230321	60787	14002	5473	2735	932	274	84	83	1056231
1971	389156	152596	61329	52895	164879	100213	21538	4368	1791	1044	442	117	78	950445
1972	992424	300486	109938	39860	31526	80813	38848	7009	1579	710	505	209	97	1604006
1973	2E+06	702455	203316	65640	22811	17047	29311	10261	1884	465	276	179	133	2917002
1974	641881	1E+06	463658	113810	35394	12225	7710	9541	3554	701	204	122	150	2613059
1975	598663	428190	726683	230519	55328	17620	5669	3246	3089	1092	268	63	115	2070544
1976	611097	434650	256648	341005	104462	24719	7353	2374	1420	948	403	89	86	1785253
1977	373265	423825	258325	122836	144972	44083	9345	2799	1119	653	369	156	81	1381828
1978	629293	249012	220698	108945	48885	54743	14623	2771	1017	427	293	113	84	1330904
1979	213022	451013	148093	91455	39189	17353	15670	3305	692	189	97	47	39	980164
1980	129637	164513	302033	81098	39017	15839	6434	4375	949	159	44	18	12	744129
1981	159337	101710	119342	173450	36039	14792	5546	1986	1181	220	42	9	4	613657
1982	174522	131037	82254	63840	79105	13794	4666	1618	660	328	74	14	5	551917
1983	155637	129394	93810	48702	25572	24798	4175	1403	583	238	109	30	7	484457
1984	412323	122560	85184	55612	21762	8559	7186	1249	531	248	103	43	13	715372
1985	557902	363909	82920	45612	24008	5432	2190	2071	392	206	102	49	19	1084814
1986	1E+06	435400	247145	43887	18690	7085	1451	813	857	180	99	56	26	1871117
1987	328128	971014	263884	105181	14998	6091	1715	490	245	285	63	49	25	1692168
1988	298195	242030	627461	116097	29732	4455	1490	470	122	54	60	25	13	1320204
1989	187904	222546	153697	346576	49593	8599	1319	402	90	25	9	21	9	970788
1990	153907	146362	144242	105774	166517	20831	2960	539	126	29	8	5	6	741304

1991	392367	132748	108277	98881	67091	95377	11187	1536	268	53	11	3	3	907802
1992	729437	313827	106050	75808	57444	38160	53209	6542	956	163	29	7	2	1381634
1993	919650	527778	250277	70756	37917	28184	17660	27518	3347	528	80	18	2	1883716
1994	727595	713965	394955	147013	35248	16782	11844	7166	11629	1340	183	31	3	2067754
1995	495919	495879	524195	221958	57366	12165	5362	3553	2271	3482	303	43	1	1822499
1996	407919	294641	330885	293781	97302	19074	4195	1599	1104	649	1033	66	1	1452248
1997	667174	222861	201230	178516	121222	37390	5886	1540	512	332	181	291	3	1437138
1998	951011	435255	127908	95329	70121	41783	9961	1445	399	127	80	57	69	1733546
1999	541276	576427	250585	59318	32866	25969	11538	2609	320	106	30	27	45	1501117
2000	669000	395347	373576	115678	23015	11293	7126	2649	622	89	27	9	28	1598460
2001	548496	525180	292583	183093	50824	8864	3493	1922	690	228	28	13	18	1615432
2002	406016	417303	373979	188318	81722	20183	3149	1206	616	268	95	13	12	1492880
2003	686290	301112	295242	246488	86890	32625	6999	1187	446	301	112	55	9	1657757
2004	245683	559406	210202	191671	124256	36818	12786	2869	502	249	173	68	34	1384718
2005	622294	188110	398464	133267	99490	42515	11827	4320	922	211	122	116	57	1501715
2006	537053	454839	135092	234950	70818	36961	13852	3819	1465	415	96	80	121	1489562
2007	1E+06	447889	292363	86289	126371	31685	13203	4613	1326	594	168	50	98	2400836
2008	1E+06	1E+06	360432	163610	52978	68190	16223	6155	2059	671	258	100	81	2937088
2009	691126	910150	839439	262677	94122	36633	35617	9222	3443	1124	354	155	115	2884179
2010	283196	521581	730981	634912	185663	59253	22114	18977	5559	1961	526	219	179	2465122
2011	467808	215316	440695	601242	452601	98442	35751	12420	9901	2635	1099	269	259	2338439
2012	538425	323772	169229	351240	467631	268335	54161	19933	6768	5095	1522	735	371	2207217
2013	589602	368262	236250	143804	268006	317068	162209	29519	11306	3813	3073	1014	867	2134793
2014	659968	392039	282808	184993	111460	190734	185242	83583	15263	6047	2251	2072	1390	2117849
2015	353296	428564	287370	196191	133710	74480	117021	99593	39922	8337	3560	1503	2526	1746074
2016	180347	220220	309500	188451	126679	80049	47361	65073	50025	18666	4897	2393	2938	1296598
2017		135152	152241	191916	102929	78257	45962	27239	31446	25510	10721	3257	3863	988840

Table 3.17 Northeast Arctic COD. Natural mortality used in final run

SAM
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2017

Year_age	3	4	5	6	7	8	9	10	11	12	13	14	+gp
1946	0.49	0.304	0.226	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1947	0.544	0.325	0.231	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1948	0.493	0.305	0.226	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1949	0.434	0.282	0.221	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1950	0.316	0.236	0.21	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1951	0.724	0.394	0.247	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1952	0.715	0.391	0.246	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1953	0.537	0.322	0.23	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1954	0.388	0.264	0.217	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1955	0.406	0.271	0.218	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1956	0.59	0.343	0.235	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1957	0.725	0.395	0.247	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1958	0.562	0.332	0.233	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1959	0.713	0.39	0.246	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1960	0.704	0.387	0.245	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1961	0.609	0.35	0.237	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1962	0.52	0.315	0.229	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1963	0.788	0.419	0.253	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1964	0.603	0.348	0.236	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1965	0.416	0.275	0.219	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1966	0.353	0.251	0.214	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1967	0.271	0.219	0.206	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1968	0.224	0.201	0.202	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1969	0.206	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1970	0.293	0.227	0.208	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1971	0.256	0.213	0.205	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1972	0.323	0.239	0.211	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1973	0.217	0.2	0.201	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1974	0.217	0.2	0.201	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1975	0.232	0.204	0.203	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1976	0.224	0.2	0.202	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1977	0.249	0.21	0.204	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1978	0.234	0.205	0.203	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1979	0.208	0.2	0.201	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1980	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1981	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1982	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1983	0.203	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1984	0.2	0.208	0.213	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1985	0.204	0.214	0.213	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1986	0.249	0.22	0.259	0.228	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1987	0.244	0.208	0.218	0.265	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1988	0.214	0.204	0.208	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1989	0.201	0.217	0.2	0.218	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1990	0.2	0.202	0.207	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

1991	0.201	0.2	0.201	0.212	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1992	0.209	0.2	0.2	0.219	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1993	0.244	0.2	0.214	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1994	0.342	0.252	0.217	0.232	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1995	0.52	0.31	0.214	0.201	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1996	0.508	0.317	0.228	0.219	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1997	0.421	0.27	0.218	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1998	0.427	0.263	0.209	0.229	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
1999	0.259	0.228	0.226	0.202	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2000	0.246	0.208	0.245	0.208	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2001	0.236	0.216	0.2	0.232	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2002	0.282	0.208	0.2	0.224	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2003	0.24	0.201	0.2	0.212	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2004	0.252	0.212	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2005	0.3	0.214	0.203	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2006	0.203	0.23	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2007	0.244	0.2	0.243	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2008	0.257	0.211	0.2	0.223	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2009	0.282	0.213	0.201	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2010	0.302	0.243	0.211	0.203	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2011	0.437	0.327	0.207	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2012	0.39	0.331	0.225	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2013	0.434	0.249	0.218	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2014	0.428	0.333	0.22	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2015	0.419	0.295	0.274	0.206	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2016	0.242	0.304	0.341	0.277	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Table 3.18. Northeast Arctic COD. Summary table

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2017

Year	RECRUITS	TOTALBIO	TOTSPBIO	LANDINGS	YIELD/SSB	FBAR 5-10
1946	1421137	4199329	990981	706000	0.712	0.213
1947	619634	3643420	1021872	882017	0.863	0.315
1948	407762	3525344	836996	774295	0.925	0.314
1949	578565	3005054	624616	800122	1.281	0.364
1950	877601	2830029	561981	731982	1.303	0.375
1951	2461844	3650535	510901	827180	1.619	0.426
1952	2322345	4049225	499119	876795	1.757	0.52
1953	2579157	4124472	395821	695546	1.757	0.395
1954	849884	4260045	409596	826021	2.017	0.416
1955	389185	3565418	331508	1147841	3.463	0.502
1956	744525	3334255	284260	1343068	4.725	0.613
1957	1415728	2817100	206864	792557	3.831	0.525
1958	1031305	2415777	204204	769313	3.767	0.527
1959	1324681	2762503	442805	744607	1.682	0.532
1960	1480139	2421738	402759	622042	1.545	0.512
1961	1527582	2397938	406019	783221	1.929	0.647
1962	1250396	2165071	320176	909266	2.84	0.758
1963	840775	1960996	214506	776337	3.619	0.874
1964	484574	1499088	192073	437695	2.279	0.675
1965	906560	1473069	106493	444930	4.178	0.555
1966	1899664	2280267	121933	483711	3.967	0.506
1967	1262781	2781651	133557	572605	4.287	0.537
1968	186558	3226588	228964	1074084	4.691	0.578
1969	111271	2743509	151405	1197226	7.908	0.76
1970	213799	2079289	230733	933246	4.045	0.697
1971	389156	1629022	319399	689048	2.157	0.585
1972	992424	1620872	365204	565254	1.548	0.691
1973	1863225	2274508	324226	792685	2.445	0.607
1974	641881	2208700	159573	1102433	6.909	0.635
1975	598663	2114889	130599	829377	6.351	0.635
1976	611097	2013745	167889	867463	5.167	0.659
1977	373265	1976216	352361	905301	2.569	0.806
1978	629293	1596472	234779	698715	2.976	0.972
1979	213022	1110181	165107	440538	2.668	0.781
1980	129637	839347	102610	380434	3.708	0.776

1981	159337	961811	151761	399038	2.629	0.764
1982	174522	736258	311677	363730	1.167	0.815
1983	155637	708440	282330	289992	1.027	0.777
1984	412323	810488	228215	277651	1.217	0.888
1985	557902	987699	187689	307920	1.641	0.789
1986	1115427	1345623	162281	430113	2.65	0.903
1987	328128	1206503	110474	523071	4.735	1.017
1988	298195	1006836	179824	434939	2.419	0.952
1989	187904	1005297	236593	332481	1.405	0.649
1990	153907	1020247	333958	212000	0.635	0.368
1991	392367	1528203	711318	319158	0.449	0.316
1992	729437	1870189	912173	513234	0.563	0.448
1993	919650	2297740	777338	581611	0.748	0.577
1994	727595	2097570	591837	771086	1.303	0.796
1995	495919	1809835	523800	739999	1.413	0.779
1996	407919	1680817	548513	732228	1.335	0.764
1997	667174	1497114	546605	762403	1.395	0.944
1998	951011	1267919	381012	592624	1.555	0.96
1999	541276	1148028	285386	484910	1.699	0.959
2000	669000	1178128	239875	414868	1.73	0.822
2001	548496	1455762	364038	426471	1.172	0.706
2002	406016	1614557	507252	535045	1.055	0.653
2003	686290	1716006	597729	551990	0.924	0.572
2004	245683	1626533	714855	606445	0.848	0.714
2005	622294	1559607	621686	641276	1.032	0.713
2006	537053	1568655	609655	537642	0.882	0.65
2007	1396185	1957226	664380	486883	0.733	0.443
2008	1219978	2693100	704486	464171	0.659	0.313
2009	691126	3425627	1111746	523430	0.471	0.267
2010	283196	3816151	1413785	609983	0.432	0.272
2011	467808	4039298	2040520	719830	0.353	0.262
2012	538425	4175910	2371480	727663	0.307	0.237
2013	589602	4376272	2692927	966209	0.359	0.266
2014	659968	3923889	2563812	986449	0.385	0.296
2015	353296	3586396	2133663	864384	0.405	0.32
2016	180347	3035323	1769635	849422	0.48	0.334
Arith. Mean	747880	2272264	573749	667652	2.108	0.6
Units	Thous	Tonnes	Tonnes	Tonnes		

Table 3.19. Northeast Arctic COD. Input for the short term prediction

	2017							
Age	N	M	Mat	PF	PM	SWT	Sel	CWT
3	566000	0.363	0	0	0	0.261	0.036	0.777
4	135152	0.31	0.002	0	0	0.649	0.216	1.219
5	152241	0.279	0.004	0	0	1.168	0.528	1.672
6	191916	0.228	0.148	0	0	1.966	0.803	2.344
7	102929	0.2	0.493	0	0	2.93	0.947	3.249
8	78257	0.2	0.781	0	0	4.627	1.086	4.534
9	45962	0.2	0.94	0	0	5.966	1.177	5.856
10	27239	0.2	0.99	0	0	7.279	1.459	7.338
11	31446	0.2	1	0	0	9.3	1.482	8.665
12	25510	0.2	0.996	0	0	12.621	1.048	11.42
13	10721	0.2	1	0	0	14.544	0.628	12.8
14	3257	0.2	1	0	0	16.466	0.374	14.18
15	3863	0.2	1	0	0	18.388	0.374	15.55

	2018							
Age	N	M	Mat	PF	PM	SWT	Sel	CWT
3	607000	0.363	0	0	0	0.271	0.036	0.777
4		0.31	0.001	0	0	0.609	0.216	1.22
5		0.279	0.007	0	0	1.218	0.528	1.751
6		0.228	0.1	0	0	1.955	0.803	2.357
7		0.2	0.343	0	0	2.941	0.947	3.332
8		0.2	0.686	0	0	4.309	1.086	4.534
9		0.2	0.876	0	0	6.301	1.177	5.893
10		0.2	0.971	0	0	7.711	1.459	7.215
11		0.2	0.991	0	0	9.298	1.482	8.698
12		0.2	0.997	0	0	12.621	1.048	11.42
13		0.2	1	0	0	14.544	0.628	12.8
14		0.2	1	0	0	16.466	0.374	14.18
15		0.2	1	0	0	18.388	0.374	15.55

	2019							
Age	N	M	Mat	PF	PM	SWT	Sel	CWT
3	543000	0.363	0	0	0	0.257	0.036	0.777
4		0.31	0.001	0	0	0.619	0.216	1.22
5		0.279	0.007	0	0	1.178	0.528	1.751
6		0.228	0.1	0	0	2.005	0.803	2.357
7		0.2	0.343	0	0	2.93	0.947	3.332
8		0.2	0.686	0	0	4.32	1.086	4.534
9		0.2	0.876	0	0	5.983	1.177	5.893
10		0.2	0.971	0	0	8.047	1.459	7.215
11		0.2	0.991	0	0	9.731	1.482	8.698
12		0.2	0.997	0	0	12.621	1.048	11.42
13		0.2	1	0	0	14.544	0.628	12.8
14		0.2	1	0	0	16.466	0.374	14.18
15		0.2	1	0	0	18.388	0.374	15.55

2020								
Age	N	M	Mat	PF	PM	SWT	Sel	CWT
3	748000	0.363	0	0	0	0.257	0.036	0.777
4		0.31	0.001	0	0	0.619	0.216	1.22
5		0.279	0.007	0	0	1.178	0.528	1.751
6		0.228	0.1	0	0	2.005	0.803	2.357
7		0.2	0.343	0	0	2.93	0.947	3.332
8		0.2	0.686	0	0	4.32	1.086	4.534
9		0.2	0.876	0	0	5.983	1.177	5.893
10		0.2	0.971	0	0	8.047	1.459	7.215
11		0.2	0.991	0	0	9.731	1.482	8.698
12		0.2	0.997	0	0	12.621	1.048	11.42
13		0.2	1	0	0	14.544	0.628	12.8
14		0.2	1	0	0	16.466	0.374	14.18
15		0.2	1	0	0	18.388	0.374	15.55

Table 3.20. Northeast Arctic COD. Management option table.

2017				
Biomass (t)	SSB (t)	FMult	FBar	Landings (t)
2821721	1835962	1	0.334	687997

2018				2019	
Biomass	SSB	FBar	Landings	Biomass	SSB
2538299	1504567	0	0	3023274	1837155
		0.05	96095	2911483	1747134
		0.1	187635	2805321	1661967
		0.15	274865	2704477	1581376
		0.2	358015	2608659	1505099
		0.25	437301	2517591	1432891
		0.3	512929	2431014	1364521
		0.35	585091	2348683	1299770
		0.4	653971	2270367	1238434
		0.45	719739	2195850	1180320
		0.5	782557	2124927	1125248
		0.55	842580	2057405	1073047
		0.6	899952	1993102	1023556
		0.65	954809	1931846	976624
		0.7	1007279	1873475	932110
		0.75	1057486	1817837	889878
		0.8	1105544	1764788	849803
		0.85	1151561	1714190	811767
		0.9	1195641	1665917	775656
		0.95	1237881	1619847	741367
		1	1278372	1575865	708799
Tonnes	Tonnes		Tonnes	Tonnes	Tonnes

Table 3.21. Northeast Arctic COD. Detailed prediction output assuming Fsq in 2017 and HCR in 2018.

Fbar age range: 5-10

Year: 2017
F multiplier: 1 Fbar: 0.334

Age	F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)
3	0.012	5650	4	566000	148	0	0
4	0.072	8102	10	135152	88	270	0
5	0.177	21599	36	152241	178	609	1
6	0.268	40621	95	191916	377	28404	56
7	0.316	25443	83	102929	302	50744	149
8	0.363	21729	99	78257	362	61119	283
9	0.394	13644	80	45962	274	43204	258
10	0.488	9610	71	27239	198	26967	196
11	0.496	11228	97	31446	292	31446	292
12	0.351	6876	79	25510	322	25408	321
13	0.21	1847	24	10721	156	10721	156
14	0.125	348	5	3257	54	3257	54
15+	0.125	412	6	3863	71	3863	71
Total	NA	167109	688	1374493	2822	286011	1836
		Thous	Thou. tonnes	Thous	Thou. tonnes	Thous	Thou. tonnes

Fbar age range: 5-10

Year: 2018
F multiplier: 1.2517
Fbar: 0.444

Age	F	CatchNos	Yield	StockNos	Biomass	SSNos(Jan)	SSB(Jan)
3	0.016	8030	6	607000	164	0	0
4	0.096	30628	37	389057	237	389	0
5	0.235	16910	30	92187	112	645	1
6	0.356	26072	61	96562	189	9656	19
7	0.42	36598	122	116869	344	40086	118
8	0.482	21463	97	61408	265	42126	182
9	0.523	16583	98	44561	281	39036	246
10	0.648	11090	80	25385	196	24649	190
11	0.658	6047	53	13690	127	13567	126
12	0.465	5331	61	15686	198	15639	197
13	0.279	3260	42	14710	214	14710	214
14	0.166	989	14	7115	117	7115	117
15+	0.166	715	11	5144	95	5144	95
Total	NA	183717	712	1489375	2538	212763	1505
		Thous	Thou. tonnes	Thous	Thou. tonnes	Thous	Thou. tonnes

Table 3.22. Northeast Arctic COD. Assesments results by means of TISVPA

Year	B(3+)	SSB	R(3)	F(5-10)
1984	801367	253777	386522	0.829
1985	965773	199581	575101	0.648
1986	1352192	179849	1064410	0.789
1987	1215348	134616	288228	1.017
1988	1004187	227697	210099	0.986
1989	901653	234863	181105	0.465
1990	987800	330721	212533	0.311
1991	1553516	711440	403314	0.230
1992	1951490	951404	698192	0.417
1993	2469176	841732	1066062	0.634
1994	2280968	635648	854977	0.832
1995	1972179	577001	561173	0.752
1996	1905101	657734	478806	0.717
1997	1740633	724067	678267	1.054
1998	1302073	438006	857097	1.063
1999	1087580	284244	489261	0.968
2000	1066029	228667	588541	0.671
2001	1303178	350093	478080	0.535
2002	1434998	472569	432110	0.523
2003	1531017	531573	685135	0.515
2004	1511366	625031	296638	0.618
2005	1521278	585012	564971	0.626
2006	1549878	605523	603915	0.662
2007	1961008	632691	1536579	0.515
2008	2805395	646498	1571270	0.366
2009	3583853	1033287	1024459	0.353
2010	3956690	1270136	547594	0.381
2011	4060835	1825237	677845	0.313
2012	4095068	2133121	628443	0.263
2013	4331961	2472544	729362	0.252
2014	3953028	2447137	828459	0.268
2015	3689404	2138758	294355	0.281
2016	3278616	1916312	233938	0.329
2017	2991431	2031025		

Table 3.23. NEA cod TISVPA estimates of abundance at age (thousands)

N(a,y)	3	4	5	6	7	8	9	10	11	12	13	14	15
1984	386522	135683	72126	41845	25230	12254	9081	1478	720	463	226	42	28
1985	575101	309523	97206	42205	18141	7073	3343	2472	479	424	196	133	33
1986	1064410	454770	217525	56168	19955	6753	2287	1303	1058	228	299	124	51
1987	268228	758294	313146	112914	23528	7094	2170	695	430	377	83	191	65
1988	210099	213712	512451	157043	37285	6197	2083	717	144	151	121	47	17
1989	181105	164020	150344	278001	58386	9077	1505	633	197	35	58	64	93
1990	212533	144971	120523	94684	154171	25291	3481	637	306	116	18	42	17
1991	403314	172434	111720	85108	60007	94371	14091	2025	369	196	78	11	22
1992	698192	325311	133516	79046	54605	35134	57214	8404	1275	251	142	60	7
1993	1066062	555342	241381	88422	45157	28128	16677	29607	4292	732	139	105	5
1994	854977	806509	413768	146339	45296	20121	11258	6427	12056	1784	304	74	16
1995	561173	564149	542207	243679	66859	14369	5903	3132	1742	3865	599	162	4
1996	478806	283211	354497	326516	118721	25514	5064	1814	912	502	1480	327	4
1997	678267	244682	162234	196122	161413	49422	9217	1952	558	303	183	706	3
1998	857097	394064	150852	80146	78047	47734	12830	2052	456	108	63	65	157
1999	489261	484695	234581	72594	30818	23861	10292	3644	491	143	25	25	94
2000	588541	350160	320654	111306	25279	10287	5755	2023	1163	164	58	4	59
2001	478080	441583	243132	171331	48390	8915	3627	1682	595	588	73	36	114
2002	432110	365895	314746	146156	80778	20103	3218	1641	636	254	358	50	33
2003	685135	314569	267352	191306	70686	31382	7591	1266	863	333	123	252	6
2004	296638	532738	237978	168328	97697	30728	12547	3474	588	526	189	82	41
2005	564971	222300	387091	148945	83546	37472	11113	4395	1353	246	300	120	35
2006	603915	375877	160079	223730	73884	33883	12784	4109	1491	589	114	207	712
2007	1536579	480979	269544	99310	110324	31744	12866	4041	1594	527	266	70	189
2008	1571270	1143549	355622	169595	56023	54167	14947	6143	1771	789	213	175	88
2009	1024459	1160826	845611	246985	104822	31807	26747	7700	3301	870	442	142	135
2010	547594	752533	885238	595409	158574	61705	17383	13796	4309	1862	211	298	213
2011	677845	388491	560465	630751	385047	92750	32294	9166	6973	1709	890	79	0
2012	628443	396821	260545	406143	432701	233599	54112	16556	4098	3373	933	483	166
2013	729362	416430	275215	188660	290578	286731	138890	32188	8965	2038	1855	566	923
2014	828459	450686	311744	196539	132332	190829	173843	74627	18182	4824	1110	1191	890
2015	294355	519708	310577	214934	130042	83821	113365	102697	39838	10750	2719	684	1297
2016	233938	202151	367116	204170	129320	78105	49940	70117	60875	19809	6191	1770	2189
2017	0	181304	146484	236025	123291	73969	42759	27684	39215	35488	11892	4281	1224

Table 3.24. NEA cod TISVPA estimates of fishing mortality coefficients

F(a,y)	3	4	5	6	7	8	9	10	11	12	13	14	15
1984	0.02303	0.14241	0.33297	0.57395	1.06585	1.01501	1.03808	0.94724	0.25242	0.76984	0.37534	0.37534	0.37534
1985	0.02068	0.13069	0.32637	0.45919	0.62685	0.94851	0.75124	0.77385	0.64036	0.19316	0.30928	0.30928	0.30928
1986	0.02163	0.15947	0.42139	0.66238	0.74778	0.87635	1.13666	0.89048	0.81381	0.68955	0.36033	0.36033	0.36033
1987	0.02645	0.1663	0.53019	0.90368	1.16796	1.06396	1.03142	1.4019	0.93148	0.87579	0.41894	0.41894	0.41894
1988	0.02501	0.17443	0.45608	0.94064	1.28956	1.32327	0.96294	0.94587	1.08934	0.78469	0.40273	0.40273	0.40273
1989	0.01376	0.0939	0.2567	0.38719	0.57867	0.60992	0.52737	0.42728	0.38357	0.4343	0.21072	0.21072	0.21072
1990	0.00819	0.06172	0.16604	0.27377	0.32741	0.40661	0.36785	0.32597	0.2466	0.22828	0.14089	0.14089	0.14089
1991	0.00638	0.03986	0.11851	0.19482	0.25855	0.26427	0.2828	0.25941	0.21225	0.16623	0.10471	0.10471	0.10471
1992	0.00942	0.06935	0.17495	0.33474	0.46279	0.53939	0.47272	0.5147	0.42402	0.34932	0.18088	0.18088	0.18088
1993	0.01452	0.08686	0.26377	0.42189	0.69631	0.84659	0.84327	0.73049	0.71874	0.59575	0.26398	0.26398	0.26398
1994	0.01707	0.11787	0.28776	0.56546	0.749	1.11376	1.13303	1.14236	0.85262	0.86362	0.33211	0.33211	0.33211
1995	0.01602	0.11179	0.31576	0.47385	0.7677	0.84845	1.03831	1.06854	0.94316	0.74315	0.32691	0.32691	0.32691
1996	0.02092	0.10802	0.30874	0.5472	0.6596	0.91534	0.83754	1.03586	0.93422	0.85705	0.33376	0.33376	0.33376
1997	0.02822	0.18891	0.40333	0.76261	1.19101	1.19552	1.45932	1.31365	1.46971	1.34203	0.46642	0.46642	0.46642
1998	0.03173	0.19403	0.55394	0.70975	1.11423	1.45336	1.14109	1.40309	1.09428	1.2521	0.46712	0.46712	0.46712
1999	0.02564	0.20643	0.52856	0.95077	0.92328	1.19301	1.21851	0.99396	1.03962	0.87034	0.43387	0.43387	0.43387
2000	0.02088	0.12737	0.42082	0.63217	0.85739	0.6823	0.70659	0.72521	0.55713	0.59207	0.30473	0.30473	0.30473
2001	0.0148	0.11219	0.27369	0.55545	0.65004	0.72051	0.49593	0.51644	0.4784	0.38709	0.23964	0.23964	0.23964
2002	0.01316	0.09077	0.28025	0.41812	0.6933	0.67407	0.6292	0.44322	0.4186	0.39847	0.2217	0.2217	0.2217
2003	0.01335	0.08163	0.22659	0.43685	0.52231	0.73517	0.60239	0.56898	0.36826	0.35665	0.20859	0.20859	0.20859
2004	0.01441	0.10117	0.25073	0.43926	0.71374	0.71904	0.87132	0.71139	0.6015	0.39619	0.24313	0.24313	0.24313
2005	0.0146	0.09716	0.27811	0.42588	0.61075	0.85223	0.71535	0.87603	0.64052	0.5588	0.24933	0.24933	0.24933
2006	0.01356	0.10536	0.28637	0.51863	0.6448	0.79321	0.93937	0.79063	0.86252	0.64901	0.27507	0.27507	0.27507
2007	0.01185	0.07517	0.23512	0.39058	0.56564	0.58625	0.60349	0.70823	0.54746	0.606	0.22837	0.22837	0.22837
2008	0.00684	0.06175	0.15494	0.29755	0.39532	0.48038	0.42648	0.44176	0.46262	0.37633	0.17909	0.17909	0.17909
2009	0.00601	0.04401	0.15951	0.24719	0.38988	0.44341	0.46342	0.41537	0.39117	0.41894	0.17863	0.17863	0.17863
2010	0.00647	0.04303	0.12558	0.26826	0.36504	0.50122	0.49043	0.51782	0.42012	0.405	0.20049	0.20049	0.20049
2011	0.00653	0.03861	0.10144	0.18333	0.34566	0.37404	0.4409	0.43545	0.41683	0.34939	0.18464	0.18464	0
2012	0.00798	0.03993	0.09299	0.15099	0.22324	0.36414	0.34091	0.404	0.36346	0.35656	0.17453	0.17453	0.17453
2013	0.00833	0.05611	0.11065	0.15931	0.21208	0.27252	0.38943	0.36732	0.39677	0.36542	0.19076	0.19076	0.19076
2014	0.01161	0.06075	0.16384	0.19819	0.23297	0.2689	0.30232	0.43886	0.37616	0.41621	0.21678	0.21678	0.21678
2015	0.01407	0.08468	0.17626	0.29675	0.28921	0.29281	0.29474	0.33466	0.44412	0.3895	0.244	0.244	0.244
2016	0.01008	0.0656	0.17044	0.274	0.35864	0.40249	0.38997	0.3611	0.33964	0.31026	0.16898	0.16898	0.16898
2017													

Table 3.25. North East arctic cod. Stock numbers at age (in thousands) estimated by VPA including discard estimates, and % increase in stock numbers relative to a VPA without discards. From Dingsør (2001). The discard numbers applied correspond to method II (1946-1982) and IIIb (1983-1998) mentioned in Dingsør (2001).

	Estimated stock numbers (thousands)			Percent increase		
Year	Age 3	Age 4	Age 5	Age 3	Age 4	Age 5
1946	875 346	602 579	407 163	20 %	4 %	1 %
1947	531 993	676 806	465 099	27 %	14 %	0 %
1948	570 356	392 309	497 476	29 %	14 %	5 %
1949	589 367	416 668	285 459	26 %	16 %	3 %
1950	799 732	414 016	291 200	13 %	9 %	1 %
1951	1 235 322	586 054	302 346	14 %	2 %	0 %
1952	1 388 731	889 509	401 768	17 %	3 %	0 %
1953	1 801 114	975 004	600 908	13 %	2 %	0 %
1954	830 653	1 321 053	684 303	29 %	5 %	0 %
1955	381 489	615 696	907 875	40 %	19 %	2 %
1956	567 555	274 235	399 344	29 %	25 %	3 %
1957	914 850	387 496	161 710	14 %	10 %	2 %
1958	552 600	672 221	262 135	11 %	4 %	2 %
1959	757 567	391 906	406 694	11 %	3 %	0 %
1960	855 470	534 350	240 047	8 %	1 %	0 %
1961	1 041 570	620 707	347 043	13 %	1 %	0 %
1962	894 728	739 196	382 556	23 %	4 %	0 %
1963	551 938	614 025	429 068	17 %	10 %	0 %
1964	389 151	396 165	361 790	15 %	5 %	0 %
1965	845 469	293 844	266 134	9 %	8 %	0 %
1966	1 618 188	647 435	203 168	2 %	4 %	2 %
1967	1 404 569	1 249 506	465 035	9 %	0 %	1 %
1968	210 875	1 088 071	876 095	24 %	6 %	0 %
1969	143 791	155 947	699 033	28 %	15 %	2 %
1970	222 635	104 415	92 541	13 %	17 %	4 %
1971	462 474	164 397	65 112	14 %	6 %	2 %
1972	1 221 559	358 357	115 892	20 %	10 %	1 %
1973	1 858 123	947 409	249 400	2 %	19 %	11 %
1974	598 555	1 246 499	583 612	14 %	2 %	9 %
1975	654 442	382 692	627 793	5 %	10 %	3 %
1976	622 230	477 390	233 608	1 %	2 %	1 %
1977	397 826	426 386	280 645	14 %	0 %	0 %
1978	653 256	277 410	198 204	2 %	11 %	0 %
1979	225 935	460 104	164 243	14 %	2 %	1 %
1980	152 937	171 954	300 312	11 %	11 %	0 %
1981	161 752	116 964	116 337	7 %	7 %	4 %
1982	151 642	125 307	81 780	0 %	4 %	1 %
1983	166 310	115 423	82 423	0 %	-1 %	3 %
1984	408 525	133 333	77 728	3 %	0 %	0 %
1985	543 828	324 072	96 327	4 %	2 %	0 %
1986	1 114 252	412 683	219 993	7 %	2 %	0 %
1987	307 425	767 656	268 642	7 %	4 %	0 %
1988	222 819	215 720	490 161	9 %	3 %	2 %
1989	180 066	166 955	151 576	4 %	6 %	0 %
1990	249 968	139 922	114 006	3 %	2 %	1 %
1991	418 955	200 700	105 559	2 %	2 %	0 %
1992	748 962	333 517	151 973	4 %	1 %	0 %
1993	1 002 933	576 112	238 980	10 %	2 %	0 %
1994	896 184	744 062	420 039	9 %	8 %	0 %
1995	733 664	584 808	476 048	10 %	6 %	3 %
1996	467 093	341 918	344 124	3 %	7 %	3 %
1997	765 234	238 202	193 102	3 %	0 %	4 %
1998	836 301	429 147	144 629	2 %	1 %	-1 %

Table 3.26. Northeast Arctic cod. Number (thousands) of cod by age groups taken as by-catch in the Norwegian shrimp fishery (1984-2006)

Age\Year	1984	1985	1986	1987	1988	1989	1990	1991
0	322	4537	28	1408	259	717	2971	11651
1	4913	19437	2339	3259	1719	668	13731	34450
2	1624	49334	6952	1961	1534	418	1518	2759
3	1073	2720	5245	499	1360	694	1019	87
4	2200	1891	716	2210	1882	2096	403	64
5	161	9306	737	1715	1124	2281	909	33
6	89	6374	520	411	269	1135	2913	293
7	144	266	92	79	186	184	1434	1138
8	38	1	93	28	178	13	185	316
9	1	2	165	6	1	0	3	29
10	0	3	88	1	0	0	9	0
11	0	0	0	0	0	0	0	0
Total('000)	10564	93872	16976	11576	8532	8206	25095	50819

Age\Year	1992	1993	1994	1995	1996	1997	1998	1999
0	6486	604	1042	1138	519	896	506	651
1	5236	6702	1628	1896	9084	17157	40314	7155
2	2922	4032	410	99	359	1805	5248	245
3	242	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
Total('000)	14886	11339	3080	3133	9962	19858	46068	8052

Age\Year	2000	2001	2002	2003	2004	2005	2006
0	66	1188	478	4253	713	945	1355
1	1572	7187	293	8805	1014	3411	2597
2	3152	1348	893	96	323	1628	218
3	218	0	190	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0
Total('000)	5007	9723	1854	13154	2051	5984	4170

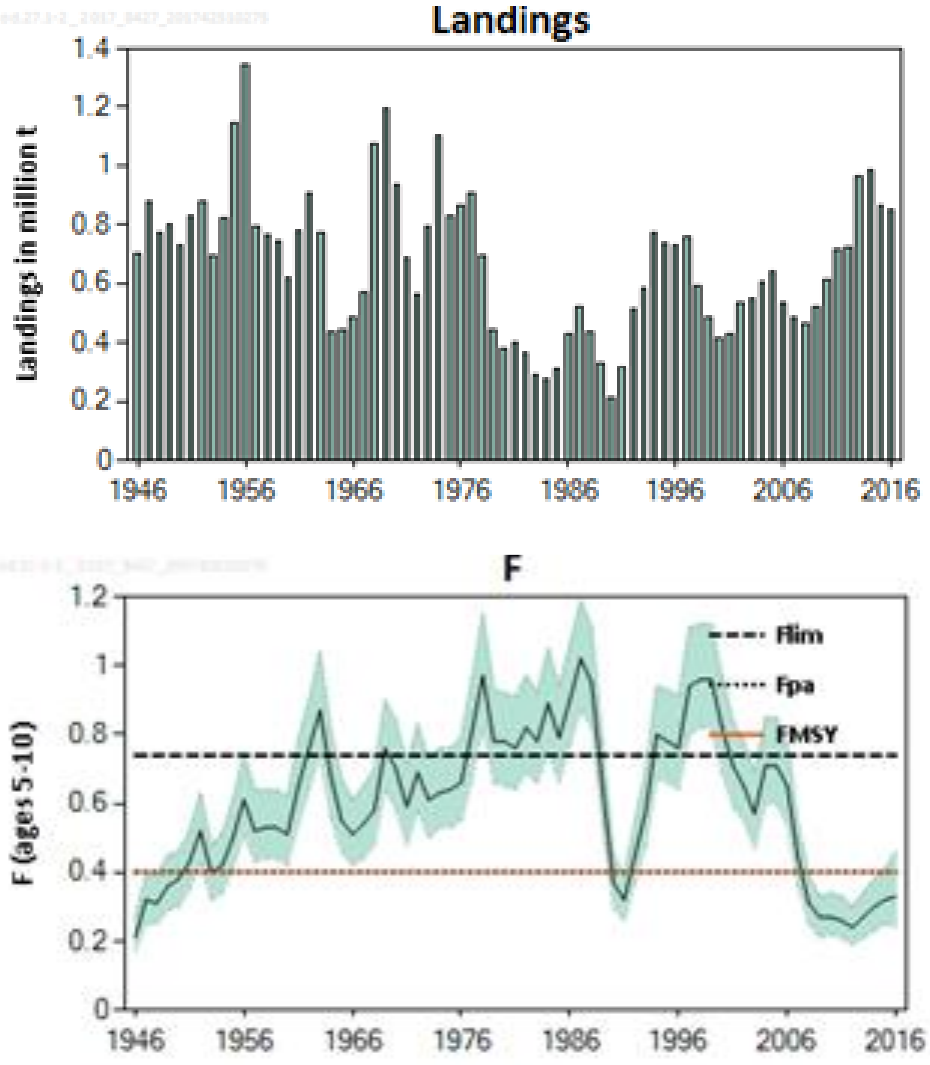


Fig. 3.1. ICES Standard plots for Northeast Arctic cod (sub-area I and II)

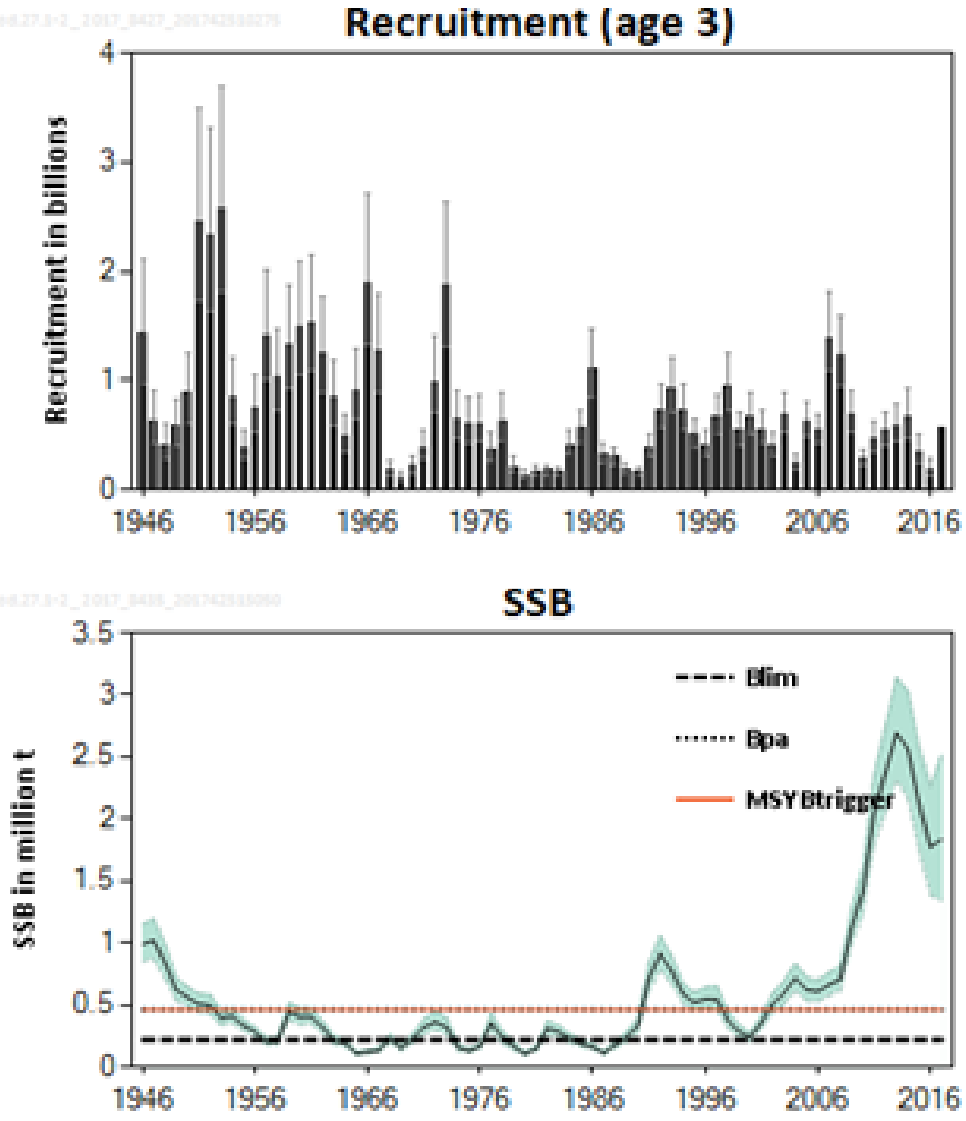


Fig. 3.1 (continued). ICES Standard plots for Northeast Arctic cod (sub-area I and II)

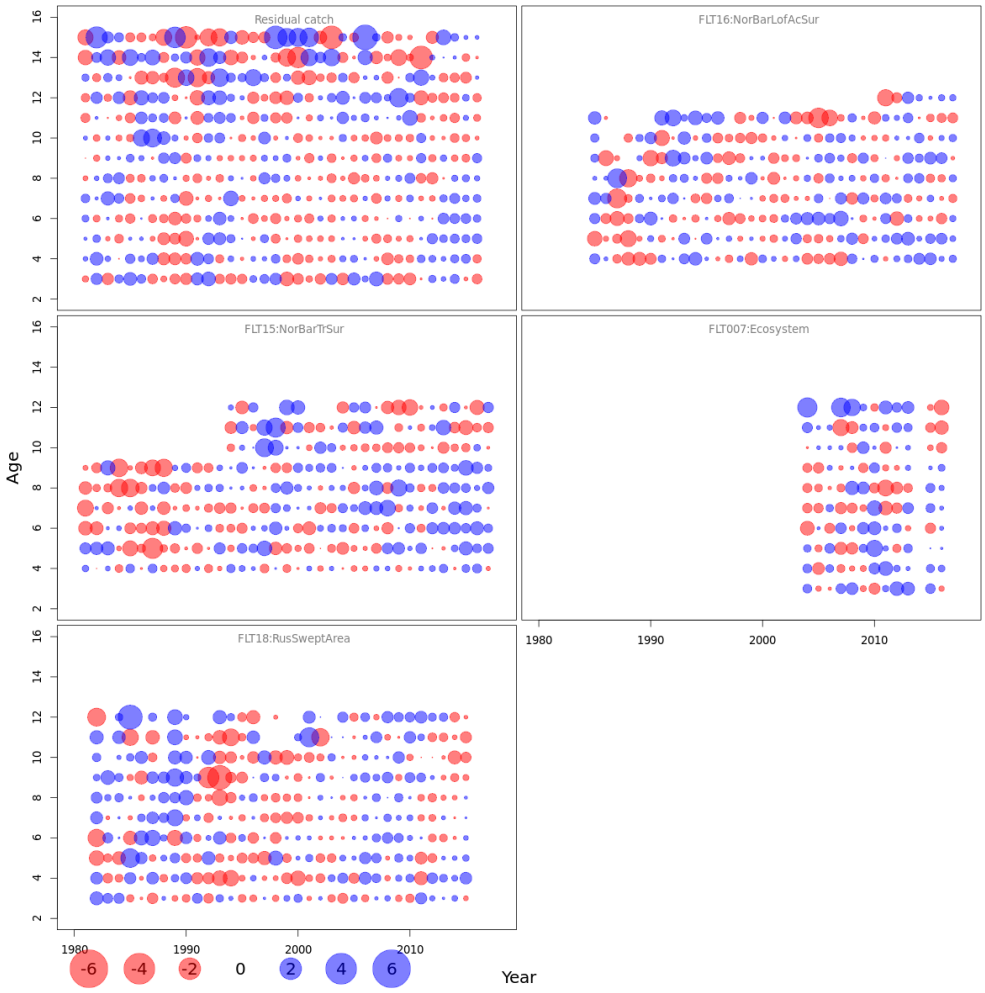


Figure 3.2a. Log catchability residuals of catch and fleets used in the final SAM run.

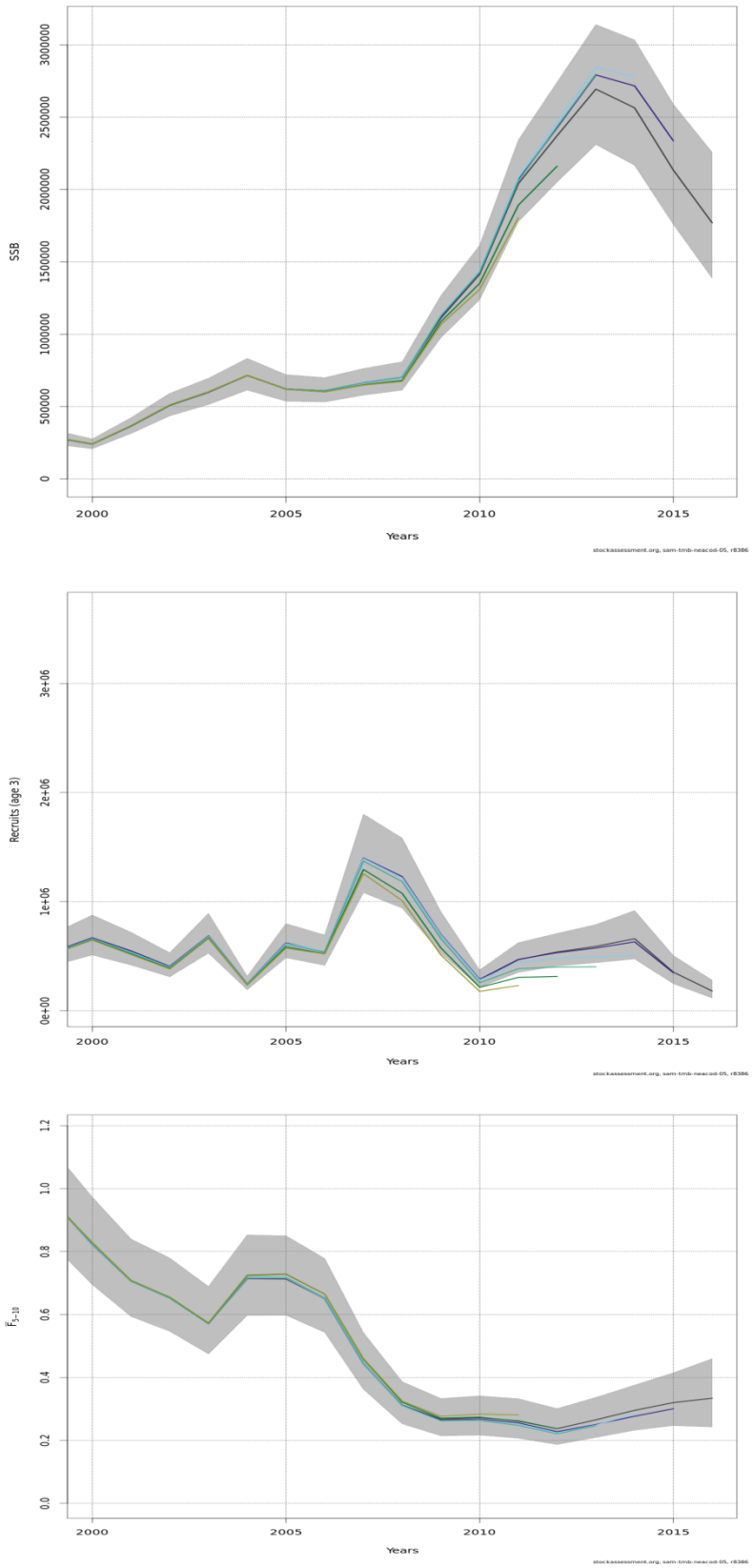


Figure 3.2b. NEA cod SSB, R and Fbar retrospective pattern for final SAM run.

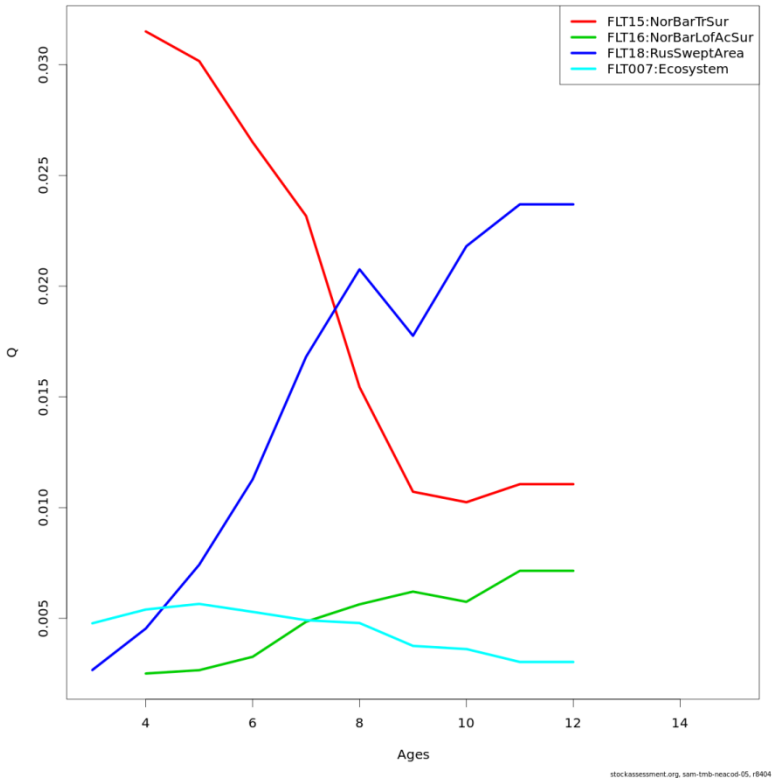


Figure 3.2c. NEA cod. Catchability of different fleets used for final SAM run fit.

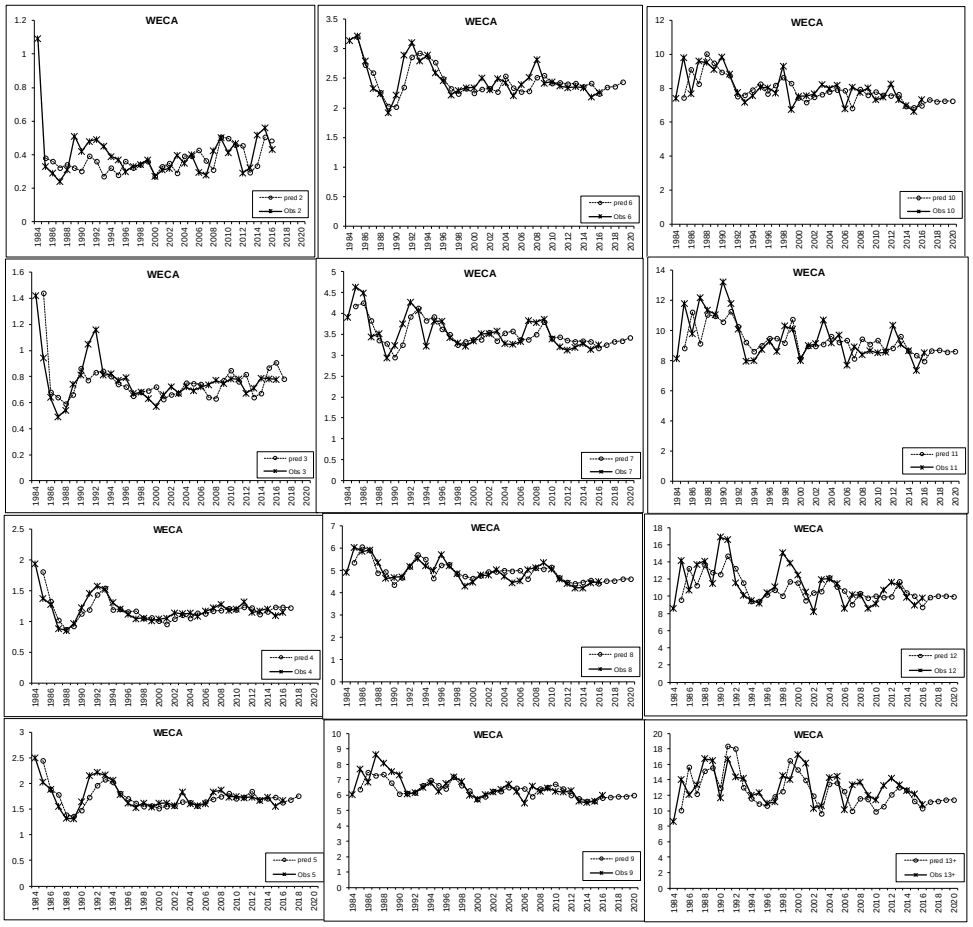


Figure 3.3. Northeast Arctic cod. Weight in catch predictions.

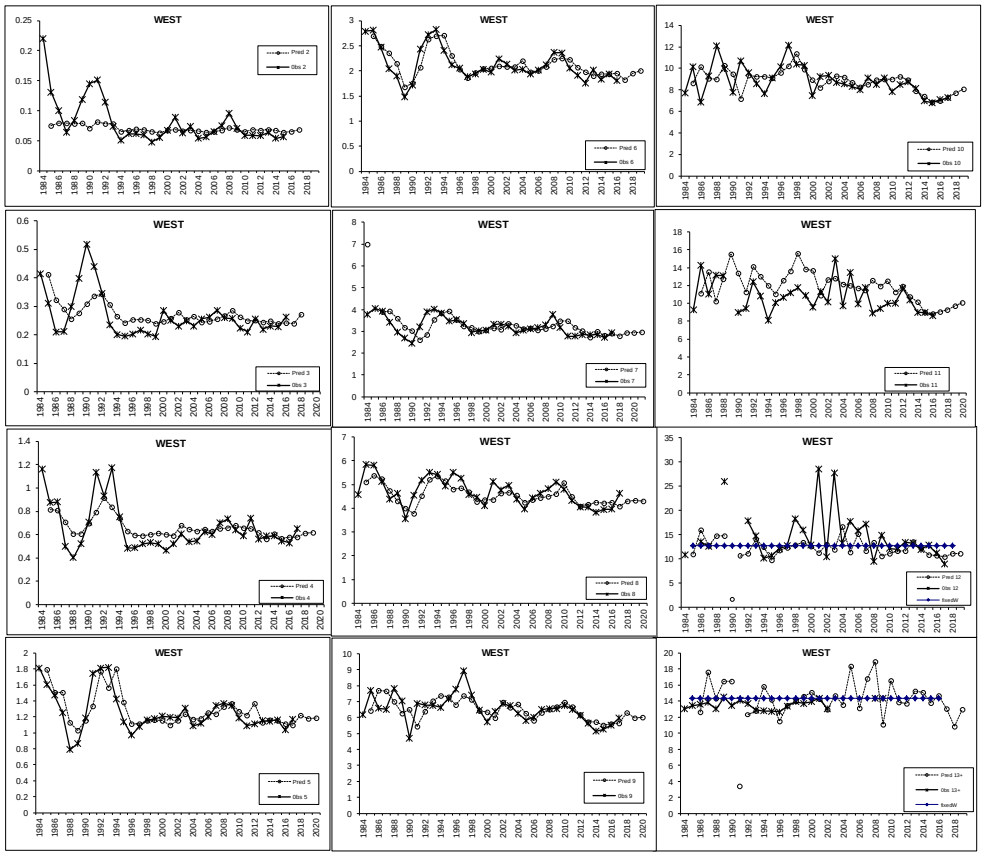


Figure 3.4. Northeast Arctic cod. Weight in stock projections

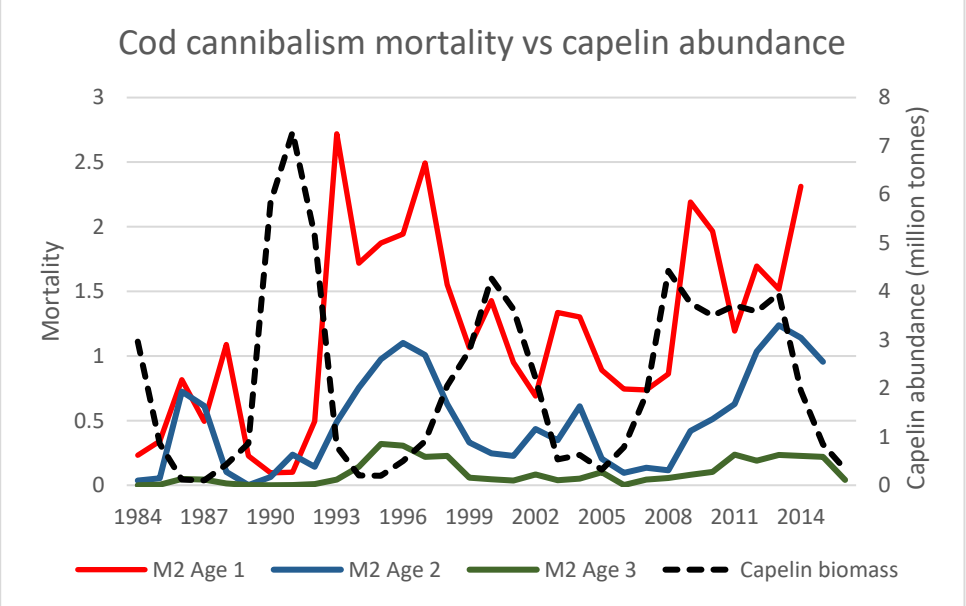
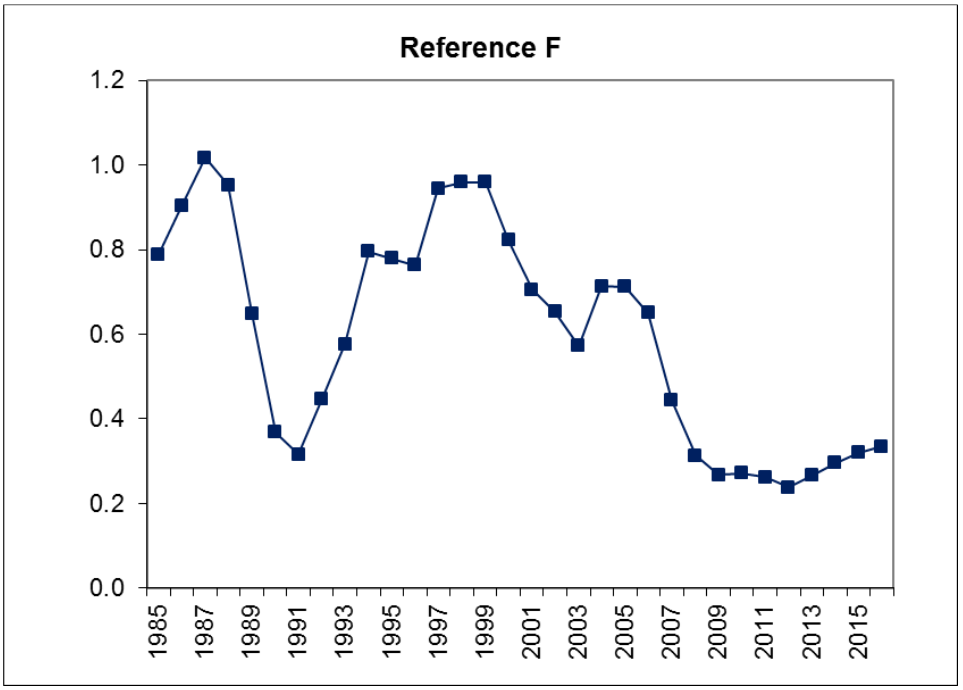


Figure 3.5. NEA cod cannibalism mortality vs. capelin abundance.



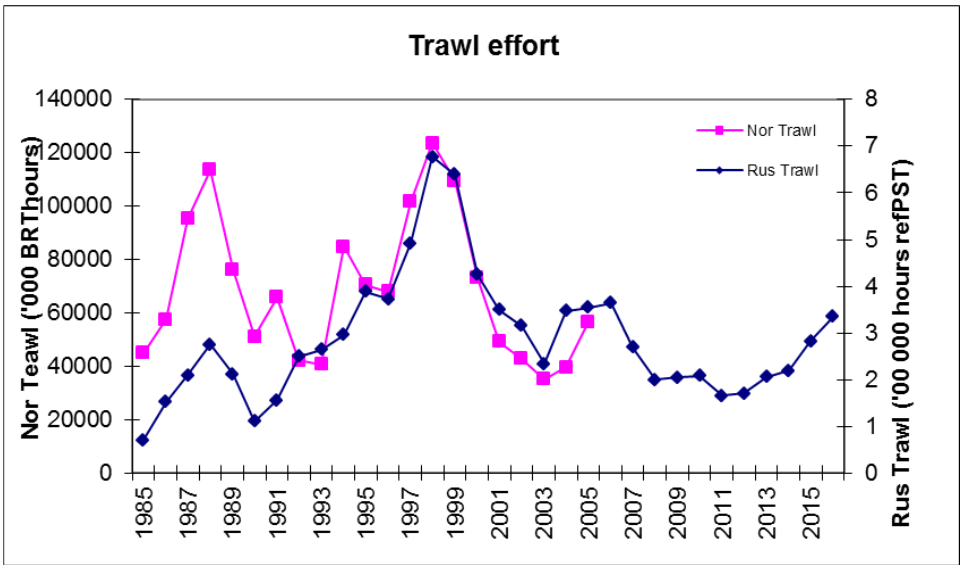


Figure 3.6. Northeast Arctic cod. Fishing mortality (F5-10) (top panel) and trawl efforts in 1985-2016 (bottom panel).

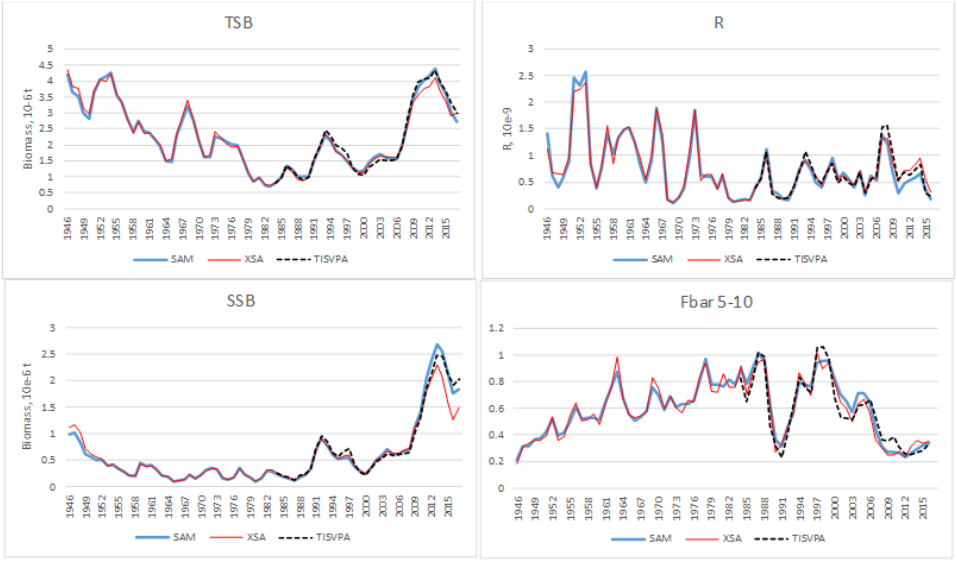


Figure 3.7. Northeast Arctic cod. Comparison of three models results

Table A1 North-East Arctic COD. Catch per unit effort.

	Sub-area I			Division IIb			Division IIa		Total
Year	Norway[2]	UK[3]	Russia[4]	Norway[2]	UK[3]	Russia[4]	Norway[2]	UK[3]	Norway
1960	-	0.075	0.42	-	0.105	0.31	-	0.067	
1961	-	0.079	0.38	-	0.129	0.44	-	0.058	
1962	-	0.092	0.59	-	0.133	0.74	-	0.066	
1963	-	0.085	0.60	-	0.098	0.55	-	0.066	
1964	-	0.056	0.37	-	0.092	0.39	-	0.070	
1965	-	0.066	0.39	-	0.109	0.49	-	0.066	
1966	-	0.074	0.42	-	0.078	0.19	-	0.067	
1967	-	0.081	0.53	-	0.106	0.87	-	0.052	
1968	-	0.110	1.09	-	0.173	1.21	-	0.056	
1969	-	0.113	1.00	-	0.135	1.17	-	0.094	
1970	-	0.100	0.80	-	0.100	0.80	-	0.066	
1971	-	0.056	0.43	-	0.071	0.16	-	0.062	
1972	0.90	0.047	0.34	0.59	0.051	0.18	1.08	0.055	
1973	1.05	0.057	0.56	0.43	0.054	0.57	0.71	0.043	
1974	1.75	0.079	0.86	1.94	0.106	0.77	0.19	0.028	
1975	1.82	0.077	0.94	1.67	0.100	0.43	1.36	0.033	
1976	1.69	0.060	0.84	1.20	0.081	0.30	1.69	0.035	
1977	1.54	0.052	0.63	0.91	0.056	0.25	1.16	0.044	1.17
1978	1.37	0.062	0.52	0.56	0.044	0.08	1.12	0.037	0.94
1979	0.85	0.046	0.43	0.62	-	0.06	1.06	0.042	0.85
1980	1.47	-	0.49	0.41	-	0.16	1.27	-	1.23
					Spain[5]			**Russia**[4]	
1981	1.42	-	0.41	(0.96)	-	0.07	1.02	0.35	1.21
1982	1.30	-	0.35	-	0.86	0.26	1.01	0.34	1.09
1983	1.58	-	0.31	(1.31)	0.92	0.36	1.05	0.38	1.11
1984	1.40	-	0.45	1.20	0.78	0.35	0.73	0.27	0.96
1985	1.86	-	1.04	1.51	1.37	0.50	0.90	0.39	1.29
1986	1.97	-	1.00	2.39	1.73	0.84	1.36	1.14	1.70
1987	1.77	-	0.97	2.00	1.82	1.05	1.73	0.67	1.77
1988	1.58	-	0.66	1.61	(1.36)	0.54	0.97	0.55	1.03
1989	1.49	-	0.71	0.41	2.70	0.45	0.78	0.43	0.76
1990	1.35	-	0.70	0.39	2.69	0.80	0.38	0.60	0.49
1991	1.38	-	0.67	0.29	4.96	0.76	0.50	0.90	0.44
1992	2.19	-	0.79	3.06	2.47	0.23	0.98	0.65	1.29
1993	2.33	-	0.85	2.98	3.38	1.00	1.74	1.03	1.87
1994	2.50	-	1.01	2.82	1.44	1.14	1.27	0.86	1.59
1995	1.57	-	0.59	2.73	1.65	1.10	1.00	1.01	1.92
1996			0.74		1.11	0.85		0.99	1.81
1997			0.61			0.57		0.74	1.36
1998			0.37			0.29		0.40	0.83
1999			0.29			0.34		0.39	0.74
2000			0.34			0.37		0.53	0.92
2001			0.46			0.46		0.69	1.21
2002			0.58			0.66		0.57	1.35
2003			0.70			1.22		0.73	1.67
2004			0.48			0.78		0.84	1.67
2005			0.45			0.62		0.81	1.23
2006			0.49			0.54		0.84	0.88
2007			0.71			0.51		0.88	1.16
2008			0.93			0.79		1.21	
2009			1.33			1.16		0.83	
2010			1.47			1.18		1.16	
2011			1.77			1.69		2.46	4.89[6]
2012			2.25			1.44		2.11	6.78[6]
2013			2.30			1.46		2.60	5.07[6]
2014			2.07			1.54		2.38	5.90[6]
2015			1.06			1.38		1.93	4.65[6]
2016[1]			1.15			1.39		1.06	3.78[6]

[1]Preliminary figures.
[2]Norwegian data - t per 1,000 tonnage*hrs fishing.
[3]United Kingdom data - t per 100 tonnage*hrs fishing.
[4]Russian data - t per hr fishing.
[5]Spanish data - t per hr fishing.
[6]2011-2016 Norwegian data on t per hr fishing are from single-trawl only, not comparable to data from previous years

Period	Sub-area I	Divisions IIa and IIb
1960–1973	RT	RT
1974–1980	PST	RT
1981–	PST	PST

Vessel type:

RT = side trawlers, 800–1000 HP, PST = stern trawlers, up to 2000 HP

Table A2 North-east Arctic COD. Abundance indices (millions) from the Norwegian acoustic survey in the Barents Sea in January-March. New TS and rock-hopper gear (1981-1988 back-calculated from bobbins gear). Corrected for length-dependent effective spread of trawl. Data from 1994 onwards from WD 3, 2017

Year		Age															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	10+	Total
1981	8.0	82.0	40.0	63.0	106.0	103.0	16.0	3.0	1.0							1.0	423.0
1982	4.0	5.0	49.0	43.0	40.0	26.0	28.0	2.0	+							0.0	197.0
1983	60.5	2.8	5.3	14.3	17.4	11.1	5.6	3.0	0.5							0.1	120.5
1984	745.4	146.1	39.1	13.6	11.3	7.4	2.8	0.2	0							0.0	966.0
1985	69.1	446.3	153.0	141.6	19.7	7.6	3.3	0.2	0.1							0.0	840.9
1986	353.6	243.9	499.6	134.3	65.9	8.3	2.2	0.4	0.1							0.0	1308.2
1987	1.6	34.1	62.8	204.9	41.4	10.4	1.2	0.2	0.7							0.0	357.3
1988	2.0	26.3	50.4	35.5	56.2	6.5	1.4	0.2	0							0.0	178.4
1989	7.5	8.0	17.0	34.4	21.4	53.8	6.9	1.0	0.1							0.1	150.1
1990	81.1	24.9	14.8	20.6	26.1	24.3	39.8	2.4	0.1							0.0	234.1
1991	181.0	219.5	50.2	34.6	29.3	28.9	16.9	17.3	0.9							0.0	578.7
1992	241.4	562.1	176.5	65.8	18.8	13.2	7.6	4.5	2.8							0.2	1092.9
1993	1074.0	494.7	357.2	191.1	108.2	20.8	8.1	5.0	2.3							2.5	2264.0
1994	858.3	577.2	349.8	404.5	193.7	63.6	12.1	3.7	1.7	0.55	0.52	0.11	0.05	0	0	1.23	2465.4
1995	2619.2	292.9	166.2	159.8	210.1	68.8	16.7	2.1	0.7	0.55	0.59	0.19	0	0	0	1.33	3537.4
1996	2396.0	339.8	92.9	70.5	85.8	74.7	20.6	2.8	0.3	0.16	0.08	0.08	0.05	0.02	0	0.39	3083.8
1997 [1]	1623.5	430.5	188.3	51.7	49.3	37.2	22.3	4.0	0.7	0.68	0.46	0	0	0	0	1.14	2407.5
1998 [1]	3401.3	632.9	427.7	182.6	42.3	33.5	26.9	13.6	1.7	0.52	0.65	0	0.35	0	0.04	1.56	4762.8
1999	358.3	304.3	150.0	96.4	45.1	10.3	6.4	4.1	0.8	0.27	0.02	0.03	0.02	0	0	0.34	976.0
2000	154.1	221.4	245.2	158.9	142.1	45.4	9.6	4.7	3.0	0.36	0.10	0.03	0.02	0	0	0.51	985.4
2001	629.9	63.9	138.2	171.6	77.3	39.7	11.8	1.4	0.5	0.19	0.04	0	0	0	0.01	0.24	1134.7
2002	18.2	215.5	69.3	112.2	102.0	47.0	18.0	3.0	0.4	0.19	0.05	0	0	0	0.02	0.26	585.9
2003	1693.9	61.5	303.4	114.4	129.0	114.9	34.3	7.7	1.9	0.16	0.04	0	0.02	0.02	0	0.24	2461.5
2004	157.6	105.2	33.6	92.8	30.7	27.6	17.0	5.9	1.2	0.29	0.08	0.01	0.01	0	0	0.39	471.8
2005	465.3	119.6	123.9	33.7	62.8	16.9	14.5	4.2	1.0	0.30	0.04	0.02	0.03	0.04	0	0.43	842.4
2006 [2]	544.6	216.6	79.8	59.1	15.5	25.6	8.8	4.5	1.4	0.22	0.21	0.08	0	0	0	0.51	956.5
2007 [1]	125.0	61.7	80.3	37.1	30.4	9.1	14.1	5.0	2.1	0.40	0.31	0.08	0	0	0	0.79	365.6
2008	68.8	97.6	210.2	306.1	140.6	69.4	21.6	12.2	3.1	0.35	0.02	0.02	0.01	0	0	0.40	930.4
2009	321.5	30.6	182.6	178.3	137.1	35.0	12.5	5.2	3.7	0.50	0.18	0.03	0.03	0	0	0.74	907.3
2010	485.4	59.4	34.7	121.9	174.7	162.3	44.4	13.8	3.5	1.64	0.57	0.05	0.02	0.03	0.02	2.33	1103.6
2011	389.4	124.8	47.1	29.1	80.4	107.7	105.4	17.1	4.5	1.17	0.79	0.20	0.17	0.04	0.02	2.39	908.6
2012 [2]	950.6	72.7	133.9	52.7	37.7	69.4	126.1	77.0	10.4	2.33	0.87	0.60	0.47	0.02	0.05	4.34	1536.4
2013	470.6	110.8	64.1	85.0	70.8	51.7	86.0	123.8	70.1	2.21	2.83	0.41	0.35	0.06	0.03	5.89	1145.3
2014	630.1	139.1	220.0	117.8	91.5	65.1	37.5	77.3	63.2	9.36	1.01	0.97	0.15	0.04	0.07	11.60	1467.7
2015	1140.8	127.0	94.9	154.2	118.3	98.0	80.4	20.5	68.3	17.00	2.86	0.72	0.10	0.07	0.04	20.79	1928.5
2016	142.9	120.7	41.0	58.3	96.7	63.4	51.2	21.9	15.0	15.00	6.52	0.99	0.50	0.17	0.14	23.32	635.2
2017 [2]	396.6	48.5	91.2	40.4	48.4	67.7	36.9	26.2	13.7	5.45	3.14	5.19	0.66	0.46	0.10	15.00	784.5

[1] Survey covered a larger area

[2] Adjusted indices

Table A3. North-East Arctic COD. Abundance indices (millions) from the Norwegian bottom trawl survey in the Barents Sea in January-March. Rock-hopper gear (1981-1988 back-calculated from bobbins gear). Corrected for length-dependent effective spread of trawl.

Data from 1994 and onwards - WD 3, 2017

				Age													
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	10+	Total
1981	4.60	34.30	16.40	23.30	40.00	38.40	4.80	1.00	0.30							0	163.1
1982	0.80	2.90	28.30	27.70	23.60	15.50	16.00	1.40	0.20							0	116.4
1983	152.90	13.40	24.95	52.34	43.33	16.96	5.82	3.21	0.97							0.1	313.9
1984	2755.04	379.11	97.49	28.28	21.44	11.74	4.07	0.40	0.08							0.1	3297.7
1985	49.49	660.04	166.79	125.98	19.92	7.67	3.34	0.21	0.07							0.1	1033.6
1986	665.79	399.61	805.00	143.93	64.14	8.30	1.91	0.34	0.04							0.0	2089.1
1987	30.72	444.98	240.38	391.15	54.35	15.70	2.00	0.45	0.03							0.0	1179.8
1988	3.21	72.83	148.03	80.49	173.31	20.48	3.58	0.53	0.03							0.0	502.5
1989	8.24	15.62	46.36	75.86	37.79	90.19	9.82	0.94	0.10							0.1	285.0
1990	207.17	56.72	28.35	34.87	34.59	20.56	27.23	1.61	0.38							0.0	411.5
1991	460.45	220.14	45.85	33.67	25.65	21.49	12.15	12.67	0.61							0.0	832.7
1992	126.56	570.92	158.26	57.71	17.82	12.83	7.67	4.29	2.72							0.2	959.0
1993	534.48	420.40	273.89	140.13	72.48	15.83	6.24	3.89	2.23							2.4	1471.9
1994	1044.50	545.50	296.80	307.60	152.60	46.80	8.13	2.59	1.32	0.55	0.52	0.11	0.05	0	0	1.2	2407.0
1995	5343.80	540.20	280.40	242.10	252.30	77.10	17.90	2.33	1.13	0.55	0.59	0.19	0	0	0	1.3	6758.7
1996	5908.30	778.60	164.00	116.70	140.70	111.20	24.80	2.79	0.37	0.16	0.08	0.08	0.05	0.02	0	0.4	7247.9
1997 [1]	5122.80	1413.70	315.40	69.20	75.00	60.70	26.80	4.95	0.63	0.68	0.46	0	0	0	0	1.1	7090.2
1998 [1]	2512.10	492.50	355.20	167.40	31.70	26.40	17.50	8.26	0.79	0.52	0.65	0	0.35	0	0.04	1.6	3613.4
1999	479.70	353.60	189.60	181.90	61.30	12.80	6.83	5.19	0.98	0.27	0.02	0.03	0.02	0	0	0.3	1292.2
2000	128.20	242.80	247.50	130.00	112.00	27.00	4.73	1.82	1.23	0.36	0.10	0.03	0.02	0	0	0.5	895.8
2001	715.80	77.60	182.00	194.50	81.60	38.00	9.58	1.19	0.45	0.19	0.04	0	0	0	0.01	0.2	1300.9
2002	34.20	416.20	118.00	137.70	108.60	46.50	14.50	2.19	0.34	0.19	0.05	0	0	0	0.02	0.3	878.5
2003	3021.40	61.20	380.80	125.40	95.20	66.60	17.90	4.72	1.02	0.16	0.04	0	0.02	0.02	0	0.2	3774.3
2004	321.30	236.30	65.50	186.10	53.60	43.20	30.90	6.92	1.66	0.29	0.08	0.01	0.01	0	0	0.4	945.8
2005	846.80	216.40	244.80	54.80	102.70	22.40	16.40	3.80	0.88	0.30	0.04	0.02	0.03	0.04	0	0.4	1509.5
2006 [2]	676.90	283.80	115.60	114.00	28.10	43.30	14.00	5.19	1.34	0.22	0.21	0.08	0	0	0	0.5	1282.6
2007 [1]	584.20	369.90	365.80	127.30	68.90	13.70	23.60	6.85	2.20	0.40	0.31	0.08	0	0	0	0.8	1563.2
2008	69.00	103.30	192.50	300.00	115.60	40.80	18.00	8.29	1.86	0.35	0.02	0.02	0.01	0	0	0.4	850.0
2009	389.40	35.50	124.30	196.10	218.00	58.20	17.50	8.44	5.27	0.50	0.18	0.03	0.03	0	0	0.7	1053.4
2010	1031.50	96.50	37.00	114.90	155.50	144.50	39.80	11.20	3.70	1.64	0.57	0.05	0.02	0.03	0.02	2.3	1637.0
2011	615.30	225.60	85.40	50.70	129.90	138.00	103.10	16.70	4.34	1.17	0.79	0.20	0.17	0.04	0.02	2.4	1371.4
2012 [3]	728.40	124.80	83.10	70.30	36.40	93.90	136.30	49.60	9.38	2.33	0.87	0.60	0.47	0.02	0.05	4.3	1336.6
2013	439.10	147.20	70.30	119.80	64.00	41.00	65.00	76.20	33.60	2.21	2.83	0.41	0.35	0.06	0.03	5.9	1062.0
2014	499.80	148.80	180.60	85.10	67.90	47.80	32.60	46.90	31.70	9.36	1.01	0.97	0.15	0.04	0.07	11.6	1153.0
2015	1295.00	196.80	125.40	170.20	135.70	99.80	71.20	27.40	52.80	17.00	2.86	0.72	0.10	0.07	0.04	20.8	2194.8
2016	212.30	232.90	53.40	112.30	151.30	109.00	66.10	26.60	12.80	15.00	6.43	0.96	0.50	0.17	0.14	23.2	1000.0
2017 [3]	471.50	71.00	115.90	39.90	48.70	56.60	27.80	18.90	7.63	3.01	2.22	3.49	0.53	0.17	0.06	9.5	867.5

1Indices raised to also represent the Russian EEZ.

2 Not complete coverage in southeast due to restrictions, strata 7 area set to default and strata 13 as in 2005

3Indices raised to also represent uncovered parts of the Russian EEZ.

Table A4. North East Arctic COD. Abundance at age (millions) from the Norwegian acoustic survey on the spawning grounds off Lofoten in March-April

Table A4. North East Arctic COD. Abundance at age (millions) from the Norwegian acoustic survey on the spawning grounds off Lofoten in March-April.												
Year	5	6	7	8	9	10	11	12	13	14+	12+	Sum
1985	0.68	7.45	12.36	3.11	1.15	1.01	0.45					26.21
1986	2.49	3.30	5.54	2.71	0.16		0.40				0.08	14.68
1987	8.77	7.04	0.23	2.83	0.04		0.03				0.03	18.97
1988	1.57	4.43	2.56	0.05	0.01	0.05						8.67
1989	0.04	13.20	9.73	2.20	0.38	0.12					0.06	25.73
1990	0.13	2.60	27.02	4.85	0.49	0.32						35.41
1991	0.00	5.00	19.83	32.67	2.75	0.19	0.17					60.61
1992	2.74	5.23	20.80	20.87	79.60	4.17	1.61				0.22	135.24
1993	4.87	14.58	17.35	20.22	25.44	41.95	4.74				0.71	129.86
1994	23.78	25.85	10.36	8.21	7.68	3.49	17.53				2.61	99.51
1995	6.49	35.24	12.34	2.27	3.60	2.56	2.15				7.96	72.61
1996	1.41	14.43	24.00	3.65	0.79	0.25	0.80				1.30	46.63
1997	0.40	4.95	27.56	16.50	1.50	0.42					0.75	52.08
1998	0.05	0.30	7.06	11.05	3.24	0.51	0.18				0.02	22.41
1999	0.25	1.92	4.84	14.58	8.42	0.75	0.19				0.10	31.05
2000	3.61	3.85	3.25	2.15	2.23	0.45	0.39				0.05	15.98
2001	4.33	17.61	8.03	0.96	0.33	0.36	0.26				0.09	31.97
2002	2.30	19.11	16.50	6.49	0.83	0.31	0.47				0.01	46.02
2003	2.49	29.56	30.01	13.46	1.90	0.11	0.04				0.02	77.59
2004	1.96	17.52	29.82	16.34	7.67	2.04	0.15				0.68	76.18
2005	3.33	12.93	28.75	13.06	6.51	1.55	0.06				0.16	66.35
2006	0.20	12.50	8.11	10.98	7.42	2.12	0.16				0.66	42.14
2007	1.46	3.88	28.52	8.69	5.35	2.80	0.68				0.36	51.72
2008	0.45	5.96	2.95	20.72	2.70	2.02	1.66				0.71	37.17
2009	3.42	14.48	27.64	8.10	22.31	3.07	1.56				0.37	80.95
2010	1.22	32.60	26.50	23.68	7.56	6.32	0.81				1.54	100.22
2011	2.02	51.01	178.92	48.47	18.10	4.58	6.98				0.44	310.50
2012	0.37	13.43	98.37	77.69	20.53	7.37	3.18				1.80	222.74
2013	0.22	5.84	33.44	101.10	105.50	15.91	7.01				6.38	275.40
2014	0.25	2.83	15.42	58.13	111.9	75.33	12.25				8.84	284.95
2015	0.96	1.58	16.09	15.66	42.91	44.45	26.80				11.01	159.46
2016	0.15	1.21	7.50	12.00	19.09	32.63	22.84	15.85	7.97	1.89	25.70	121.11
2017	0.18	8.94	12.86	24.07	14.76	12.58	11.58	12.01	3.72	3.51	19.24	104.20

Table A5. COD length (cm) at agein the Barents Sea from the investigations winter 1981–2017

Table A5. COD. Length (cm) at age in the Barents Sea from the investigations winter 1981 - 2017.

	Age													
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
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	12.8	27.6	34.8	45.9	54.5	62.7	73.1	78.6						
1984	14.2	28.4	35.8	48.6	56.6	66.2	74.1	79.7						
1985	16.5	23.7	40.3	48.7	61.3	71.1	81.2	85.7						
1986	11.9	21.6	34.4	49.9	59.8	69.4	80.3	93.8						
1987	13.9	21.0	31.8	41.3	56.3	66.3	77.6	87.9						
1988	15.3	23.3	29.7	38.7	47.6	56.8	71.7	79.4						
1989	12.5	25.4	34.7	39.9	46.8	56.2	67.0	83.3						
1990	14.4	27.9	39.4	47.1	53.8	60.6	68.2	79.2						
1991	13.6	27.2	41.6	51.7	59.5	67.1	72.3	77.6						
1992	13.2	23.9	41.3	49.9	60.2	68.4	76.1	82.8						
1993	11.3	20.3	35.9	50.8	59.0	68.2	76.8	85.8						
1994	11.3	17.9	30.2	44.6	55.1	65.5	73.8	78.5	87.5	97.9	97.7	100.8	122.1	-
1995	12.2	18.0	28.8	42.1	54.0	63.7	75.7	80.2	83.9	99.1	+	109.0	-	-
1996	12.1	18.9	28.7	40.6	49.3	60.9	71.7	84.8	92.2	92.2	99.5	104.6	108.7	121.0
1997	10.9	15.9	26.8	39.9	49.5	59.2	69.9	81.6	91.8	+	+	-	-	-
1998	9.8	18.0	29.3	40.0	50.9	58.9	67.7	76.7	87.4	+	+	-	+	-
1999	12.0	18.3	29.0	39.9	50.4	59.4	70.4	78.5	88.7	88.4	+	+	+	-
2000	12.9	20.7	28.4	39.7	51.5	61.4	70.5	76.2	84.8	81.8	99.7	+	+	-
2001	11.6	22.6	33.0	41.1	52.2	63.3	70.2	77.7	86.0	96.2	103.8	-	-	-
2002	12.0	19.5	28.6	43.6	52.1	62.0	71.3	79.5	91.0	89.3	102.3	-	-	-
2003	11.4	18.0	28.9	39.4	53.4	61.7	70.6	80.8	89.1	90.6	104.5	-	105.8	111.6
2004	10.6	18.4	31.7	40.6	51.7	61.6	68.6	79.7	90.9	88.5	91.7	+	+	-
2005	11.2	18.3	29.5	43.5	51.1	60.3	71.0	79.6	88.9	96.2	109.4	+	+	+
2006	12.0	19.5	30.9	42.1	53.6	60.2	66.4	76.5	84.5	98.8	93.2	96.3	-	-
2007	13.1	21.0	29.4	40.2	53.1	62.9	68.7	76.6	87.6	94.9	102.4	+	-	-
2008	12.1	22.4	33.1	43.2	51.7	64.1	69.0	81.3	88.4	94.6	108.9	+	+	-
2009	11.2	21.2	32.1	42.6	53.1	61.7	76.5	81.8	89.3	97.9	99.9	+	+	-
2010	11.2	18.2	31.5	42.7	52.4	60.7	70.6	80.4	88.5	96.2	102.7	+	+	+
2011	11.9	19.4	29.5	41.9	51.0	60.7	68.1	78.3	85.9	95.2	101.3	111.1	111.7	119.0
2012	11.0	18.4	22.6	41.0	52.4	58.0	66.5	75.7	86.0	91.4	106.2	113.4	119.7	+
2013	11.2	19.2	31.0	41.0	51.6	62.1	69.7	76.5	81.1	95.2	92.2	110.7	110.7	+
2014	9.8	17.3	29.1	40.1	51.8	59.5	70.3	77.0	81.9	87.1	96.7	98.1	110.5	+
2015	10.5	16.2	30.0	39.9	51.2	60.5	69.0	77.6	80.1	88.9	95.4	101.4	+	+
2016	12.2	18.5	29.9	40.6	50.0	60.6	68.4	76.9	85.4	86.0	90.0	91.9	111.8	122.2
2017	12.4	21.8	31.4	42.3	51.9	60.8	69.7	79.5	85.9	90.6	96.3	91.9	106.9	108.7

In 1997, 1998 and 2012 lengths were adjusted for missing coverage of Russian EEZ.

Table A6 COD weight (g) at age in the Barents Sea from the investigations winter 1983–2017.

Table A6. COD. Weight (g) at age in the Barents Sea from the investigations winter 1983-2017.

Year \ Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1983	20	190	372	923	1597	2442	3821	4758						
1984	23	219	421	1155	1806	2793	3777	4566						
1985	20	171	576	1003	2019	3353	5015	6154						
1986	20	119	377	997	1623	2926	3838	7385						
1987	21	65	230	490	1380	2300	3970	6000						
1988	24	114	241	492	892	1635	3040	4373						
1989	16	158	374	604	947	1535	2582	4906	10943	5226				
1990	26	217	580	1009	1435	1977	2829	4435	10772	11045	9615			
1991	18	196	805	1364	2067	2806	3557	4502	7404	13447				
1992	20	136	619	1118	1912	2792	3933	5127	6420	8103	17705	22060		
1993	9	71	415	1179	1743	2742	3977	5758	7068	7515	7521	10744		
1994	12	55	260	796	1463	2372	3477	4624	6782	8420	8530	13516	20786	-
1995	15	53	239	656	1341	2194	3628	4577	5315	8907	+	12176	-	-
1996	15	62	232	632	1079	1979	3327	5479	7655	8192	9760	13013	13614	14650
1997	13	46	181	592	1097	1785	2917	4928	7290	+	+	-	-	-
1998	8	50	256	608	1184	1749	2601	4040	6383	+	+	-	+	-
1999	14	58	231	588	1178	1827	2994	4123	6343	7326	+	+	+	-
2000	16	74	210	558	1210	1961	3042	3842	5384	5727	9960	+	+	-
2001	14	106	336	642	1288	2233	3090	4332	5727	8571	11022	-	-	-
2002	14	67	233	747	1225	2065	3189	4577	7472	6431	11645	-	-	-
2003	13	59	229	586	1313	2013	2982	4725	6511	7552	12467	-	12885	16112
2004	10	59	276	607	1142	1946	2618	4139	6684	6988	7957	+	+	-
2005	13	61	245	724	1145	1857	2953	4224	6418	8607	12488	+	+	+
2006	13	69	280	663	1413	1965	2599	4244	5783	10131	8620	10735	-	-
2007	17	71	226	638	1370	2270	2918	4254	6556	8727	11130	+	-	-
2008	15	90	336	799	1410	2449	3144	5218	6793	9494	12918	+	+	-
2009	13	84	294	704	1293	2030	4061	5082	6884	9504	9614	+	+	-
2010	11	64	307	702	1297	2031	3165	4736	6501	9016	10417	+	+	+
2011	15	65	247	667	1129	1940	2725	4003	5914	8233	9888	13213	13814	+
2012	13	62	251	609	1278	1673	2480	3772	5923	7783	12298	14876	17868	+
2013	11	65	264	591	1201	2064	2804	3839	4814	8433	8759	15101	14729	+
2014	8	49	238	592	1234	1776	2849	3942	4946	6181	8368	9212	12578	+
2015	10	47	242	574	1250	1971	2760	4077	4621	6901	8096	11366	+	+
2016	13	54	239	602	1063	1952	2701	3855	5553	6034	6963	8061	15330	21950
2017	16	92	297	737	1253	2016	3091	4645	6088	7403	9186	8412	12416	14916

1987: Estimated weights

1997, 1998 and 2012: Adjusted weights due to missing coverage of Russian EEZ.

Table A7. Northeast Arctic COD. Length at age in cm in the Lofoten survey

Table A7.	**Northeast Arctic COD.** Length at age in cm in the Lofoten survey										
Year/age	5	6	7	8	9	10	11	12	13	14	12+
1985	59.6	71.1	79.0	88.2	97.3	105.2	114.0				
1986	62.7	70.0	80.0	89.4	86.6		105.8				115.0
1987	58.2	64.5	76.7	86.2	88.0		118.5				116.0
1988	53.1	67.1	71.6	94.0	97.0	119.6					
1989	54.0	59.0	69.8	80.8	96.6	103.0					125.0
1990	56.9	65.1	69.2	79.5	83.7	100.1					
1991	59.0	67.3	74.4	81.0	91.3	99.8	85.0				
1992	66.3	68.7	78.3	83.9	89.2	92.2	101.9				127.0
1993	58.3	66.1	72.8	83.6	87.4	92.7	95.4				111.2
1994	64.3	70.6	82.0	87.3	90.0	95.3	92.4				101.4
1995	61.5	69.7	77.8	84.4	92.6	96.7	100.3				99.5
1996	62.2	67.1	75.9	81.0	93.6	100.9	97.4				104.1
1997	63.7	68.6	74.2	83.8	99.9	108.4					109.0
1998	55.0	62.6	70.2	80.0	92.0	98.0	96.7				115.0
1999	52.7	67.0	69.4	78.6	85.8	100.3	102.0				125.0
2000	58.4	66.5	72.6	77.0	83.9	90.6	93.7				112.4
2001	59.3	66.9	73.2	87.1	88.7	102.8	98.5				128.2
2002	58.6	66.0	73.2	80.8	88.2	101.8	91.0				101.4
2003	62.3	65.0	73.2	80.9	88.9	86.4	120.0				122.0
2004	58.8	64.7	71.2	80.1	85.6	97.0	102.6				115.8
2005	56.3	65.4	72.3	76.0	85.3	95.5	110.5				117.8
2006	56.2	63.7	72.6	77.5	82.9	88.3	89.2				116.3
2007	63.0	66.4	72.4	82.5	88.2	99.8	103.7				115.0
2008	63.8	69.1	73.6	80.9	90.0	94.9	94.9				96.5
2009	60.5	69.3	76.5	82.7	88.7	98.8	92.9				111.6
2010	60.6	64.2	75.0	82.8	93.9	93.7	102.8				108.1
2011	56.8	64.5	70.0	79.9	91.1	96.7	101.1				104.8
2012	59.6	65.4	69.9	77.0	85.4	99.0	105.2				106.0
2013	63.6	68.8	73.1	78.2	83.5	90.9	99.1				96.6
2014	57.2	65.8	74.3	77.9	82.8	86.8	93.3				99.0
2015	60.4	67.8	73	78.3	83	88.3	94.7				99.2
2016	58.2	63	74.4	80.1	89.1	92.9	95.7				97.1
2017	57.6	64.9	70.7	80.9	87.3	94.7	98.6	99.3	102.6	106.6	

Table A8. Northeast Arctic COD. Mean weight at age (kg) in the Lofoten survey

Table A8. Northeast Arctic COD. Mean weight at age (kg) in the Lofoten survey											
Year	5	6	7	8	9	10	11	12	13	14+	12+
1985	2.00	3.42	4.61	6.67	8.89	10.73	14.29				
1986	2.22	3.22	4.74	6.40	5.80		10.84				13.48
1987	1.44	1.94	3.61	5.40	5.64		13.15				12.55
1988	1.46	2.82	3.39	6.63	7.27	13.64					
1989	1.30	1.77	2.89	4.74	8.28	9.98					26.00
1990	1.54	2.32	2.55	3.78	4.77	8.80					
1991	2.21	2.52	3.51	5.18	7.40	11.36	5.35				
1992	2.56	2.85	3.99	5.43	6.35	8.03	9.50				17.80
1993	1.79	2.58	3.55	5.31	6.21	7.69	9.28				14.71
1994	2.31	3.27	5.06	6.39	6.64	7.92	7.73				10.10
1995	2.20	3.24	4.83	5.98	7.80	10.03	10.39				10.68
1996	2.22	2.75	4.11	5.63	7.92	10.53	10.58				12.08
1997	2.42	2.92	3.86	5.71	9.65	13.41					12.67
1998	1.88	2.09	2.98	4.85	7.92	9.91	11.05				18.34
1999	1.51	2.80	2.96	4.22	5.92	9.33	9.17				16.00
2000	1.71	2.50	3.16	3.85	5.32	7.07	7.62				12.84
2001	1.90	2.72	3.49	6.23	6.82	10.95	10.29				28.58
2002	1.87	2.57	3.52	4.71	6.18	10.56	8.70				10.48
2003	2.30	2.34	3.48	4.59	5.89	8.07	24.50				27.70
2004	1.74	2.30	3.02	4.50	5.77	7.81	9.95				13.25
2005	1.56	2.40	3.20	3.71	5.79	8.52	16.27				18.63
2006	1.54	2.35	3.44	4.19	5.43	6.57	6.19				18.15
2007	2.34	2.67	3.53	5.30	6.70	9.95	11.24				16.62
2008	2.21	2.97	3.63	4.88	6.74	8.18	7.70				9.07
2009	2.04	2.98	4.10	5.19	6.56	9.38	8.58				15.67
2010	1.91	2.28	3.60	4.70	7.03	7.11	9.09				12.50
2011	1.61	2.29	2.89	4.51	6.79	8.30	9.46				10.54
2012	2.34	2.46	2.93	3.93	5.39	8.91	11.68				12.56
2013	2.49	3.04	3.51	4.43	5.54	7.56	10.25				11.69
2014	2.00	2.45	3.76	4.05	5.06	5.97	7.34				10.37
2015	2.14	2.66	3.44	3.91	5.06	6.27	7.89				11.32
2016	2.55	2.23	3.65	4.80	6.67	7.74	8.68	8.83	12.63	18.02	10.68
2017	1.96	2.48	2.94	4.80	5.74	7.12	8.16	9.12	10.43	12.31	

Table A9 North-east Arctic COD. Results from the Russian trawl-acoustic survey in the Barents Sea and adjacents waters in the autumm. Stock number in millions.

Table A9 North-east Arctic COD. Results from the Russian trawl-acoustic survey												
in the Barents Sea and adjacent wates in the autumn. Stock number in millions.												
Year					Age							
		1	2	3	4	5	6	7	8	9	10+	Total
1985	[1]	77	569	400	568	244	51	20	8	1	3	1941
1986	[1]	25	129	899	612	238	69	20	3	2	1	1998
1987	[2]	2	58	103	855	198	82	19	4	1	1	1323
1988	[2]	3	23	96	100	305	54	16	3	1	1	602
1989	[1]	1	3	17	45	57	91	75	25	13	5	332
1990	[1]	36	27	8	27	62	74	91	39	10	3	377
1991	[1]	63	65	96	45	50	54	66	49	5	1	494
1992	[1]	133	399	380	121	56	58	33	29	11	2	1222
1993	[1]	20	44	220	234	164	51	19	13	8	10	783
1994	[1]	105	38	147	275	303	314	100	35	10	8	1335
1995	[1]	242	42	111	219	229	97	21	6	2	2	971
1996	[1,3,5]	424	275	189	316	449	314	126	27	3	4	2127
1997	[4,5]	72	160	263	198	112	57	27	9	1	1	900
1998	[1]	26	86	279	186	57	23	10	4	1	0	672
1999	[1]	19	79	166	260	98	20	8	5	2	1	658
2000	[1, rev]	24	82	191	159	127	48	6	3	1	1	642
2001	[1]	38	59	148	204	120	70	14	2	1		656
2002	[1,5,6]	83	2	106	85	140	151	67	30	7	1	672
2003		69	36	25	218	142	167	163	60	23	4	908
2004		375	35	170	85	345	194	229	167	49	19	1669
2005		112	48	65	154	70	214	68	47	17	8	803
2006	[7]	12	20	39	49	78	32	64	23	13	8	341
2007		13	35	165	372	208	189	74	113	32	20	1221
[1]	October-December											
[2]	September-October											
[3]	Area IIb not covered											
[4]	Areas IIa, IIb covered in October-December, part of Area I covered in February-March 1998											
[5]	Adjusted for incomplete area coverage											
[6]	Area IIa not covered											
[7]	Area I not fully covered											

Table A10. North-East Arctic COD. Abundance indices (millions) from the Russian bottom trawl survey in the Barents Sea.

Table A10. North-East Arctic COD. Abundance indices (millions) from the Russian bottom trawl survey in the Barents Sea																
Year				Age												
		0	1	2	3	4	5	6	7	8	9	10	11	12	13+	Sum
				Total (Sub-area I and Division IIa and IIb)												
1982		849.3	1905.3	33.2	141.3	152.5	72.1	19.8	55.1	17.4	3.7	1.9	1.5	0.1	0.0	3253.3
1983		1872.2	2003.4	73.2	52.0	64.2	50.6	35.8	17.9	25.2	9.4	0	0	0	0	4203.9
1984		363.3	180.5	104.4	118.9	70.0	48.9	35.7	15.4	6.9	6.1	1.7	1.5	0.6	0.2	954.0
1985		284.6	15.6	129.0	118.8	159.2	106.8	36.5	16.5	3.7	0.8	1.6	0.1	2.1	0.0	875.3
1986		329.9	7.6	31.7	162.2	153.2	149.3	48.1	18.9	4.2	0.2	0.6	0.0	0.0	0.0	905.9
1987		7.7	1.3	46.9	55.7	307.6	90.0	70.1	18.4	6.0	2.5	0.4	0.1	0.3	0.0	607.0
1988		92.5	2.9	31.3	99.3	93.8	287.9	58.3	26.0	4.7	2.4	0.1	0.0	0.0	0.0	699.2
1989		355.8	3.0	14.7	49.0	97.8	106.2	145.4	116.7	29.9	11.2	4.7	1.8	0.7	0.5	937.4
1990		1248.4	31.1	51.0	16.7	48.7	62.7	97.2	153.8	67.3	15.3	4.9	0.9	0.2	0.0	1798.2
1991		974.0	64.0	91.1	107.7	48.4	53.2	58.3	68.5	74.7	9.8	1.4	0.3	0.0	0.0	1551.4
1992		1204.8	157.7	151.1	67.5	30.8	23.9	27.3	21.8	17.5	2.5	2.5	0.4	0.0	0.0	1707.8
1993		484.8	38.0	158.6	160.4	113.5	68.1	41.6	35.4	8.7	0.3	0.7	0.1	0.1	0.0	1110.3
1994		1606.6	833.2	69.9	136.3	130.9	101.9	35.4	12.8	4.9	2.1	1.1	0.6	0.2	0.0	2935.9
1995		5703.5	471.9	36.9	58.9	106.5	139.5	84.9	25.1	8.3	1.9	1.8	0.9	0.6	0.0	6640.8
1996		2660.3	396.5	128.5	73.3	78.4	103.5	77.3	34.8	13.2	1.9	0.5	1.2	0.2	0.0	3569.6
1997		1371.4	353.9	135.3	134.2	83.5	61.3	60.2	34.8	11.6	3.2	3.0	0.0	0.0	0.0	2252.4
1998		304.8	276.8	89.6	202.8	136.3	78.8	47.0	25.9	13.0	4.8	0.5	0.0	0.1	0.0	1180.4
1999		266.9	40.1	118.4	158.7	207.2	98.0	30.1	12.3	9.4	4.2	0.4	0.0	0.0	0.0	945.7
2000		1436.5	37.7	103.6	183.9	128.6	178.6	77.3	11.4	5.2	2.3	0.9	0.4	0.0	0.0	2166.4
2001		321.6	233.8	77.3	122.4	155.7	129.0	106.1	30.4	5.0	1.4	0.5	2.5	1.3	0.0	1187.1
2002		1797.9	26.7	135.6	98.0	147.3	147.3	89.6	60.0	18.2	2.9	0.8	0.1	0.1	0.0	2524.4
2003		489.5	517.5	26.8	124.6	105.7	116.6	120.3	53.5	24.1	4.0	0.9	0.3	0.0	0.1	1583.9
2004		1770.4	158.4	87.5	32.9	157.6	88.0	111.1	77.6	27.9	9.3	2.3	0.4	0.2	0.0	2523.6
2005		2298.0	323.9	61.7	140.8	63.1	183.2	74.4	60.5	24.4	8.8	2.8	0.6	0.1	0.0	3242.4
2006		427.4	52.4	63.2	92.7	161.3	77.7	180.1	66.2	34.2	16.1	4.3	1.7	0.7	0.0	1178.1
2007		177.5	37.0	148.6	257.9	161.7	190.3	84.6	152.5	55.3	22.6	8.6	4.9	1.1	0.7	1303.3
2008		1468.6	45.2	86.3	220.3	308.8	163.5	147.2	83.0	86.3	29.1	11.5	3.3	1.7	0.2	2654.9
2009		1877.7	287.8	21.9	97.4	231.7	368.7	201.6	117.5	62.0	41.3	20.5	6.5	3.2	0.9	3338.7
2010	*	2210.4	214.9	47.0	33.4	107.0	250.5	371.5	181.7	78.9	39.5	29.9	15.6	5.5	2.0	3587.7
2011		2296.1	125.9	80.0	88.2	50.8	143.2	306.5	330.0	91.7	43.9	17.6	17.5	7.0	3.5	3602.1
2012		1096.0	196.2	45.1	81.5	111.4	83.9	212.2	335.8	187.8	43.2	19.5	4.6	5.7	1.9	2424.8
2013		297.1	654.0	107.6	74.7	117.4	117.7	88.4	234.9	313.2	136.7	30.6	9.2	5.4	4.5	2191.5
2014		909.7	211.0	72.1	139.9	136.8	172.5	148.3	111.1	192.9	129.7	38.3	9.3	3.5	2.0	2277.1
2015		572.9	465.4	51.5	65.7	158.3	174.2	193.2	161.0	92.5	115.8	76.1	24.2	6.5	4.9	2162.0
2016		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
*	corrected															

Table A11. North-East Arctic COD. Length at age (cm) from Russian surveys in November–December.

	Table A11 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	10	11	12
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	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	-	-	-
1994	12.2	20.3	26.3	33.7	47.4	58.7	70.6	80.8	90.1	96.1	-	-	-
1995	11.6	19.8	27.6	33.8	45.2	60.5	71.1	83.5	92.9	99.1	-	-	-
1996	10.2	20.0	28.1	36.7	48.7	58.9	70.5	80.0	93.6	102.7	-	-	-
1997	9.6	18.5	28.8	38.2	50.8	62.0	70.5	80.1	88.9	103.5	-	-	-
1998	11.4	19.0	28.0	36.4	50.5	61.0	70.7	80.3	91.1	102.5	-	-	-
1999	11.7	19.7	27.9	35.3	51.6	60.6	70.6	78.9	86.8	94.3	-	-	-
2000	10.7	20.8	30.1	34.7	49.8	61.1	71.6	82.0	88.3	85.7	104,2	-	-
2001	10.6	19.4	29.8	37.3	50.4	61.9	71.9	81.4	91.0	98.7	103,8	-	-
2002	10.7	19.2	29.9	38.2	52.5	60.4	70.6	82.2	91.3	97.2	104.1	-	-
2003	9.8	18.9	28.3	34.9	49.2	62.2	71.0	81.5	92.3	100.9	104.3	-	-
2004	9.8	19.6	29.3	38.4	49.1	60.0	70.5	80.0	91.0	98.0	106.0	-	-
2005	11.2	19.4	29.7	38.5	48.7	59.3	69.3	79.2	87.7	96.1	104.4	-	-
2006	13.0	21.9	31.6	42.7	53.2	60.1	70.2	79.1	88.3	95.2	107.7	-	-
2007	10.7	21.5	30.8	42.2	53.6	63.7	71.0	79.6	87.3	95.9	-	-	-
2008	10.2	20.0	30.3	40.2	53.7	64.5	74.6	82.7	89.5	98.2	102.3	110.2	111.9
2009	12.9	19.3	29.5	38.4	50.7	61.5	70.7	81.7	89.9	94.7	101.8	105.9	109.4
2010	11.1	19.3	28.7	38.5	48.9	59.1	68.0	78.4	88.2	97.3	102.5	108.4	117.7
2011	11.2	20.3	29.2	38.5	49.5	58.6	68.7	78.2	90.0	97.9	106.9	109.3	116.0
2012	11.0	20.3	31.1	40.8	50.8	60.7	68.4	77.6	87.4	97.7	105.2	111.7	116.6
2013	9.5	19.5	29.0	40.3	50.4	59.3	67.3	75.3	84.4	95.3	104.5	111.9	119.4
2014	10.1	20.1	29.8	39.2	50.7	60.9	69.4	77.9	85.1	93.6	102.7	113.3	122.8
2015	11.5	19.0	28.5	37.5	48.0	58.4	67.4	76.3	83.5	91.0	98,8	107,1	117,9
2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table A12. North-East Arctic COD. Weight (g) at age from Russian surveys in November–December.

Table A12 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	11	12
1984	26	90	250	746	1187	2234	3422	5027	6479	9503	-	-	-
1985	26	80	245	762	1296	1924	3346	5094	7360	6833	11167	-	-
1986	25	63	191	506	1117	1940	2949	4942	7406	9300	-	-	-
1987	-	54	182	316	672	1691	2688	3959	8353	10583	13107	-	-
1988	15	78	223	435	789	1373	2609	4465	5816	-	-	-	-
1989	-	73	216	401	928	1427	2200	3133	4649	6801	8956	-	-
1990	28	106	230	908	1418	2092	2897	4131	6359	10078	13540	-	-
1991	26	93	260	743	1629	2623	3816	4975	7198	11165	15353	-	-
1992	10	76	273	1165	1895	2971	4377	5596	7319	9452	12414	-	-
1993	11	46	211	717	1280	2293	3509	4902	6621	7339	8494	-	-
1994	12	69	153	316	919	1670	2884	4505	6520	8207	9812	-	-
1995	11	61	180	337	861	1987	3298	5427	7614	9787	10757	-	-
1996	7	64	191	436	1035	1834	3329	5001	8203	10898	11358	-	-
1997	6	48	203	487	1176	2142	3220	4805	6925	10823	12426	-	-
1998	11	55	187	435	1186	2050	3096	4759	7044	11207	12593	-	-
1999	10	58	177	371	1214	1925	3064	4378	6128	7843	11543	-	-
2000	8	74	232	379	1101	2128	3341	5054	6560	8497	12353	-	-
2001	9	58	221	459	1125	2078	3329	4950	7270	9541	11672	-	-
2002	8	65	232	505	1299	1964	3271	5325	7249	9195	11389	-	-
2003	6	49	205	492	972	1993	2953	4393	6638	9319	11085	-	-
2004	6	55	231	543	1079	1798	2977	4110	5822	8061	12442	-	-
2005	10	59	223	521	1034	1910	3036	4619	6580	9106	12006	-	-
2006	13	72	270	707	1332	1953	2969	4340	6410	8622	12436	-	-
2007	10	96	252	669	1344	2277	3140	4691	6178	8567	10014	-	-
2008	7	58	228	558	1332	2305	3527	5001	6519	8848	10339	13276	15196
2009	15	54	214	495	1116	2024	3090	4876	6592	8087	10262	11472	13268
2010	9	54	191	794	989	1784	2719	4246	6384	8747	10499	12117	14199
2011	10	63	206	486	1037	1691	2827	4312	6698	8979	11557	12915	15694
2012	9	62	237	561	1087	1877	2688	3974	5930	8495	11000	13377	14826
2013	5	55	202	546	1062	1718	2541	3667	5258	7821	10509	13161	16581
2014	7	64	221	508	1079	1849	2734	3994	5418	7480	10100	14163	18404
2015	11	55	198	452	947	1735	2588	3728	5081	6827	8877	11623	15626
2016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table A13. North-East Arctic COD. Sum of acoustic abundance estimates (millions) in the Joint winter Barents Sea survey (Table A2) and the Norwegian Lofoten acoustic survey (Table A4).

Table A13. North-East Arctic COD. Sum of acoustic abundance estimates (millions) in the Joint winter Barents Sea survey (Table A2) and the Norwegian Lofoten acoustic survey (Table A4)

	Age													
Year	1	2	3	4	5	6	7	8	9	10	11	12	13+	12+
1985	69.1	446.3	153.0	141.6	20.4	15.1	15.7	3.3	1.3	1.0	0.5	na	na	0.0
1986	353.6	243.9	499.6	134.3	68.4	11.6	7.7	3.1	0.3	0.0	0.4	na	na	0.1
1987	1.6	34.1	62.8	204.9	50.2	17.4	1.4	3.0	0.7	0.0	0.0	na	na	0.0
1988	2.0	26.3	50.4	35.5	57.8	10.9	4.0	0.3	0.0	0.1	0.0	na	na	0.0
1989	7.5	8.0	17.0	34.4	21.4	67.0	16.6	3.2	0.5	0.2	0.0	na	na	0.1
1990	81.1	24.9	14.8	20.6	26.2	26.9	66.8	7.3	0.6	0.3	0.0	na	na	0.0
1991	181.0	219.5	50.2	34.6	29.3	33.9	36.7	50.0	3.7	0.2	0.2	na	na	0.0
1992	241.4	562.1	176.5	65.8	21.5	18.4	28.4	25.4	82.4	4.3	1.7	na	na	0.2
1993	1074.0	494.7	357.2	191.1	113.1	35.4	25.5	25.2	27.7	44.2	4.9	na	na	0.8
1994	858.3	577.2	349.8	404.5	217.5	89.5	22.5	11.9	9.4	3.9	18.0	na	na	2.7
1995	2619.2	292.9	166.2	159.8	216.6	104.0	29.0	4.4	4.3	3.0	2.6	na	na	8.1
1996	2396.0	339.8	92.9	70.5	87.2	89.1	44.6	6.5	1.1	0.4	0.9	na	na	1.4
1997	1623.5	430.5	188.3	51.7	49.7	42.2	49.9	20.5	2.2	0.5	0.0	na	na	0.8
1998	3401.3	632.9	427.7	182.6	42.4	33.8	34.0	24.7	4.9	0.7	0.2	na	na	0.1
1999	358.3	304.3	150.0	96.4	45.4	12.2	11.2	18.7	9.2	1.0	0.2	na	na	0.2
2000	154.1	221.4	245.2	158.9	145.7	49.3	12.9	6.9	5.2	1.2	0.6	na	na	0.2
2001	629.9	63.9	138.2	171.6	81.6	57.3	19.8	2.4	0.8	0.6	0.3	na	na	0.1
2002	18.2	215.5	69.3	112.2	104.3	66.1	34.5	9.5	1.2	0.5	0.6	na	na	0.0
2003	1693.9	61.5	303.4	114.4	131.5	144.5	64.3	21.2	3.8	0.5	0.1	na	na	0.1
2004	157.7	105.2	33.6	92.8	32.7	45.1	46.8	22.2	8.8	2.2	0.2	na	na	0.7
2005	465.3	119.6	123.9	33.7	66.1	29.9	43.2	17.2	7.5	1.8	0.1	na	na	0.2
2006	544.6	216.6	79.8	59.1	15.7	38.1	16.9	15.5	8.8	2.4	0.3	na	na	0.8
2007	125.0	61.7	80.3	37.1	31.8	13.0	42.7	13.8	7.5	3.3	0.8	na	na	0.4
2008	68.8	97.6	210.2	306.1	141.0	75.4	24.6	32.9	5.8	2.8	1.7	na	na	0.8
2009	321.5	30.6	182.6	178.3	140.5	49.5	40.1	13.3	26.0	3.7	1.7	na	na	0.4
2010	485.4	59.4	34.7	121.9	175.9	194.9	70.9	37.5	11.1	8.8	1.7	na	na	1.7
2011	389.3	124.8	47.1	29.1	82.4	158.7	284.3	65.6	22.6	6.1	7.8	0.5	0.6	1.0
2012	950.6	72.7	133.9	52.7	38.1	82.8	224.4	154.7	30.9	10.8	4.8	2.0	0.8	2.7
2013	470.6	110.8	64.1	85.0	71.0	57.5	119.4	224.9	175.6	20.9	12.6	4.9	3.3	8.2
2014	630.1	139.1	220.0	117.8	91.8	67.9	52.9	135.4	175.1	97.7	14.2	6.6	4.0	10.6
2015	1141.0	127.0	94.9	154.2	119.3	99.6	96.5	36.2	111.2	66.3	30.0	6.8	5.2	12.0
2016	142.9	120.7	41.0	58.3	96.9	64.6	58.7	33.9	34.1	48.1	29.2	17.0	11.3	28.1
2017	396.6	48.5	91.2	40.4	48.6	76.6	49.8	50.3	28.5	18.0	14.7	17.2	8.5	25.6

Table A14. Swept area estimates (millions) of Northeast Arctic Cod from the Joint Norwegian-Russian ecosystem survey in August–September (taken from WD05)

Table A14. Swept area estimates (millions) of Northeast Arctic Cod from the Joint Norwegian-Russian ecosystem survey in August-September (taken from WD 05)

year	0	1	2	3	4	5	6	7	8	9	10	11	12	13+
2004	543.0	330.6	329.7	147.7	421.5	150.2	79.8	40.2	10.1	2.2	0.5	0.1	0.1	0.1
2005	180.2	440.7	146.6	216.6	55.8	100.9	28.0	15.6	5.7	1.2	0.5	0.1	0.0	0.1
2006	276.0	479.0	509.7	186.1	205.6	59.9	69.8	17.6	8.1	2.6	0.6	0.2	0.0	0.0
2007	101.0	333.3	505.4	586.2	159.2	79.1	24.6	26.9	6.0	2.2	0.9	0.1	0.2	0.0
2008	483.4	130.9	372.6	652.6	483.4	132.3	51.1	12.8	17.5	3.3	0.9	0.2	0.2	0.2
2009	903.3	569.7	93.5	202.3	280.6	289.6	101.7	31.9	12.7	7.3	2.6	0.8	0.3	0.2
2010	652.6	310.3	84.2	56.8	177.0	397.2	424.9	142.7	38.5	10.5	6.8	1.6	0.3	0.3
2011	2083.0	509.8	160.0	123.6	101.5	240.2	300.4	178.4	32.3	7.7	1.8	1.3	0.6	0.3
2012	1412.7	1454.3	255.9	229.1	146.4	70.0	150.8	165.2	84.5	12.7	4.4	1.6	1.4	0.6
2013	2281.8	914.2	659.0	249.1	183.6	125.7	63.2	118.2	130.2	53.8	9.1	3.3	1.5	0.9
2014	2445.2	308.2	155.1	190.0	108.6	93.9	52.8	30.4	50.2	36.3	12.1	3.4	1.0	1.4
2014 *	***2445.2***	***339.0***	***184.0***	***226.3***	***122.2***	***103.4***	***67.7***	***42.1***	***81.3***	***78.9***	***28.1***	***4.7***	***1.3***	***1.5***
2015	350.9	725.3	154.0	174.4	225.2	141.3	72.6	48.6	26.2	35.3	26.6	7.9	1.7	1.0
2016	1164.8	350.8	341.3	77.2	93.7	121.6	70.1	44.4	27.2	13.8	13.2	5.4	1.7	1.4

* data adjasted taking into account not complete area covarage