

Cod (*Gadus morhua*) in Subdivision 21 (Kattegat)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catch in 2024.

ICES advice on conservation aspects

ICES has not identified any conservation aspects.

Stock development over time

ICES cannot assess the stock and exploitation status relative to MSY and precautionary approach (PA) reference points because the reference points are undefined. SSB is considered to be below possible biomass reference points.

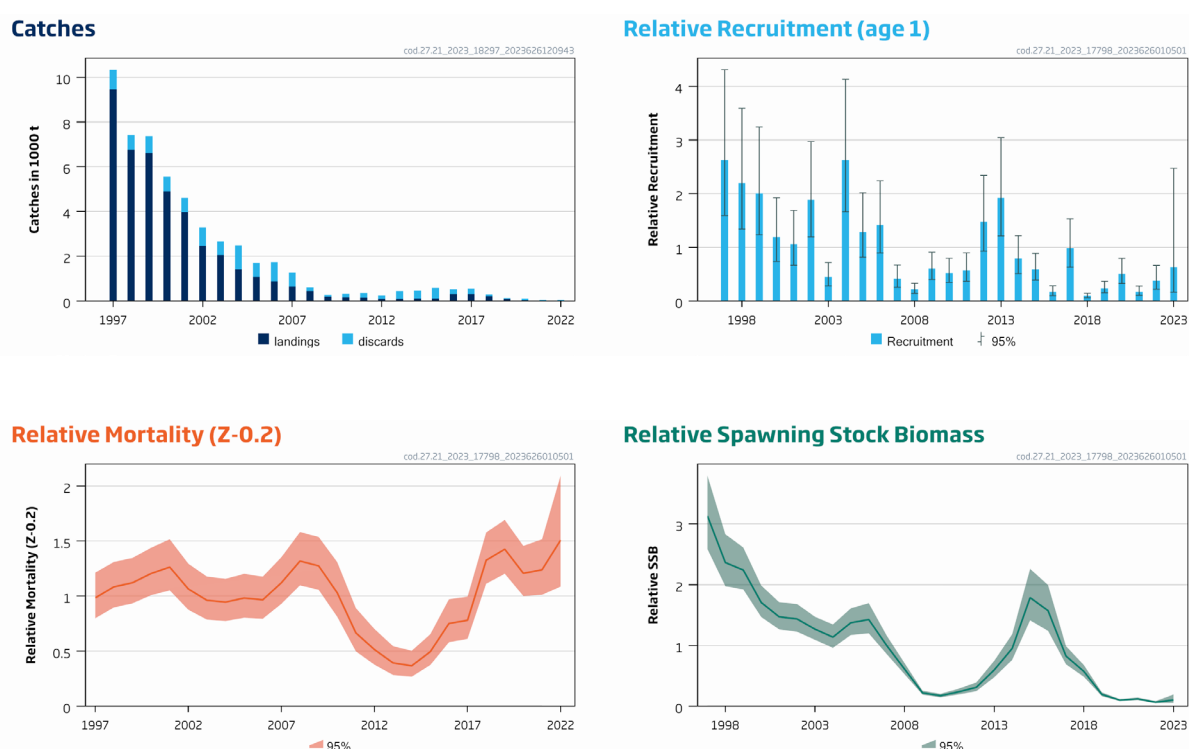


Figure 1 Cod in Subdivision 21. Summary of the stock assessment. Recruitment, mortality, and SSB are relative to the average of the time-series. Landings since 2018 include landings below minimum conservation reference size (BMS). Relative mortality refers to fishing mortality plus unaccounted removals, including migration and additional natural mortality.

Conservation status

Cod is categorized on the HELCOM Red List for the Baltic Sea and Kattegat as Vulnerable (2013).

Catch scenarios

ICES is not able to identify any catch level that is likely to rebuild the stock; thus, the advice is zero catch for 2024.

Basis of the advice

Table 1 Cod in Subdivision 21. The basis of the advice.

| | |
|-----------------|------------------------------------------------------------------------------------|
| Advice basis | Precautionary approach |
| Management plan | ICES is not aware of any agreed precautionary management plan for cod in this area |

Quality of the assessment

Reported landings and discard estimates in recent years did not represent total removals from the stock. Unreported catches have historically been a concern for this stock, estimated as part of the unaccounted removals within the assessment model (i.e. the difference between estimated and observed landings). ICES concluded the catch data to be of reasonable quality from 2011 onwards (ICES, 2017). The unaccounted removals estimated in the model from 2011 onwards only include North Sea cod that use the Kattegat area as nursery grounds and migrate back to the North Sea for spawning, as well as possible increased natural mortality from seal predation.

The assessment is indicative of trends for SSB and total mortality. The current absolute level of fishing mortality is still unknown because the assessment model estimates total removals from the stock. This estimate is a combination of fishing mortality, natural mortality, and migration out from the Kattegat area. It is not possible at present to estimate the relative contribution of these three processes. The level of fishing mortality, therefore, remains unknown.

Issues relevant for the advice

So far, management measures taken, e.g. area closure, effort restriction, and bycatch quota, have not been sufficient to ensure the recovery of the stock.

There is no targeted cod fishery in Kattegat at present, and cod is mainly taken as bycatch in the Norway lobster fishery. This implies that the fishing mortality of the stock is linked to effort directed to the Norway lobster fishery (ICES, 2022). Catches are low and mostly discarded.

The fishing effort regulation as part of the cod long-term management plan has not been in place since 2016. The Swedish sorting grid has a bycatch of less than 1.5% of cod in the Norway lobster fishery (Valentinsson and Ulmestrand, 2006) and has been extensively used in previous years. The removal of the effort system, however, reduced the incentives to use sorting grids.

Reference points

No reference points are defined for this stock.

Basis of the assessment

Table 2 Cod in Subdivision 21. Basis of assessment and advice.

| | |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ICES stock data category | 3 (ICES, 2023a) |
| Assessment type | Age-based analytical assessment (SAM), considered indicative of trends only (ICES, 2023b) |
| Input data | Commercial catches (international landings, age distribution from catch sampling), four bottom trawl survey indices (IBTS-Q1 [G1022], IBTS-Q3 [G2829], BITS-Q1 [G2916], and Cods_Q4 [G7026]), and annual maturity data from survey (IBTS-Q1). Natural mortalities fixed at 0.2. |
| Discards and bycatch | Included in the assessment; data series from the majority of the fleets |
| Indicators | None |
| Other information | Benchmarked in 2017 (ICES, 2017) |
| Working group | Baltic Fisheries Assessment Working Group (WGBFAS) |

History of the advice, catch, and management

Table 3 Cod in Subdivision 21. ICES advice, TAC, and ICES catch estimates. All Weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice | Agreed TAC | Landings (ICES estimates) | Catch (ICES estimates) |
|------|----------------|----------------------------------|-------------------------------|------------|---------------------------|------------------------|
| 1987 | Reduction in F | < 13000 | | 15500 | 11491 | |
| 1988 | Reduction in F | < 15000 | | 15000 | 5527 | |
| 1989 | TAC | 10000 | | 12500 | 8590 | |
| 1990 | TAC | 7000 | | 8500 | 5936 | |

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice | Agreed TAC | Landings (ICES estimates) | Catch (ICES estimates) |
|------|-----------------------------------------------------------------------|----------------------------------|-------------------------------|------------|---------------------------|------------------------|
| 1991 | TAC | 6300 | | 6650 | 6834 | |
| 1992 | 30% reduction in fishing effort | - | | 6650 | 6271 | |
| 1993 | Limit fishing effort to 70% of 1991 effort | - | | 6800 | 7170 | |
| 1994 | Reduction in catch from 1991–1992 | < 6800 | | 6700 | 7802 | |
| 1995 | Precautionary TAC based on recent catches | 6000–7000 | | 6700 | 8164 | |
| 1996 | 30% reduction in fishing effort from 1994 level | - | | 7700 | 6126 | |
| 1997 | Fishing effort should not exceed 70% of the 1994 level | - | | 8500 | 9460 | 10341 |
| 1998 | Fishing effort should not exceed 70% of the 1994 level | - | | 7500 | 6835 | 7499 |
| 1999 | $F = 0.6$ | 4500 | | 6300 | 6608 | 7372 |
| 2000 | At least 40% reduction in F | 6400 | | 7000 | 4897 | 5550 |
| 2001 | $F = F_{pa} = 0.6$ | 4700 | | 6200 | 3960 | 4617 |
| 2002 | No fishery | 0 | | 2800 | 2470 | 3290 |
| 2003 | No fishery | 0 | | 2300 | 2045 | 2661 |
| 2004 | No fishery | 0 | | 1363 | 1403 | 2488 |
| 2005 | No fishery | 0 | | 1000 | 1070 | 1694 |
| 2006 | No fishery | 0 | | 850 | 876 | 1738 |
| 2007 | No fishery | 0 | | 731 | 645 | 1269 |
| 2008 | No catch | 0 | | 673 | 449 | 605 |
| 2009 | No catch | 0 | | 505 | 197 | 264 |
| 2010 | No catch | 0 | | 379 | 155 | 325 |
| 2011 | No directed fisheries; minimize bycatches | 0 | | 190 | 145 | 356 |
| 2012 | No directed fisheries; minimize bycatch and discards | 0 | | 133 | 94 | 251 |
| 2013 | No directed fisheries; minimize bycatch and discards | 0 | | 100 | 92 | 447 |
| 2014 | Same advice as for 2013 | 0 | | 100 | 108 | 456 |
| 2015 | Same advice as in 2014 | 0 | | 100 | 103 | 584 |
| 2016 | Precautionary approach (increase recent landings by no more than 20%) | ≤ 130 | ≤ 536 | 370 | 299 | 521 |

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice | Agreed TAC | Landings (ICES estimates) | Catch (ICES estimates) |
|------|------------------------------------------------------------------------------|----------------------------------|-------------------------------|------------|---------------------------|------------------------|
| 2017 | Precautionary approach (increase recent catch advice by no more than 20%) | ≤ 129 | ≤ 643 | 525 | 294 | 552 |
| 2018 | Precautionary approach (increase recent catch advice by no more than 20%) | ≤ 254 | ≤ 772 | 630 | 212 | 284 |
| 2019 | Precautionary approach | | ≤ 494 | 567 | 83 | 123 |
| 2020 | Precautionary approach | | 0 | 130 | 36 | 97 |
| 2021 | Precautionary approach | | 0 | 123 | 24 | 50 |
| 2022 | Precautionary approach | | 0 | 97 | 19 | 55 |
| 2023 | Precautionary approach | | 0 | 97 | | |
| 2024 | Precautionary approach | | 0 | | | |

History of the catch and landings

Table 4 Cod in Subdivision 21. Catch distribution by fleet in 2022 as estimated by ICES.

| Catch | Landings* | | Discards |
|-----------|------------------|-------------------|-----------|
| 55 tonnes | Active gears 90% | Passive gears 10% | 36 tonnes |
| | 19 tonnes | | |

*Landings since 2018 include landings below minimum conservation reference size (BMS) < 1 tonnes

Table 5 Cod in Subdivision 21. History of commercial catch and landings; the official landings for each country participating in the fishery and ICES catch and discard estimates are presented. Weights are in tonnes.

| Year | Denmark | Sweden | Germany* | Total landings | Discard | Catch |
|------|---------|--------|----------|----------------|---------|-------|
| 1971 | 11748 | 3962 | 22 | 15732 | | |
| 1972 | 13451 | 3957 | 34 | 17442 | | |
| 1973 | 14913 | 3850 | 74 | 18837 | | |
| 1974 | 17043 | 4717 | 120 | 21880 | | |
| 1975 | 11749 | 3642 | 94 | 15485 | | |
| 1976 | 12986 | 3242 | 47 | 16275 | | |
| 1977 | 16668 | 3400 | 51 | 20119 | | |
| 1978 | 10293 | 2893 | 204 | 13390 | | |
| 1979 | 11045 | 3763 | 22 | 14830 | | |
| 1980 | 9265 | 4206 | 38 | 13509 | | |
| 1981 | 10693 | 4380 | 284 | 15337 | | |
| 1982 | 9320 | 3087 | 58 | 12465 | | |
| 1983 | 9149 | 3625 | 54 | 12828 | | |
| 1984 | 7590 | 4091 | 205 | 11886 | | |
| 1985 | 9052 | 3640 | 14 | 12706 | | |
| 1986 | 6930 | 2054 | 112 | 9096 | | |
| 1987 | 9396 | 2006 | 89 | 11491 | | |
| 1988 | 4054 | 1359 | 114 | 5527 | | |
| 1989 | 7056 | 1483 | 51 | 8590 | | |

| Year | Denmark | Sweden | Germany* | Total landings | Discard | Catch |
|------|---------|--------|----------|----------------|---------|-------|
| 1990 | 4715 | 1186 | 35 | 5936 | | |
| 1991 | 4664 | 2006 | 104 | 6774 | | |
| 1992 | 3406 | 2771 | 94 | 6271 | | |
| 1993 | 4464 | 2549 | 157 | 7170 | | |
| 1994 | 3968 | 2836 | 98 | 7802** | | |
| 1995 | 3789 | 2704 | 71 | 8164*** | | |
| 1996 | 4028 | 2334 | 64 | 6126^ | | |
| 1997 | 6099 | 3303 | 58 | 9460^^ | 881 | 10341 |
| 1998 | 4207 | 2509 | 38 | 6754 | 664 | 7418 |
| 1999 | 4029 | 2540 | 39 | 6608 | 764 | 7372 |
| 2000 | 3285 | 1568 | 45 | 4897 | 653 | 5550 |
| 2001 | 2752 | 1191 | 16 | 3960 | 657 | 4617 |
| 2002 | 1726 | 744 | 3 | 2470 | 820 | 3290 |
| 2003 | 1441 | 603 | 1 | 2045 | 616 | 2661 |
| 2004 | 827 | 575 | 1 | 1403 | 1086 | 2489 |
| 2005 | 608 | 336 | 10 | 1070^^^ | 624 | 1694 |
| 2006 | 540 | 315 | 21 | 876 | 862 | 1738 |
| 2007 | 390 | 247 | 7 | 645 | 624 | 1269 |
| 2008 | 296 | 152 | 1 | 449 | 156 | 605 |
| 2009 | 134 | 62 | 0.30 | 197 | 67 | 264 |
| 2010 | 117 | 38 | 0.30 | 155 | 170 | 325 |
| 2011 | 102 | 42 | 1.40 | 145 | 211 | 356 |
| 2012 | 63 | 31 | < 0.1 | 94 | 157 | 251 |
| 2013 | 60 | 32 | 0.50 | 92 | 355 | 447 |
| 2014 | 75 | 32 | < 0.1 | 108 | 348 | 456 |
| 2015 | 65 | 38 | < 0.1 | 103 | 481 | 584 |
| 2016 | 185 | 114 | 0 | 299 | 222 | 521 |
| 2017 | 208 | 85 | 0.10 | 294 | 258 | 552 |
| 2018 | 175 | 37 | 0.70 | 212 | 72 | 284 |
| 2019 | 66 | 17 | 1 | 83 | 40 | 123 |
| 2020 | 26 | 11 | 0.10 | 36 | 61 | 97 |
| 2021 | 19 | 4 | 0.80 | 24 | 26 | 50 |
| 2022 | 15 | 3 | 0.9 | 19 | 36 | 55 |

* Landings statistics incompletely split on the Kattegat and Skagerrak.

** Including 900 t reported in Skagerrak.

*** Including 1600 t misreported by area.

^ Excluding 300 t taken in subdivisions 22–24.

^^ Including 1700 t reported in Subdivision 23.

^^^ Including 116 t reported as pollack.

+ Includes landings below minimum conservation reference size (BMS).

Summary of the assessment

Table 6 Cod in Subdivision 21. Assessment summary. High and Low refer to 95% confidence limits. Recruitment, spawning-stock biomass (SSB), and mortality are relative to the average of the time-series.

| Year | Relative Recruitment (age 1) | | | SSB | | | Landings | Discards | Relative Mortality (Z - 0.2)* | | |
|------|------------------------------|----------|------------------|---------|----------|----------|----------|----------|-------------------------------|---------------------|------|
| | Low Recruitment | Midpoint | High Recruitment | Low SSB | Midpoint | High SSB | | | Low | Midpoint (ages 3–5) | High |
| 1997 | 1.59 | 2.6 | 4.3 | 2.6 | 3.1 | 3.8 | 9461 | 881 | 0.80 | 0.98 | 1.21 |
| 1998 | 1.34 | 2.2 | 3.6 | 1.98 | 2.4 | 2.8 | 6754 | 664 | 0.90 | 1.08 | 1.31 |
| 1999 | 1.23 | 2.0 | 3.2 | 1.92 | 2.2 | 2.6 | 6608 | 764 | 0.93 | 1.12 | 1.35 |
| 2000 | 0.74 | 1.19 | 1.93 | 1.47 | 1.71 | 1.99 | 4897 | 653 | 1.01 | 1.21 | 1.44 |
| 2001 | 0.67 | 1.06 | 1.69 | 1.26 | 1.47 | 1.71 | 3960 | 657 | 1.05 | 1.26 | 1.52 |
| 2002 | 1.20 | 1.89 | 3.0 | 1.23 | 1.44 | 1.68 | 2470 | 820 | 0.88 | 1.06 | 1.29 |
| 2003 | 0.28 | 0.45 | 0.72 | 1.09 | 1.27 | 1.47 | 2045 | 616 | 0.79 | 0.96 | 1.18 |
| 2004 | 1.66 | 2.6 | 4.1 | 0.96 | 1.14 | 1.35 | 1402 | 1086 | 0.77 | 0.95 | 1.16 |
| 2005 | 0.82 | 1.28 | 2.0 | 1.17 | 1.37 | 1.61 | 1070 | 624 | 0.80 | 0.98 | 1.20 |
| 2006 | 0.89 | 1.42 | 2.2 | 1.20 | 1.43 | 1.70 | 876 | 862 | 0.79 | 0.97 | 1.18 |
| 2007 | 0.26 | 0.41 | 0.67 | 0.86 | 1.00 | 1.16 | 645 | 624 | 0.93 | 1.12 | 1.35 |
| 2008 | 0.141 | 0.22 | 0.33 | 0.52 | 0.61 | 0.71 | 449 | 156 | 1.10 | 1.32 | 1.58 |
| 2009 | 0.40 | 0.60 | 0.91 | 0.189 | 0.22 | 0.26 | 197 | 67 | 1.06 | 1.27 | 1.54 |
| 2010 | 0.35 | 0.52 | 0.79 | 0.147 | 0.173 | 0.20 | 155 | 170 | 0.81 | 1.03 | 1.31 |
| 2011 | 0.37 | 0.57 | 0.90 | 0.192 | 0.24 | 0.29 | 145 | 211 | 0.50 | 0.67 | 0.89 |
| 2012 | 0.93 | 1.47 | 2.3 | 0.25 | 0.31 | 0.39 | 94 | 157 | 0.38 | 0.51 | 0.70 |
| 2013 | 1.21 | 1.92 | 3.0 | 0.48 | 0.60 | 0.75 | 92 | 355 | 0.28 | 0.39 | 0.55 |
| 2014 | 0.51 | 0.79 | 1.22 | 0.76 | 0.95 | 1.19 | 108 | 348 | 0.27 | 0.37 | 0.50 |
| 2015 | 0.39 | 0.59 | 0.89 | 1.41 | 1.79 | 2.3 | 103 | 481 | 0.37 | 0.50 | 0.65 |
| 2016 | 0.099 | 0.167 | 0.28 | 1.24 | 1.57 | 2.00 | 299 | 222 | 0.58 | 0.75 | 0.97 |
| 2017 | 0.63 | 0.98 | 1.53 | 0.69 | 0.83 | 0.99 | 294 | 258 | 0.61 | 0.78 | 1.00 |
| 2018 | 0.060 | 0.093 | 0.144 | 0.48 | 0.57 | 0.68 | 212 | 72 | 1.11 | 1.33 | 1.58 |
| 2019 | 0.154 | 0.24 | 0.37 | 0.165 | 0.194 | 0.23 | 83 | 40 | 1.20 | 1.43 | 1.69 |
| 2020 | 0.33 | 0.51 | 0.79 | 0.083 | 0.098 | 0.116 | 36 | 61 | 1.00 | 1.21 | 1.46 |
| 2021 | 0.104 | 0.170 | 0.28 | 0.099 | 0.119 | 0.142 | 24 | 26 | 1.01 | 1.24 | 1.52 |
| 2022 | 0.22 | 0.38 | 0.66 | 0.050 | 0.064 | 0.082 | 19 | 36 | 1.09 | 1.51 | 2.1 |
| 2023 | 0.164 | 0.64 | 2.5 | 0.052 | 0.101 | 0.194 | | | | | |

* Includes unaccounted removals (including migration and additional natural mortality).

Sources and references

- ICES. 2017. Report of the Benchmark Workshop on Baltic Stocks (WKBALT), 7–10 February 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:30. 108 pp. <https://doi.org/10.17895/ices.pub.19280918>
- ICES. 2022. EU standing request on catch scenarios for zero-TAC stocks: cod (*Gadus morhua*) in Subdivision 21. In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sr.2022.09e, <https://doi.org/10.17895/ices.advice.21458106>
- ICES. 2023a. Advice on fishing opportunities. In Report of the ICES Advisory Committee, 2023. ICES Advice 2023, section 1.1.1. <https://doi.org/10.17895/ices.advice.22240624>
- ICES. 2023b. Baltic Fisheries Assessment Working Group (WGBFAS). ICES Scientific Reports. 5:58. 606 pp. <https://doi.org/10.17895/ices.pub.23123768>
- Stepputtis, D., Santos, J., Mieske, B., Lichtenstein, U., Schütz, A., and Stechert, R. 2020. Abschlussbericht an das Ministerium für Landwirtschaft und Umwelt Mecklenburg-Vorpommern für das Projekt CODEX (CodEXcluder) - Netzmodifikation zur Reduktion des Dorschbeifanges: final report (in German, English summary). Thünen-Institute of Baltic Sea Fisheries, Rostock. 44 pp. https://literatur.thuenen.de/digbib_external/dn063252.pdf
- Valentinsson, D., and Ulmestrand, M. 2008. Species-selective Nephrops trawling: Swedish grid experiments. Fisheries Research, 90: 109–117. <https://doi.org/10.1016/j.fishres.2007.10.011>

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