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REPORT

**Advice on fishing opportunities  
for Northeast Arctic cod in 2024  
in ICES subareas 1 and 2**



Institute of Marine Research – IMR



Polar branch of the FSBSI "VINRO" ("PINRO")

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Advice on fishing opportunities for Northeast Arctic cod in 2024 in ICES subareas 1 and 2

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## Content

|  |    |
|--|----|
| <b>Stock Name: Northeast Arctic cod (ICES areas 1 and 2)</b> ..... | 4  |
| <b>Advice on fishing opportunities</b> .....                       | 4  |
| <b>Stock development over time</b> .....                           | 4  |
| <b>Catch scenarios</b> .....                                       | 4  |
| <b>Basis of the advice</b> .....                                   | 5  |
| <b>Quality of the assessment</b> .....                             | 5  |
| <b>Issues relevant for the advice</b> .....                        | 6  |
| <b>Reference points</b> .....                                      | 6  |
| <b>Basis of the assessment</b> .....                               | 7  |
| <b>History of the advice, catch, and management</b> .....          | 7  |
| <b>History of catch and landings</b> .....                         | 9  |
| <b>Summary of the assessment</b> .....                             | 11 |
| <b>References</b> .....  | 13 |

# Stock Name: Northeast Arctic cod (ICES areas 1 and 2)

## Advice on fishing opportunities

The Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG) advises that when the Joint Norwegian–Russian Fisheries Commission management plan is applied, catches in 2024 should be no more than 453 427 tonnes.

## Stock development over time

Fishing pressure on the stock is between  $F_{pa}$  and  $F_{lim}$  and within the  $F_{mgt}$  range and spawning-stock size is above  $B_{pa}$  and  $B_{lim}$  and between the lower and middle breakpoints ( $SSB_{mgt}$  values) in the harvest control rule.

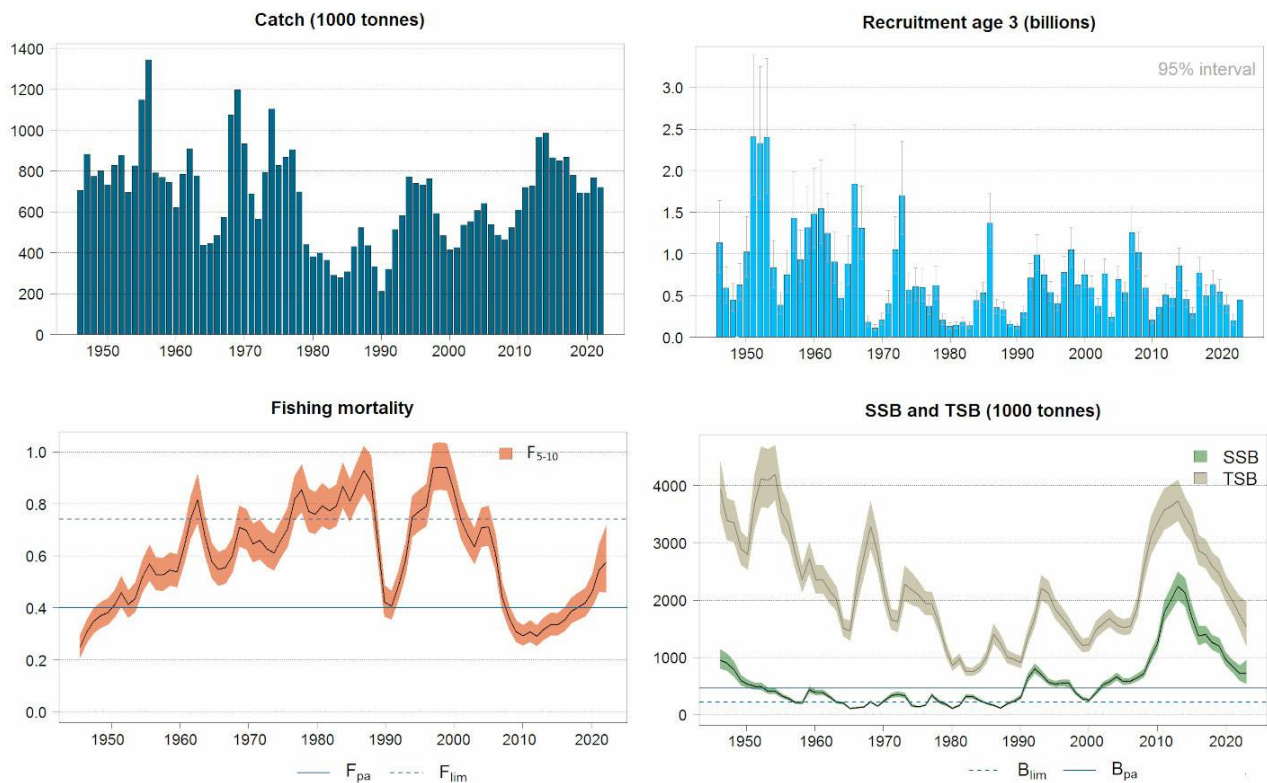


Figure 1 Cod in ICES subareas 1 and 2 (Northeast Arctic). Catch, recruitment,  $F$ , SSB and TSB (total stock biomass, age 3+) with 95 % confidence levels. The biomass reference points relate to SSB. For this stock,  $F_{mgt}$  ranges from 0.40 to 0.60, and there are three SSB mgt values (460 000, 920 000 and 1 380 000 tonnes).

## Catch scenarios

Table 1 Cod in ICES subareas 1 and 2 (Northeast Arctic). Assumptions made for the interim year and in the forecast. SSB, catch in tonnes, and recruitment in thousands.

| Variable           | Value   | Notes                                 |
|--------------------|---------|---------------------------------------|
| F ages 5–10 (2023) | 0.574   | $F_{sq} = F_{2022}$ . From assessment |
| SSB (2024)         | 587 836 | From assessment                       |
| R age 3 (2023)     | 446 000 | From recruitment model                |
| R age 3 (2024)     | 409 000 | From recruitment model                |
| R age 3 (2025)     | 239 000 | From recruitment model                |
| Total catch (2023) | 572 800 | Corresponding to $F_{sq}$             |

Table 2 Cod in ICES subareas 1 and 2 (Northeast Arctic). Annual catch options. All weights are in tonnes.

| Basis                        | Total catch (2024) | F <sub>5-10</sub> (2024) | SSB(2025) | % SSB change* | % TAC change** | % Advice change*** |
|------------------------------|--------------------|--------------------------|-----------|---------------|----------------|--------------------|
| ICES advice basis            |                    |                          |           |               |                |                    |
| Management plan <sup>^</sup> | 453 427            | 0.540                    | 506 615   | -14           | -20            | -20                |
| Other options                |                    |                          |           |               |                |                    |
| F = 0.40****                 | 357 377            | 0.40                     | 586 401   | 0             | -37            | -37                |
| F = 0                        | 0                  | 0                        | 900 153   | 53            | -100           | -100               |
| F = F <sub>2022</sub>        | 475 016            | 0.574                    | 489 013   | -17           | -16            | -16                |
| F <sub>pa</sub>              | 357 377            | 0.40                     | 586 401   | 0             | -37            | -37                |
| F <sub>lim</sub>             | 571 054            | 0.74                     | 412 367   | -30           | 1              | 1                  |

\* SSB 2025 relative to SSB 2024.

\*\* Advice for 2024 relative to TAC for 2023 (566 784 tonnes).

\*\*\* Advice for 2024 relative to advice for 2023.

\*\*\*\* F = 0.40 corresponds to the lower bound of the F<sub>MSY</sub> range (0.40-0.60).

<sup>^</sup> Since SSB in 2024 is between B<sub>pa</sub> = 460 000 tonnes and 2 × B<sub>pa</sub> = 920 000 tonnes, F = 0.40 is used in the 3-year prediction, giving catches of 357 377, 354 196 and 355 390 tonnes in 2024, 2025 and 2026, respectively. The average of this is 355 655 tonnes. According to the harvest control rule (HCR), the maximum decrease in TAC is limited by 20%, giving a catch of 453 427 tonnes, which corresponds to an F of 0.540 in 2024.

The advice for 2024 is 20 % lower than the advice for 2023 due to a declining stock trend and the application of the 20% TAC change constraint.

## Basis of the advice

Table 3 Cod in ICES subareas 1 and 2 (Northeast Arctic). The basis of the advice.

| Advice basis    | Joint Norwegian-Russian Fisheries Commission management plan  |
|-----------------|---|
| Management plan | <p>At the 46th meeting of the Joint Norwegian-Russian Fisheries Commission (JNRFC) in October 2016, the previously used management plan was amended, and the current plan is as follows:</p> <p>The TAC is calculated as the average catch predicted for the coming 3 years, using the target level of exploitation (F<sub>tr</sub>).</p> <p>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 &lt; B<sub>pa</sub>, then F<sub>tr</sub> = SSB / B<sub>pa</sub> × F<sub>MSY</sub>; - if B<sub>pa</sub> ≤ SSB ≤ 2×B<sub>pa</sub>, then F<sub>tr</sub> = F<sub>MSY</sub>; - if 2 × B<sub>pa</sub> &lt; SSB &lt; 3 × B<sub>pa</sub>, then F<sub>tr</sub> = F<sub>MSY</sub> × (1 + 0.5 × (SSB – 2 × B<sub>pa</sub>) / B<sub>pa</sub>); - if SSB ≥ 3 × B<sub>pa</sub>, then F<sub>tr</sub> = 1.5 × F<sub>MSY</sub>; where F<sub>MSY</sub> = 0.40 and B<sub>pa</sub> = 460 000 tonnes.</p> <p>If the spawning-stock biomass in the present year, the previous year, and each of the three years of prediction is above B<sub>pa</sub>, the TAC should not be changed by more than ±20% compared with the previous year's TAC. In this case, F<sub>tr</sub> should however not be below 0.30. In 2014, JNRFC decided that from 2015 onwards, Norway and Russia can transfer to or borrow from the following year up to 10% of the country's quota. In 2021, this was increased to 15% as an extraordinary measure for transfers between 2021 and 2022 only. ICES evaluated this harvest control rule in 2016 (ICES, 2016) and 2021 (ICES, 2021) and concluded that it is precautionary.</p> |

## Quality of the assessment

After the 2021 benchmark, the assessment has been fairly consistent from year to year. Recruitment predictions in recent years have been overestimates.

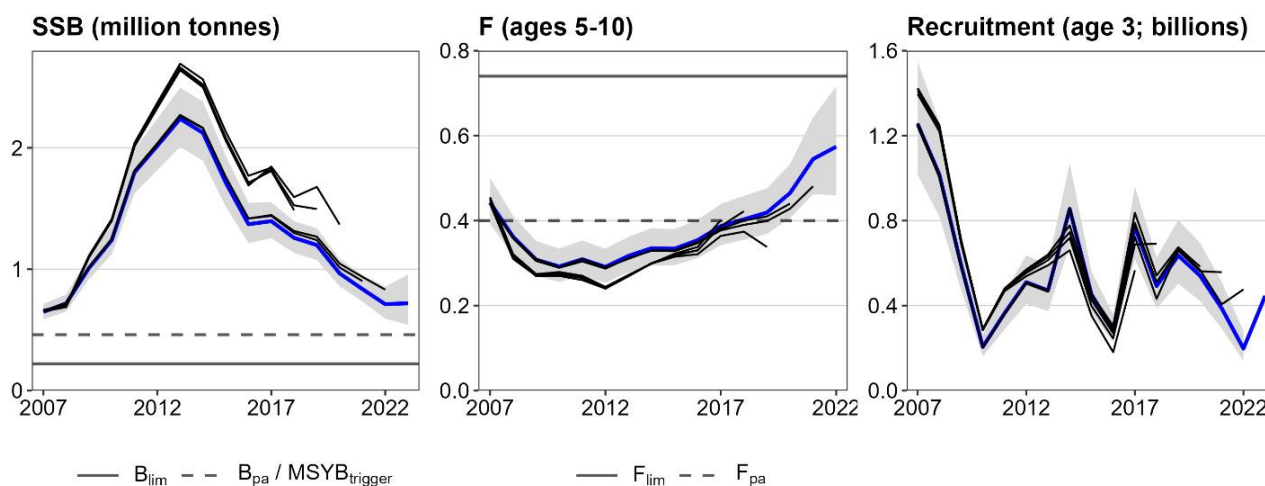


Figure 2 Cod in ICES subareas 1 and 2 (Northeast Arctic). Historical assessment results. There was a benchmark revision in 2021. The shaded areas indicate the 95% confidence intervals for the 2023 assessment.

## Issues relevant for the advice

Due to the temporary suspension of Russian scientists from ICES, this assessment was as in 2022 conducted by a Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG) consisting of scientists from VNIRO (Russia) and IMR (Norway) (Howell et al., 2023).

This advice has been conducted outside ICES and should not be considered as ICES advice. However, this assessment and advice has been produced following the methodology agreed at the ICES benchmark in 2021 (ICES, 2021).

Fisheries targeting Northeast Arctic (NEA) cod take as bycatch a considerable part of the total golden redfish (*Sebastes norvegicus*) catch, and the bycatch of the latter species is still above any sustainable catch level. Measures to minimize bycatch levels are essential.

Bycatch of coastal cod should be kept as low as possible in order to avoid overfishing of the coastal cod (*Gadus morhua*) stocks.

The 2022 data from the ecosystem survey were not included due to incomplete spatial coverage and poor synopticity.

The advice this year is considerably lower than last year due to the declining trend in stock size which is confirmed by low survey indices and below average recruitment to the stock.

Recruitment has been below average after the 2014 year class. The medium-term predictions for 2025 and following years indicate that a further 20% reduction in catch from 2024 to 2025 will be advised and then catches will stabilize around 350 000 tonnes and stock size will also stabilize around 1.3 million tonnes. However, SSB is now approaching  $B_{pa}$ , below which level recruitment may be impaired. Should SSB fall below  $B_{pa}$ , then according to the management plan the 20% stability constraint on the advised quota will no longer be applied.

## Reference points

Table 4 Cod in ICES subareas 1 and 2 (Northeast Arctic). Reference points, values, and their technical basis.

| Framework              | Reference point          | Value       | Technical basis   | Source            |
|------------------------|--------------------------|-------------|---|-------------------|
| MSY approach           | MSY $B_{\text{trigger}}$ | 460 000 t   | $B_{\text{pa}}$ , and trigger point in HCR  | ICES (2003, 2021) |
|                        | $F_{\text{MSY range}}$   | 0.40 – 0.60 | Long-term simulations   | ICES (2003, 2021) |
| Precautionary approach | $B_{\text{lim}}$         | 220 000 t   | Change point regression   | ICES (2003, 2021) |
|                        | $B_{\text{pa}}$          | 460 000 t   | The lowest SSB estimate having >90% probability of remaining above $B_{\text{lim}}$ | ICES (2003, 2021) |
|                        | $F_{\text{lim}}$         | 0.74        | F corresponding to an equilibrium stock = $B_{\text{lim}}$                          | ICES (2003, 2021) |
|                        | $F_{\text{pa}}$          | 0.40        | The highest F estimate having >90% probability of remaining below $F_{\text{lim}}$  | ICES (2003, 2021) |
| Management plan        | SSB <sub>mgt</sub>       | 460 000 t   | Two-step (double hockey-stick) HCR, see Table 3                                     | ICES (2017)       |
|                        | $F_{\text{mgt}}$         | 0.40 – 0.60 | Two-step (double hockey-stick) HCR, see Table 3                                     | ICES (2017)       |

## Basis of the assessment

Table 5 Cod in ICES subareas 1 and 2 (Northeast Arctic). Basis of the assessment and advice.

|                          |  |
|--------------------------|--|
| ICES stock data category | 1  |
| Assessment type          | Age-based analytical assessment (SAM) that uses catches in the model and in the forecast.  |
| Input data               | Commercial catches (international landings, ages and length frequencies from catch sampling); four survey indices (Joint bottom trawl survey Barents Sea, Jan–Mar; Joint acoustic survey Barents Sea and Lofoten, Feb–Mar; Russian bottom trawl survey, October–December; Joint Ecosystem survey); annual maturity data from the four surveys; natural mortalities from annual stomach sampling. |
| Discards and bycatch     | Discarding is considered negligible in recent years (below 5%). Bycatch is included.   |
| Indicators               | None.  |
| Other information        | The methodology of assessment adopted by the last ICES benchmark for the stock in February 2021 (ICES, 2021) was followed.   |
| Working group            | Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG).   |

## History of the advice, catch, and management

Table 6 Cod in ICES subareas 1 and 2 (Northeast Arctic). ICES advice, agreed TACs, the official and unreported landings, and ICES catches. All weights are in tonnes.

| Year | ICES advice   | Catch corresponding to advice | Agreed TAC      | Official catches | Unreported landings (included in ICES catches) | ICES catches |
|------|---|-------------------------------|-----------------|------------------|--|--------------|
| 1987 | Gradual reduction in F  | 595000                        | 560000          | 552000           |  | 523071       |
| 1988 | F = 0.51; TAC (Advice November 1987, revised advice May 1988) | 530000 (320000–360000)        | 590000 (451000) | 459000           |  | 434939       |
| 1989 | Large reduction in F  | 335000                        | 300000          | 348000           |  | 332481       |
| 1990 | F at Flow; TAC  | 172000                        | 160000          | 210000           | 25000  | 212000       |
| 1991 | F at Flow; TAC  | 215000                        | 215000          | 294000           | 50000  | 319158       |

| Year | ICES advice   | Catch corresponding to advice | Agreed TAC | Official catches | Unreported landings (included in ICES catches) | ICES catches |
|------|---|-------------------------------|------------|------------------|--|--------------|
| 1992 | Within safe biological limits   | 250000                        | 356000     | 421000           | 130000   | 513234       |
| 1993 | Healthy stock   | 256000                        | 500000     | 575000           | 50000  | 581611       |
| 1994 | No long-term gains in increased F   | 649000                        | 700000     | 795000           | 25000  | 771086       |
| 1995 | No long-term gains in increased F   | 681000                        | 700000     | 763000           |  | 739999       |
| 1996 | No long-term gains in increased F   | 746000                        | 700000     | 759000           |  | 732228       |
| 1997 | Well below Fmed   | < 993000                      | 850000     | 792000           |  | 762403       |
| 1998 | F less than Fmed  | 514000                        | 654000     | 615000           |  | 592624       |
| 1999 | Reduce F to below Fpa   | 360000                        | 480000     | 506000           |  | 484910       |
| 2000 | Increase B above Bpa in 2001  | 110000                        | 390000     |                  |  | 414870       |
| 2001 | High probability of SSB> Bpa in 2003  | 263000                        | 395000     |                  |  | 426471       |
| 2002 | Reduce F to well below 0.25   | 181000                        | 395000     |                  | 90000  | 535045       |
| 2003 | Reduce F to below Fpa   | 305000                        | 395000     |                  | 115000   | 551990       |
| 2004 | Reduce F to below Fpa   | 398000                        | 486000     |                  | 117000   | 606445       |
| 2005 | Take into account coastal cod and redfish bycatches. Apply catch rule.            | 485000                        | 485000     |                  | 166000   | 641276       |
| 2006 | Take into account coastal cod and redfish bycatches. Apply amended catch rule.    | 471000                        | 471000     |                  | 67100  | 537642       |
| 2007 | Take into account coastal cod and redfish bycatches. Fpa                          | 309000                        | 424000     |                  | 41087  | 486883       |
| 2008 | Take into account coastal cod and redfish bycatches. Apply catch rule.            | 409000                        | 430000     |                  | 15000  | 464171       |
| 2009 | Take into account coastal cod and redfish bycatches. Apply catch rule.            | 473000                        | 525000     |                  | 0  | 523431       |
| 2010 | Take into account coastal cod and redfish bycatches. Apply catch rule.            | 577500                        | 607000     |                  | 0  | 609983       |
| 2011 | Take into account coastal cod and redfish bycatches. Apply catch rule.            | 703000                        | 703000     |                  | 0  | 719829       |
| 2012 | Take into account coastal cod and redfish bycatches. Apply catch rule.            | 751000                        | 751000     |                  | 0  | 727663       |
| 2013 | Take into account coastal cod and S. marinus ^^ bycatches. Apply catch rule.      | 940000                        | 1000000    |                  | 0  | 966209       |
| 2014 | Take into account coastal cod and S. marinus^^ bycatches. Apply catch rule.       | 993000                        | 993000     |                  | 0  | 986449       |
| 2015 | Take into account coastal cod and S. norvegicus bycatches. Apply catch rule.      | 894000                        | 894000     |                  | 0  | 864384       |
| 2016 | Take into account coastal cod and S. norvegicus bycatches. Apply catch rule.      | 805000                        | 894000     |                  | 0  | 849422       |
| 2017 | Take into account coastal cod and S. norvegicus bycatches. Apply management plan. | ≤ 805000                      | 890000 ^   |                  | 0  | 868276       |
| 2018 | Take into account coastal cod and S. norvegicus bycatches. Apply management plan. | 712000                        | 775000     |                  | 0  | 778627       |
| 2019 | Take into account coastal cod and S. norvegicus bycatches. Apply management plan. | 674678                        | 725000     |                  | 0  | 692609       |
| 2020 | Apply management plan   | ≤ 689672                      | 738000     |                  | 0  | 692903       |
| 2021 | Apply management plan   | ≤ 885600                      | 885600     |                  | 0  | 767284^^^    |



| Year | ICES advice                         | Catch corresponding to advice | Agreed TAC | Official catches | Unreported landings (included in ICES catches) | ICES catches            |
|------|-------------------------------------|-------------------------------|------------|------------------|--|-------------------------|
| 2022 | Apply management plan               | ≤ 708480                      | 708480     |                  |  | 0 719211 <sup>^^^</sup> |
| 2023 | Apply management plan <sup>^^</sup> | ≤ 566784                      | 566784     |                  |  |                         |
| 2024 | Apply management plan <sup>^^</sup> | ≤ 453427                      |            |                  |  |                         |

<sup>^</sup> The 2017 TAC was set according to the management plan agreed by JNRF in October 2016.

<sup>^^</sup> Until 2014 this species was named *Sebastes marinus*, thereafter *Sebastes norvegicus*.

<sup>^^^</sup> In 2022 and 2023 assessment and advice was carried out by the Joint Russian-Norwegian Arctic Fisheries working group (JRN-AFWG) which compiled catches for 2021 and 2022 and gave advice for 2023 and 2024.

## History of catch and landings

Table 7 Cod in ICES subareas 1 and 2 (Northeast Arctic). History of commercial landings by country. All weights are in tonnes.

| Year | Faroe Islands | France | German Dem.Rep. | Fed.Rep. Germany | Greenland | Iceland | Norway | Poland | United Kingdom | Russia** | Spain | Others | Total  |
|------|---------------|--------|-----------------|------------------|-----------|---------|--------|--------|----------------|----------|-------|--------|--------|
| 1961 | 3934          | 13755  | 3921            | 8129             |           |         | 268377 | -      | 158113         | 325780   |       | 1212   | 78322  |
| 1962 | 3109          | 20482  | 1532            | 6503             |           |         | 225615 | -      | 175020         | 476760   |       | 245    | 90926  |
| 1963 | -             | 18318  | 129             | 4223             |           |         | 205056 | 108    | 129779         | 417964   |       | -      | 77557  |
| 1964 | -             | 8634   | 297             | 3202             |           |         | 149878 | -      | 94549          | 180550   |       | 585    | 43769  |
| 1965 | -             | 526    | 91              | 3670             |           |         | 197085 | -      | 89962          | 152780   |       | 816    | 44493  |
| 1966 | -             | 2967   | 228             | 4284             |           |         | 203792 | -      | 103012         | 169300   |       | 121    | 48370  |
| 1967 | -             | 664    | 45              | 3632             |           |         | 218910 | -      | 87008          | 262340   |       | 6      | 57260  |
| 1968 | -             | -      | 225             | 1073             |           |         | 255611 | -      | 140387         | 676758   |       | -      | 107408 |
| 1969 | 29374         | -      | 5907            | 5543             |           |         | 305241 | 7856   | 231066         | 612215   |       | 133    | 119722 |
| 1970 | 26265         | 44245  | 12413           | 9451             |           |         | 377606 | 5153   | 181481         | 276632   |       | -      | 93324  |
| 1971 | 5877          | 34772  | 4998            | 9726             |           |         | 407044 | 1512   | 80102          | 144802   |       | 215    | 68904  |
| 1972 | 1393          | 8915   | 1300            | 3405             |           |         | 394181 | 892    | 58382          | 96653    |       | 166    | 56528  |
| 1973 | 1916          | 17028  | 4684            | 16751            |           |         | 285184 | 843    | 78808          | 387196   |       | 276    | 79268  |
| 1974 | 5717          | 46028  | 4860            | 78507            |           |         | 287276 | 9898   | 90894          | 540801   |       | 38453  | 110243 |
| 1975 | 11309         | 28734  | 9981            | 30037            |           |         | 277099 | 7435   | 101843         | 343580   |       | 19368  | 82937  |
| 1976 | 11511         | 20941  | 8946            | 24369            |           |         | 344502 | 6986   | 89061          | 343057   |       | 18090  | 86746  |
| 1977 | 9167          | 15414  | 3463            | 12763            |           |         | 388982 | 1084   | 86781          | 369876   |       | 17771  | 90530  |
| 1978 | 9092          | 9394   | 3029            | 5434             |           |         | 363088 | 566    | 35449          | 267138   |       | 5525   | 69871  |
| 1979 | 6320          | 3046   | 547             | 2513             |           |         | 294821 | 15     | 17991          | 105846   |       | 9439   | 44053  |
| 1980 | 9981          | 1705   | 233             | 1921             |           |         | 232242 | 3      | 10366          | 115194   |       | 8789   | 38043  |
| 1981 | 12825         | 3106   | 298             | 2228             |           |         | 277818 |        | 5262           | 83000    | 14500 | -      | 39903  |
| 1982 | 11998         | 761    | 302             | 1717             |           |         | 287525 |        | 6601           | 40311    | 14515 | -      | 36373  |
| 1983 | 11106         | 126    | 473             | 1243             |           |         | 234000 |        | 5840           | 22975    | 14229 | -      | 28999  |
| 1984 | 10674         | 11     | 686             | 1010             |           |         | 230743 |        | 3663           | 22256    | 8608  | -      | 27765  |
| 1985 | 13418         | 23     | 1019            | 4395             |           |         | 211065 |        | 3335           | 62489    | 7846  | 4330   | 30792  |
| 1986 | 18667         | 591    | 1543            | 10092            |           |         | 232096 |        | 7581           | 150541   | 5497  | 3505   | 43011  |
| 1987 | 15036         | 1      | 986             | 7035             |           |         | 268004 |        | 10957          | 202314   | 16223 | 2515   | 52307  |

| Year  | Faroe Islands | France | German Dem.Rep. | Fed.Rep. Germany | Greenland | Iceland | Norway | Poland | United Kingdom | Russia**  | Spain | Others | Total   |
|-------|---------------|--------|-----------------|------------------|-----------|---------|--------|--------|----------------|-----------|-------|--------|---------|
| 1988  | 15329         | 2551   | 605             | 2803             |           |         | 223412 |        | 8107           | 169365    | 10905 | 1862   | 434930  |
| 1989  | 15625         | 3231   | 326             | 3291             |           |         | 158684 |        | 7056           | 134593    | 7802  | 1273   | 332480  |
| 1990  | 9584          | 592    | 169             | 1437             |           |         | 88737  |        | 3412           | 74609     | 7950  | 510    | 187000  |
| 1991  | 8981          | 975    |                 | 2613             |           |         | 126226 |        | 3981           | 119427*** | 3677  | 3278   | 269150  |
| 1992  | 11663         | 2      |                 | 3911             | 3337      |         | 168460 |        | 6120           | 182315    | 6217  | 1209   | 383230  |
| 1993  | 17435         | 3572   |                 | 5887             | 5389      | 9374    | 221051 |        | 11336          | 244860    | 8800  | 3907   | 531610  |
| 1994  | 22826         | 1962   |                 | 8283             | 6882      | 36737   | 318395 |        | 15579          | 291925    | 14929 | 28568  | 746080  |
| 1995  | 22262         | 4912   |                 | 7428             | 7462      | 34214   | 319987 |        | 16329          | 296158    | 15505 | 15742  | 739990  |
| 1996  | 17758         | 5352   |                 | 8326             | 6529      | 23005   | 319158 |        | 16061          | 305317    | 15871 | 14851  | 732220  |
| 1997  | 20076         | 5353   |                 | 6680             | 6426      | 4200    | 357825 |        | 18066          | 313344    | 17130 | 13303  | 762400  |
| 1998  | 14290         | 1197   |                 | 3841             | 6388      | 1423    | 284647 |        | 14294          | 244115    | 14212 | 8217   | 592620  |
| 1999  | 13700         | 2137   |                 | 3019             | 4093      | 1985    | 223390 |        | 11315          | 210379    | 8994  | 5898   | 484910  |
| 2000  | 13350         | 2621   |                 | 3513             | 5787      | 7562    | 192860 |        | 9165           | 166202    | 8695  | 5115   | 414870  |
| 2001  | 12500         | 2681   |                 | 4524             | 5727      | 5917    | 188431 |        | 8698           | 183572    | 9196  | 5225   | 426470  |
| 2002  | 15693         | 2934   |                 | 4517             | 6419      | 5975    | 202559 |        | 8977           | 184072    | 8414  | 5484   | 445040  |
| 2003  | 19427         | 2921   |                 | 4732             | 7026      | 5963    | 191977 |        | 8711           | 182160    | 7924  | 6149   | 436990  |
| 2004  | 19226         | 3621   |                 | 6187             | 8196      | 7201    | 212117 |        | 14004          | 201525    | 11285 | 6082   | 489440  |
| 2005  | 16273         | 3491   |                 | 5848             | 8135      | 5874    | 207825 |        | 10744          | 200077    | 9349  | 7660   | 475270  |
| 2006  | 16327         | 4376   |                 | 3837             | 8164      | 5972    | 201987 |        | 10594          | 203782    | 9219  | 6271   | 470520  |
| 2007  | 14788         | 3190   |                 | 4619             | 5951      | 7316    | 199809 |        | 9298           | 186229    | 9496  | 5101   | 445790  |
| 2008  | 15812         | 3149   |                 | 4955             | 5617      | 7535    | 196598 |        | 8287           | 190225    | 9658  | 7336   | 449170  |
| 2009  | 16905         | 3908   |                 | 8585             | 4977      | 7380    | 224298 |        | 8632           | 229291    | 12013 | 7442   | 523430  |
| 2010  | 15977         | 4499   |                 | 8442             | 6584      | 11299   | 264701 |        | 9091           | 267547    | 12657 | 9185   | 609980  |
| 2011  | 13429         | 1173   |                 | 4621             | 7155      | 12734   | 331535 |        | 8210           | 310326    | 13291 | 17354^ | 719820  |
| 2012  | 17523         | 2841   |                 | 8500             | 8520      | 9536    | 315739 |        | 11166          | 329943    | 12814 | 11081  | 727660  |
| 2013  | 13833         | 7858   |                 | 8010             | 7885      | 14734   | 438734 |        | 12536          | 432314    | 15042 | 15263  | 966200  |
| 2014  | 33298         | 8149   |                 | 6225             | 10864     | 18205   | 431846 |        | 14762          | 433479    | 16378 | 13243  | 986440  |
| 2015  | 26568         | 7480   |                 | 6427             | 7055      | 16120   | 377983 |        | 11778          | 381778    | 19905 | 9880   | 864380  |
| 2016  | 24084         | 7946   |                 | 6336             | 8607      | 16031   | 348949 |        | 13583          | 394107    | 14640 | 15139  | 849420  |
| 2017  | 28637         | 9554   |                 | 5977             | 13638     | 11925   | 357419 |        | 16731          | 396180    | 14414 | 13802  | 868270  |
| 2018  | 26152         | 6605   |                 | 9768             | 12743     | 10708   | 333539 |        | 11533          | 340364    | 13143 | 14071  | 778620  |
| 2019  | 22270         | 6371   |                 | 8470             | 7553      | 12294   | 282120 |        | 11214          | 316813    | 13939 | 11565  | 692600  |
| 2020  | 21679         | 5796   |                 | 9725             | 7391      | 9734    | 289472 |        | 12113          | 312683    | 11403 | 12908  | 692900  |
| 2021  | 21767         | 4459   |                 | 6190             | 8246      | 8933    | 337931 |        | 5426           | 352064    | 11080 | 11188  | 767284^ |
| 2022* | 21530         | 4988   |                 | 7134             | 7688      | 6214    | 310145 |        | 7024           | 333697    | 12214 | 8577   | 719211^ |

\* Provisional figures

\*\* USSR prior to 1991.

\*\*\* Includes Baltic countries.

^ Includes unspecified EU catches.

^^ In 2022 and 2023 assessment and advice was carried out by the Joint Russian-Norwegian Arctic Fisheries working group (JRN-AFWG) which

compiled catches for 2021 and 2022 and gave advice for 2023 and 2024.

## Summary of the assessment

Table 8 Cod in ICES subareas 1 and 2 (Northeast Arctic). Assessment summary. High and low refer to 95% confidence bounds.

| Year | Recruitment         |         |         | Spawning-stock biomass |        |         | Total catch | Fishing mortality |       |       |
|------|---------------------|---------|---------|------------------------|--------|---------|-------------|-------------------|-------|-------|
|      | Recruitment (Age 3) | Low     | High    | SSB                    | Low    | High    |             | F (ages 5–10)     | Low   | High  |
|      | thousands           |         |         | Tonnes                 |        |         | tonnes      |                   |       |       |
| 1946 | 1131733             | 781426  | 1639078 | 952756                 | 800517 | 1133947 | 706000      | 0.25              | 0.21  | 0.297 |
| 1947 | 589231              | 412364  | 841960  | 903304                 | 767137 | 1063639 | 882017      | 0.309             | 0.268 | 0.357 |
| 1948 | 449846              | 312706  | 647128  | 785151                 | 662274 | 930827  | 774295      | 0.348             | 0.303 | 0.4   |
| 1949 | 626523              | 442032  | 888016  | 595159                 | 511249 | 692840  | 800122      | 0.369             | 0.323 | 0.422 |
| 1950 | 1024221             | 725123  | 1446690 | 536002                 | 470975 | 610007  | 731982      | 0.382             | 0.335 | 0.436 |
| 1951 | 2407714             | 1708528 | 3393032 | 495064                 | 440346 | 556581  | 827180      | 0.413             | 0.363 | 0.469 |
| 1952 | 2328597             | 1666298 | 3254138 | 488824                 | 431608 | 553625  | 876795      | 0.459             | 0.404 | 0.522 |
| 1953 | 2402267             | 1722497 | 3350304 | 412181                 | 361649 | 469774  | 695546      | 0.412             | 0.362 | 0.468 |
| 1954 | 833170              | 598061  | 1160703 | 408246                 | 361032 | 461635  | 826021      | 0.438             | 0.386 | 0.497 |
| 1955 | 385036              | 276191  | 536778  | 328014                 | 294465 | 365385  | 1147841     | 0.519             | 0.46  | 0.585 |
| 1956 | 750321              | 539501  | 1043523 | 281300                 | 253788 | 311795  | 1343068     | 0.57              | 0.505 | 0.643 |
| 1957 | 1431458             | 1031662 | 1986186 | 212225                 | 191029 | 235773  | 792557      | 0.528             | 0.468 | 0.595 |
| 1958 | 929503              | 672056  | 1285573 | 205350                 | 182986 | 230448  | 769313      | 0.526             | 0.467 | 0.591 |
| 1959 | 1312954             | 952699  | 1809437 | 434392                 | 385395 | 489618  | 744607      | 0.546             | 0.486 | 0.613 |
| 1960 | 1476784             | 1071422 | 2035511 | 384764                 | 338846 | 436904  | 622042      | 0.539             | 0.479 | 0.606 |
| 1961 | 1544518             | 1119487 | 2130919 | 386646                 | 343405 | 435331  | 783221      | 0.634             | 0.568 | 0.707 |
| 1962 | 1247843             | 903580  | 1723271 | 315444                 | 283722 | 350713  | 909266      | 0.743             | 0.666 | 0.827 |
| 1963 | 907862              | 653790  | 1260669 | 216030                 | 194731 | 239659  | 776337      | 0.815             | 0.727 | 0.914 |
| 1964 | 473547              | 338597  | 662283  | 200204                 | 179696 | 223053  | 437695      | 0.678             | 0.606 | 0.758 |
| 1965 | 878677              | 630292  | 1224945 | 107974                 | 96100  | 121315  | 444930      | 0.578             | 0.514 | 0.65  |
| 1966 | 1839953             | 1327238 | 2550732 | 121031                 | 108952 | 134449  | 483711      | 0.548             | 0.487 | 0.616 |
| 1967 | 1308974             | 944125  | 1814816 | 128774                 | 115835 | 143159  | 572605      | 0.556             | 0.494 | 0.625 |
| 1968 | 182936              | 131716  | 254074  | 223025                 | 203117 | 244884  | 1074084     | 0.599             | 0.536 | 0.67  |
| 1969 | 111045              | 79892   | 154347  | 148985                 | 134427 | 165120  | 1197226     | 0.71              | 0.635 | 0.792 |
| 1970 | 206796              | 148561  | 287857  | 242030                 | 218197 | 268466  | 933246      | 0.698             | 0.625 | 0.779 |
| 1971 | 406737              | 293540  | 563586  | 330272                 | 293895 | 371152  | 689048      | 0.646             | 0.577 | 0.723 |
| 1972 | 1052751             | 765031  | 1448681 | 353277                 | 311941 | 400090  | 565254      | 0.659             | 0.587 | 0.739 |
| 1973 | 1700149             | 1229756 | 2350472 | 334102                 | 290855 | 383779  | 792685      | 0.627             | 0.56  | 0.703 |
| 1974 | 565981              | 414583  | 772666  | 158993                 | 135790 | 186160  | 1102433     | 0.611             | 0.546 | 0.685 |
| 1975 | 610161              | 446588  | 833648  | 133549                 | 119560 | 149175  | 829377      | 0.658             | 0.591 | 0.732 |
| 1976 | 599582              | 436054  | 824436  | 167188                 | 151704 | 184253  | 867463      | 0.705             | 0.635 | 0.783 |
| 1977 | 372307              | 273059  | 507629  | 336002                 | 299922 | 376423  | 905301      | 0.817             | 0.736 | 0.907 |
| 1978 | 621548              | 454061  | 850816  | 227858                 | 199872 | 259761  | 698715      | 0.855             | 0.77  | 0.95  |
| 1979 | 204031              | 149163  | 279081  | 180352                 | 157650 | 206324  | 440538      | 0.772             | 0.693 | 0.859 |

|      |         |         |         |         |         |         |        |       |       |       |
|------|---------|---------|---------|---------|---------|---------|--------|-------|-------|-------|
| 1980 | 131519  | 98463   | 175674  | 108439  | 96843   | 121423  | 380434 | 0.76  | 0.684 | 0.845 |
| 1981 | 144577  | 110226  | 189635  | 161362  | 146224  | 178068  | 399038 | 0.793 | 0.715 | 0.879 |
| 1982 | 181947  | 141264  | 234346  | 321353  | 288699  | 357700  | 363730 | 0.774 | 0.699 | 0.857 |
| 1983 | 140981  | 109477  | 181550  | 311520  | 280575  | 345878  | 289992 | 0.791 | 0.715 | 0.874 |
| 1984 | 443366  | 347905  | 565021  | 243628  | 222591  | 266654  | 277651 | 0.868 | 0.786 | 0.958 |
| 1985 | 529829  | 425095  | 660367  | 195463  | 178630  | 213881  | 307920 | 0.809 | 0.733 | 0.894 |
| 1986 | 1369810 | 1087193 | 1725895 | 164102  | 150226  | 179259  | 430113 | 0.873 | 0.793 | 0.962 |
| 1987 | 357271  | 283078  | 450909  | 115111  | 104735  | 126515  | 523071 | 0.928 | 0.842 | 1.023 |
| 1988 | 334096  | 265195  | 420897  | 191558  | 173316  | 211720  | 434939 | 0.884 | 0.793 | 0.986 |
| 1989 | 158520  | 127033  | 197810  | 237290  | 212684  | 264742  | 332481 | 0.667 | 0.594 | 0.749 |
| 1990 | 132388  | 104361  | 167942  | 303044  | 266322  | 344828  | 212000 | 0.422 | 0.366 | 0.487 |
| 1991 | 298599  | 236478  | 377039  | 636493  | 565917  | 715869  | 319158 | 0.407 | 0.357 | 0.464 |
| 1992 | 714479  | 573702  | 889802  | 804452  | 723148  | 894898  | 513234 | 0.485 | 0.433 | 0.544 |
| 1993 | 988559  | 794000  | 1230793 | 701423  | 635092  | 774681  | 581611 | 0.586 | 0.526 | 0.652 |
| 1994 | 749508  | 601265  | 934300  | 570797  | 521257  | 625045  | 771086 | 0.747 | 0.673 | 0.83  |
| 1995 | 537661  | 431639  | 669725  | 533335  | 486300  | 584919  | 739999 | 0.771 | 0.697 | 0.854 |
| 1996 | 402269  | 321983  | 502573  | 550636  | 497293  | 609701  | 732228 | 0.791 | 0.714 | 0.876 |
| 1997 | 777417  | 621950  | 971746  | 545650  | 488212  | 609845  | 762403 | 0.937 | 0.851 | 1.032 |
| 1998 | 1048459 | 836046  | 1314841 | 385769  | 345766  | 430401  | 592624 | 0.941 | 0.855 | 1.035 |
| 1999 | 626609  | 499228  | 786493  | 280600  | 252500  | 311828  | 484910 | 0.939 | 0.853 | 1.032 |
| 2000 | 747832  | 598408  | 934569  | 255331  | 233975  | 278637  | 414868 | 0.848 | 0.768 | 0.936 |
| 2001 | 591465  | 473742  | 738441  | 383395  | 347133  | 423445  | 426471 | 0.739 | 0.666 | 0.82  |
| 2002 | 374563  | 300534  | 466828  | 520889  | 471374  | 575605  | 535045 | 0.679 | 0.612 | 0.754 |
| 2003 | 757474  | 609542  | 941308  | 571223  | 518205  | 629664  | 551990 | 0.634 | 0.569 | 0.705 |
| 2004 | 242780  | 198236  | 297334  | 665197  | 604504  | 731983  | 606445 | 0.707 | 0.637 | 0.785 |
| 2005 | 694272  | 565628  | 852175  | 578178  | 526828  | 634532  | 641276 | 0.711 | 0.638 | 0.793 |
| 2006 | 538504  | 438414  | 661446  | 581768  | 530654  | 637805  | 537642 | 0.61  | 0.543 | 0.684 |
| 2007 | 1254871 | 1016429 | 1549250 | 647938  | 587310  | 714824  | 486883 | 0.443 | 0.392 | 0.501 |
| 2008 | 1016970 | 818493  | 1263575 | 718024  | 651175  | 791736  | 464171 | 0.362 | 0.318 | 0.411 |
| 2009 | 590980  | 474494  | 736061  | 1008860 | 916837  | 1110118 | 523430 | 0.308 | 0.269 | 0.352 |
| 2010 | 205517  | 160601  | 262996  | 1239289 | 1124664 | 1365596 | 609983 | 0.292 | 0.256 | 0.334 |
| 2011 | 363991  | 286985  | 461659  | 1798145 | 1625479 | 1989153 | 719830 | 0.309 | 0.269 | 0.353 |
| 2012 | 510052  | 408859  | 636292  | 2016129 | 1816113 | 2238173 | 727663 | 0.291 | 0.254 | 0.334 |
| 2013 | 471175  | 373624  | 594197  | 2238973 | 2008666 | 2495686 | 966209 | 0.317 | 0.278 | 0.362 |
| 2014 | 854919  | 683245  | 1069728 | 2123627 | 1894193 | 2380852 | 986449 | 0.335 | 0.294 | 0.382 |
| 2015 | 452525  | 365146  | 560813  | 1714210 | 1518318 | 1935376 | 864384 | 0.334 | 0.295 | 0.38  |
| 2016 | 285806  | 228500  | 357483  | 1370535 | 1213588 | 1547780 | 849422 | 0.354 | 0.312 | 0.402 |
| 2017 | 770881  | 619270  | 959609  | 1395722 | 1255582 | 1551503 | 868276 | 0.387 | 0.342 | 0.439 |
| 2018 | 492321  | 386933  | 626414  | 1258206 | 1134927 | 1394875 | 778627 | 0.403 | 0.355 | 0.458 |
| 2019 | 635422  | 502979  | 802738  | 1198577 | 1074802 | 1336606 | 692609 | 0.419 | 0.369 | 0.476 |
| 2020 | 540952  | 421568  | 694146  | 964937  | 859377  | 1083463 | 692903 | 0.465 | 0.406 | 0.533 |

|             |         |        |        |        |        |        |        |       |       |       |
|-------------|---------|--------|--------|--------|--------|--------|--------|-------|-------|-------|
| <b>2021</b> | 386652  | 292436 | 511222 | 835773 | 733382 | 952460 | 767284 | 0.545 | 0.462 | 0.643 |
| <b>2022</b> | 197418  | 139406 | 279570 | 711549 | 592344 | 854745 | 719211 | 0.574 | 0.46  | 0.716 |
| <b>2023</b> | 446000* |        |        | 718754 | 540782 | 955296 |        |       |       |       |

\* Recruitment model estimate.

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