

ICES. 2018. Report on the Assessment of a Long-term Management Strategy for Southern Horse Mackerel (hom27.9a), 15–16 February 2018. Manuela Azevedo, Hugo Mendes, Gersom Costas, Ernesto Jardim, Iago Mosqueira, Finlay Scott (Authors.) ICES CM 2018/ACOM:42. 36 pp.

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ICES. 2022b. Working Group on Southern Horse Mackerel, Anchovy and Sardine (WGHANSA). Draft report. ICES Scientific Reports. 4:51. <https://doi.org/10.17895/ices.pub.19982720>. Publication of the full report is expected end of 2022.

[Download the stock assessment data and figures.](#)

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Four-spot megrim (*Lepidorhombus boscii*) in divisions 8.c and 9.a (southern Bay of Biscay and Atlantic Iberian waters East)

ICES advice on fishing opportunities

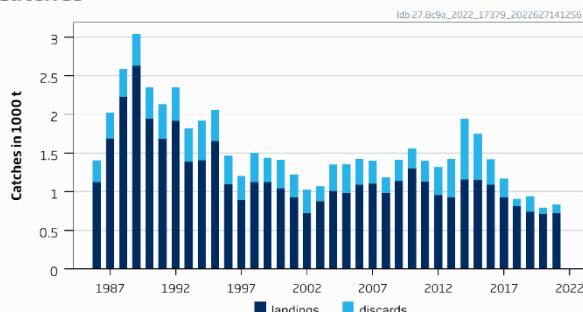
ICES advises that when the EU multiannual plan (MAP) for Western Waters and adjacent waters is applied, catches in 2023 that correspond to the F ranges in the MAP are between 1595 tonnes and 3421 tonnes. According to the MAP, catches higher than those corresponding to F_{MSY} (2282 tonnes) can only be taken under conditions specified in the MAP, while the entire range is considered precautionary when applying the ICES advice rule.

Management of catches of the two megrim species—megrim (*Lepidorhombus whiffagonis*) and four-spot megrim (*Lepidorhombus boscii*)—under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species.

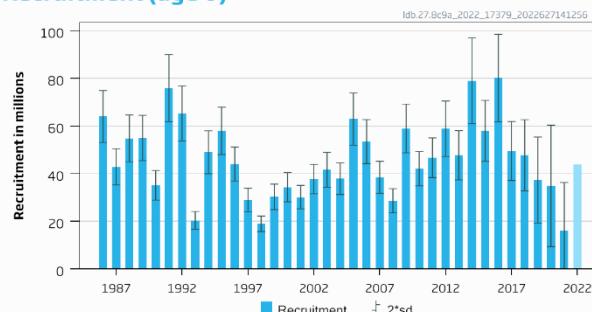
Stock development over time

The fishing pressure on the stock is below F_{MSY} ; spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

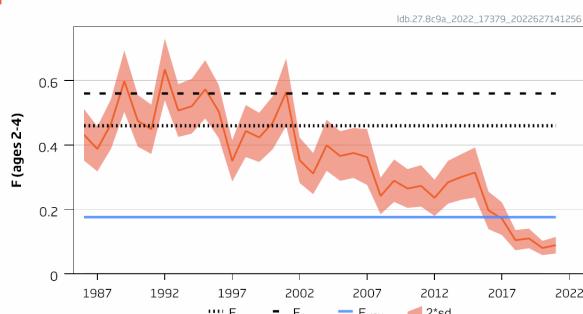
Catches



Recruitment (age 0)



F



SSB

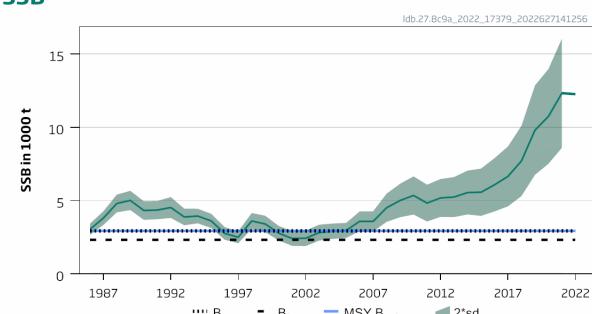


Figure 1 Four-spot megrim in divisions 8.c and 9.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. The SSB in 2022 is a forecast.

Catch scenarios

Table 1 Four-spot megrim in divisions 8.c and 9.a. The basis of the catch scenarios.

| Variable | Value | Notes |
|---------------------------|-------|--|
| $F_{ages\ 2-4}\ (2022)$ | 0.093 | F_{sq} = average F (2019–2021). |
| SSB (2023) | 12118 | Short-term forecast (STF); in tonnes. |
| $R_{age\ 0}\ (2022-2023)$ | 43826 | Geometric mean 1990–2019; in thousands. |
| Total catch (2022) | 1288 | STF; in tonnes. |
| Projected landings (2022) | 1118 | STF assuming average landings ratio at age 2017–2021; in tonnes. |
| Projected discards (2022) | 100 | STF assuming average discards ratio at age 2017–2021; in tonnes. |

Table 2 Four-spot megrim in divisions 8.c and 9.a. Annual catch scenarios. All weights are in tonnes. Note: The % change in TAC is not computed because the TAC is for the two megrim species combined.

| Basis | Total catch (2023) | Projected landings (2023) | Projected discards (2023) | F _{ages 2–4} Total (2023) | F _{ages 2–4} Projected landings (2023) | F _{ages 1–2} Projected discards (2023) | SSB (2024) | % SSB change* | % advice change ^{^^} |
|---|--------------------|---------------------------|---------------------------|------------------------------------|---|---|------------|---------------|-------------------------------|
| ICES advice basis | | | | | | | | | |
| EU MAP [^] : F _{MSY} | 2282 | 2129 | 153 | 0.176 | 0.108 | 0.075 | 10295 | -15.0 | 21 |
| F = MAP [^] F _{MSY lower} | 1595 | 1489 | 106 | 0.119 | 0.073 | 0.051 | 11023 | -9.0 | 24 ^{^^} |
| F = MAP [^] F _{MSY upper} | 3421 | 3187 | 234 | 0.28 | 0.173 | 0.119 | 9095 | -25 | 26 ^{^^} |
| Other scenarios | | | | | | | | | |
| MSY approach = F _{MSY} | 2282 | 2129 | 153 | 0.176 | 0.108 | 0.075 | 10295 | -15.0 | 21 |
| F = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12718 | 5.0 | 0 |
| F _{pa} | 5090 | 4730 | 360 | 0.46 | 0.28 | 0.195 | 7350 | -39 | 169 |
| SSB (2024) = B _{pa} | 9444 | 8689 | 755 | 1.26 | 0.82 | 0.54 | 2932 | -76 | 399 |
| SSB (2024) = B _{lim} | 10076 | 9248 | 828 | 1.48 | 0.96 | 0.63 | 2321 | -81 | 433 |
| SSB ₂₀₂₄ = SSB ₂₀₂₃ | 563 | 526 | 37 | 0.04 | 0.026 | 0.0170 | 12118 | 0 | -70 |
| SSB (2024) = MSY B _{trigger} | 9444 | 8689 | 755 | 1.26 | 0.82 | 0.54 | 2932 | -76 | 399 |
| F = F ₂₀₂₂ | 1268 | 1184 | 84 | 0.093 | 0.057 | 0.040 | 11370 | -6.2 | -33 |

* SSB 2024 relative to SSB 2023.

[^] The EU multiannual plan (MAP; EU, 2019).

^{^^} Advice value for 2023 relative to the advice value for 2022 for the F_{MSY lower} (1283 tonnes) and F_{MSY upper} (2724 tonnes).

^{^^^} Advice value for 2023 relative to advice value for 2022 (1892 tonnes).

The advice for 2023 is 21% higher than the advice for 2022. The stock was benchmarked in 2022 (ICES, 2022a) resulting in a new model and reference points for this stock.

Basis of the advice

Table 3 Four-spot megrim in divisions 8.c and 9.a. The basis of the advice.

| Advice basis | Management plan approach |
|-----------------|---|
| Management plan | <p>The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock.</p> <p>In accordance with the MAP, “provided that the stock is above MSY B_{trigger}:</p> <ul style="list-style-type: none"> (a) if, on the basis of scientific advice or evidence, it is necessary for the achievement of the objectives laid down in Article 3 in the case of mixed fisheries; (b) if, on the basis of scientific advice or evidence, it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; or (c) in order to limit variations in fishing opportunities between consecutive years to not more than 20 %.” <p>ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary.</p> <p>Full details of the plan are described in Regulation 2019/472 (EU, 2019).</p> |

Quality of the assessment

The stock was benchmarked in 2022 and this resulted in a different assessment model and revisions to data (ICES, 2022a). A Portuguese survey index is now included in the assessment and commercial abundance indices were removed. These changes triggered the calculation of new reference points. Such changes have lead to a different picture of the historical assessment results in comparison with previous years' assessments. However the perception of the stock, in relation to reference points, does not change in relation to previous years' assessments.

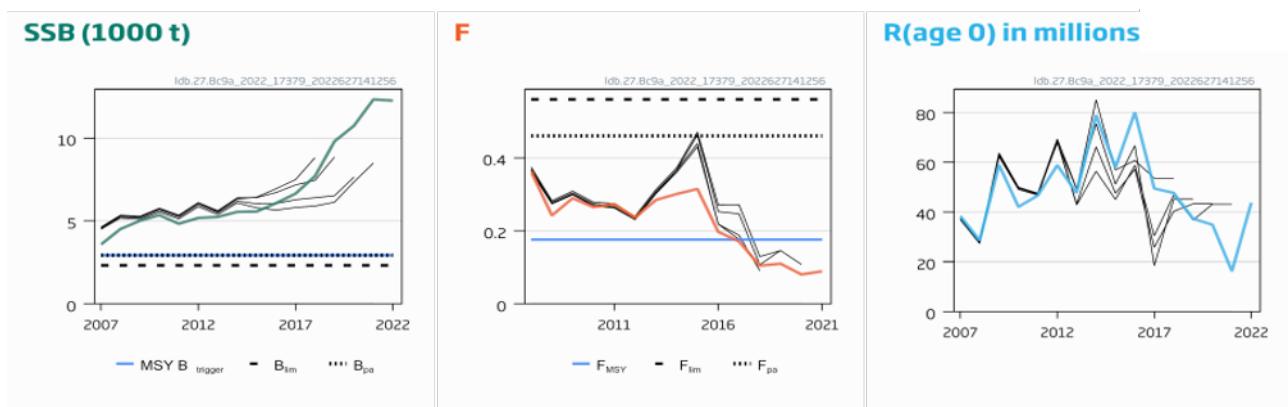


Figure 2 Four-spot megrim in divisions 8.c and 9.a. Historical assessment results (final-year recruitment assumptions included for each line). The reference points were revised in 2022 following a benchmark, and only the last assessment results should be compared to the reference points indicated.

Issues relevant for the advice

The two megrim species are not separated in the landings statistics, and species-specific landings are estimated by ICES. A single TAC covers both. ICES considers that management of the catches of the two megrim species under a combined TAC prevents effective control of single-species exploitation rates and could lead to overexploitation of either species. Mixed-fisheries advice for the two megrim species will be provided in the Iberian waters fisheries overview later in the year.

Reference points

Table 4 Four-spot megrim in divisions 8.c and 9.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------|----------------|--|-------------------------|
| MSY approach | MSY $B_{trigger}$ | 2932 | B_{pa} ; in tonnes. | ICES (2022a) |
| | F_{MSY} | 0.176 | Stochastic simulations (EqSim) based on the recruitment period 1986–2020. | ICES (2022a) |
| Precautionary approach | B_{lim} | 2321 | B_{loss} , biomass in 2001 as estimated in 2022; in tonnes. | ICES (2022a) |
| | B_{pa} | 2932 | $B_{lim} * \exp(1.645 * \sigma)$, with $\sigma = 0.142$; in tonnes. | ICES (2022a) |
| | F_{lim} | 0.56 | The F that results in long-term probability ($SSB < B_{lim}$) = 50% (EqSim). | ICES (2022a) |
| | F_{pa} | 0.46 | F_{P95} with advice rule (AR): the F that provides a 95% probability for SSB to be above B_{lim} . | ICES (2022a) |
| Management plan | SSB_{mgt} | Not applicable | | |
| | F_{mgt} | Not applicable | | |
| | MAP MSY $B_{trigger}$ | 2932 | MSY $B_{trigger}$; in tonnes | ICES (2022a), EU (2019) |
| | MAP B_{lim} | 2321 | B_{lim} ; in tonnes.. | ICES (2022a), EU (2019) |
| | MAP F_{MSY} | 0.176 | F_{MSY} | ICES (2022a), EU (2019) |
| | MAP range F_{lower} | 0.119 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2022a), EU (2019) |
| | MAP range F_{upper} | 0.28 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2022a), EU (2019) |

Basis of the assessment

Table 5 Four-spot megrim in divisions 8.c and 9.a. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022b). |
| Assessment type | Age-based assessment (a4a; ICES, 2022c) that uses catches in the model and in the forecast. |
| Input data | Commercial catches (international landings, ages, and length frequencies from catch sampling); two survey indices, the Spanish North Coast Bottom Trawl Survey (SP-NSGFS-Q4 [G2784]) from 1988 to 2020 but excluding 2003 and 2013 and the Portuguese Crustacean Survey (PT-CTS -UWTV -FU 28-29 [G2913]) from 1997 to 2018; constant maturity ogive; assumed natural mortality of 0.2 |
| Discards and bycatch | Included in the assessment for all data series from the majority of the fleet. |
| Indicators | None. |
| Other information | Last benchmarked in 2022 (ICES, 2022a). |
| Working group | Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE) |

History of the advice, catch, and management

Table 6 Four-spot megrim in divisions 8.c and 9.a. ICES advice and official landings. All weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice for combined <i>Lepidorhombus species</i> *; **, ^ | Catches corresponding to advice <i>L. boscii</i> ** | Agreed TAC*, *** | ICES landings (combined <i>Lepidorhombus species</i>)* | Landings <i>L. boscii</i> | Discards |
|------|--|---|---|------------------|---|---------------------------|----------|
| 1987 | Not assessed | | | 13000 | 2185 | 1688 | 333 |
| 1988 | Not assessed | | | 13000 | 3040 | 2223 | 363 |
| 1989 | Not assessed | | | 13000 | 3343 | 2629 | 408 |
| 1990 | Not assessed | | | 13000 | 2922 | 1945 | 409 |
| 1991 | No advice | | | 14300 | 2296 | 1682 | 447 |
| 1992 | No advice | | | 14300 | 2432 | 1916 | 437 |
| 1993 | <i>L. boscii</i> no gain in increasing F; <i>L. whiff</i> . safe biological limits | | | 8000 | 1767 | 1384 | 438 |
| 1994 | No gains in increasing F | | | 6000 | 1882 | 1403 | 517 |
| 1995 | Concern about low SSB | | | 6000 | 1870 | 1652 | 406 |
| 1996 | Mixed fishing aspects | | | 6000 | 1426 | 1098 | 368 |
| 1997 | Reduce F by at least 50% | | | 6000 | 1252 | 896 | 308 |
| 1998 | Reduce F by at least 50% | 900 | | 6000 | 1569 | 1123 | 378 |
| 1999 | Reduce F by at least 50% | 1000 | | 6000 | 1468 | 1125 | 317 |
| 2000 | Reduce F by at least 20% | < 1500 | | 5000 | 1294 | 1041 | 373 |
| 2001 | No increase in F | 1610 | | 5000 | 1105 | 931 | 290 |
| 2002 | No increase in F | 1550 | | 4000 | 837 | 720 | 308 |
| 2003 | No increase in F | 1550 | | 2400 | 1009 | 876 | 191 |
| 2004 | No increase in F | 1380 | | 1336 | 1155 | 1006 | 348 |
| 2005 | No increase in F | 1090 | | 1336 | 1130 | 983 | 375 |
| 2006 | No increase in F | 1200 | | 1269 | 1302 | 1092 | 335 |
| 2007 | No increase in F | 1440 | | 1440 | 1259 | 1104 | 292 |
| 2008 | No increase in F | 1430 | | 1430 | 1113 | 980 | 202 |
| 2009 | Same advice as last year | 1430 | | 1430 | 1218 | 1134 | 279 |
| 2010 | Reduce F to $F_{0.1}$ | 900 | | 1287 | 1381 | 1297 | 265 |
| 2011 | MSY framework | < 890 | < 780 | 1094 | 1430 | 1128 | 269 |
| 2012 | MSY framework | < 860 | < 760 | 1214 | 1214 | 952 | 369 |
| 2013 | MSY framework | < 890 | < 780 | 1214 | 1163 | 931 | 496 |
| 2014 | MSY approach | < 2257 | < 1957 | 2257 | 1531 | 1154 | 788 |
| 2015 | MSY approach | < 1013 | < 821 | 1377 | 1424 | 1148 | 597 |
| 2016 | MSY approach | ≤ 1259 | ≤ 1072 | 1363 | 1322 | 1087 | 332 |
| 2017 | MSY approach | | ≤ 1197 | 1159 | 1172 | 926 | 246 |
| 2018 | MSY approach | | ≤ 1399 | 1387 | 1129 | 814 | 92 |
| 2019 | MSY approach | | ≤ 1633 | 1872 | 981 | 742 | 201 |

| Year | ICES advice | Landings corresponding to advice for combined <i>Lepidorhombus species</i> *, **, ^ | Catches corresponding to advice <i>L. boscii</i> ** | Agreed TAC*, *** | ICES landings (combined <i>Lepidorhombus species</i>)* | Landings <i>L. boscii</i> | Discards |
|------|-----------------|---|---|------------------|---|---------------------------|----------|
| 2020 | Management plan | | 1885 (range 1275–2651) [#] | 2322 | 1026 | 711 | 81 |
| 2021 | Management plan | | 1690 (range 1148–2375) [#] | 2158 | 985 | 723 | 109 |
| 2022 | Management plan | | 1892 (range 1283–2724) [#] | 2445 | | | |
| 2023 | Management plan | | 2282 (range 1595–3421) [#] | | | | |

* For both megrim species combined.

** Advice was for landings until 2015, and advice is for catches from 2016 onward.

*** For Division 8.c and subareas 9 and 10; EU waters of CECAF 34.1.1.

[#] Catches corresponding to F_{MSY} ; EU MAP range in brackets (MAP; EU, 2019).

[^] The advice for 2017 onward is for single species only.

History of the catch and landings

Table 7 Four-spot megrim in divisions 8.c and 9.a. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

| Catch | Landings | | | Discards |
|-------|------------------------|----------------------|-----|----------|
| | 831 | | 723 | |
| | 89% bottom otter trawl | 11% other gear types | | 109 |

Table 8 Four-spot megrim in divisions 8.c and 9.a. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Year | Official landings | | | | ICES landings | Discards | ICES catch |
|------|-------------------|------------|----------|----------|---------------|----------|------------|
| | Spain | | Portugal | | | | |
| | Div. 8.c | Div. 9.a * | Total | Div. 9.a | | | |
| 1986 | 799 | 197 | 996 | 128 | 1124 | 284 | 1408 |
| 1987 | 995 | 586 | 1581 | 107 | 1688 | 333 | 2021 |
| 1988 | 917 | 1099 | 2016 | 207 | 2223 | 363 | 2586 |
| 1989 | 805 | 1548 | 2353 | 276 | 2629 | 408 | 3037 |
| 1990 | 927 | 798 | 1725 | 220 | 1945 | 409 | 2354 |
| 1991 | 841 | 634 | 1475 | 207 | 1682 | 447 | 2129 |
| 1992 | 654 | 938 | 1592 | 324 | 1916 | 437 | 2353 |
| 1993 | 744 | 419 | 1163 | 221 | 1384 | 438 | 1822 |
| 1994 | 665 | 561 | 1227 | 176 | 1403 | 517 | 1920 |
| 1995 | 685 | 826 | 1512 | 141 | 1652 | 406 | 2058 |
| 1996 | 480 | 448 | 928 | 170 | 1098 | 368 | 1466 |
| 1997 | 505 | 289 | 794 | 101 | 896 | 308 | 1204 |
| 1998 | 725 | 284 | 1010 | 113 | 1123 | 378 | 1501 |
| 1999 | 713 | 298 | 1011 | 114 | 1125 | 317 | 1442 |
| 2000 | 674 | 225 | 899 | 142 | 1041 | 373 | 1414 |
| 2001 | 629 | 177 | 807 | 124 | 931 | 290 | 1221 |
| 2002 | 343 | 247 | 590 | 130 | 720 | 308 | 1028 |
| 2003 | 393 | 314 | 707 | 169 | 876 | 191 | 1067 |
| 2004 | 534 | 295 | 829 | 177 | 1006 | 348 | 1354 |
| 2005 | 473 | 321 | 794 | 189 | 983 | 375 | 1358 |
| 2006 | 542 | 348 | 891 | 201 | 1092 | 335 | 1427 |
| 2007 | 591 | 295 | 886 | 218 | 1104 | 292 | 1396 |
| 2008 | 546 | 262 | 808 | 172 | 980 | 202 | 1182 |
| 2009 | 577 | 342 | 919 | 215 | 1134 | 279 | 1413 |
| 2010 | 616 | 484 | 1100 | 197 | 1297 | 265 | 1562 |
| 2011 | 390 | 384 | 774 | 181 | 1128 | 269 | 1397 |

| Year | Official landings | | | | ICES landings | Discards | ICES catch | | | |
|------|-------------------|------------|----------|----------|---------------|----------|------------|--|--|--|
| | Spain | | Portugal | | | | | | | |
| | Div. 8.c | Div. 9.a * | Total | Div. 9.a | | | | | | |
| 2012 | 240 | 239 | 479 | 98 | 952 | 369 | 1321 | | | |
| 2013 | 338 | 283 | 621 | 80 | 931 | 496 | 1427 | | | |
| 2014 | 427 | 313 | 739 | 142 | 1154 | 788 | 1942 | | | |
| 2015 | 460 | 255 | 715 | 137 | 1148 | 597 | 1745 | | | |
| 2016 | 403 | 276 | 679 | 105 | 1087 | 332 | 1419 | | | |
| 2017 | 346 | 265 | 611 | 144 | 926 | 246 | 1172 | | | |
| 2018 | 381 | 231 | 612 | 130 | 814 | 92 | 906 | | | |
| 2019 | 385 | 240 | 625 | 118 | 742 | 201 | 943 | | | |
| 2020 | 346# | 224# | 569# | 141# | 711 | 81 | 792 | | | |
| 2021 | 368# | 222# | 590# | 132# | 723 | 109 | 831 | | | |

* Division 9.a excluding Gulf of Cadiz until 2016.

Preliminary.

Summary of the assessment

Table 9 Four-spot megrim in divisions 8.c and 9.a. Assessment summary. ‘High’ and ‘Low’ refer to two standard deviations (sd) confidence intervals. Weights are in tonnes and recruitment is in thousands.

| Year | Recruitment (age 0) | | | Spawning-stock biomass | | | Landing | Discards | Fishing pressure (ages 2–4) | | |
|------|---------------------|-------|-------|------------------------|------|------|---------|----------|-----------------------------|------|-------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | thousands | | | tonnes | | | tonnes | | | | |
| 1986 | 64015 | 74909 | 53120 | 3034 | 3422 | 2645 | 1124 | 284 | 0.43 | 0.51 | 0.35 |
| 1987 | 42845 | 50427 | 35262 | 3803 | 4275 | 3332 | 1688 | 333 | 0.39 | 0.46 | 0.32 |
| 1988 | 54812 | 64668 | 44956 | 4804 | 5413 | 4194 | 2223 | 363 | 0.46 | 0.54 | 0.39 |
| 1989 | 54992 | 64503 | 45481 | 5008 | 5669 | 4347 | 2629 | 408 | 0.60 | 0.69 | 0.50 |
| 1990 | 35121 | 41355 | 28886 | 4323 | 4963 | 3683 | 1945 | 409 | 0.48 | 0.56 | 0.39 |
| 1991 | 75915 | 89999 | 61831 | 4352 | 4978 | 3726 | 1682 | 447 | 0.45 | 0.53 | 0.37 |
| 1992 | 65257 | 76803 | 53711 | 4526 | 5241 | 3812 | 1916 | 437 | 0.63 | 0.73 | 0.54 |
| 1993 | 20398 | 24142 | 16654 | 3883 | 4455 | 3312 | 1384 | 438 | 0.51 | 0.59 | 0.43 |
| 1994 | 48992 | 58007 | 39977 | 3944 | 4445 | 3443 | 1403 | 517 | 0.52 | 0.61 | 0.44 |
| 1995 | 57993 | 67937 | 48049 | 3612 | 4103 | 3122 | 1652 | 406 | 0.57 | 0.66 | 0.48 |
| 1996 | 44066 | 51194 | 36939 | 2756 | 3189 | 2323 | 1098 | 368 | 0.50 | 0.59 | 0.42 |
| 1997 | 29004 | 33937 | 24070 | 2499 | 2907 | 2091 | 896 | 308 | 0.35 | 0.42 | 0.29 |
| 1998 | 19002 | 22279 | 15725 | 3606 | 4153 | 3058 | 1123 | 378 | 0.44 | 0.52 | 0.36 |
| 1999 | 30271 | 35607 | 24935 | 3405 | 3970 | 2840 | 1125 | 317 | 0.42 | 0.50 | 0.35 |
| 2000 | 34347 | 40496 | 28199 | 2775 | 3276 | 2275 | 1041 | 373 | 0.47 | 0.55 | 0.39 |
| 2001 | 30174 | 35107 | 25241 | 2414 | 2920 | 1908 | 931 | 290 | 0.56 | 0.67 | 0.46 |
| 2002 | 37729 | 43890 | 31568 | 2430 | 2966 | 1894 | 720 | 308 | 0.35 | 0.42 | 0.28 |
| 2003 | 41618 | 48952 | 34284 | 2813 | 3356 | 2269 | 876 | 191 | 0.31 | 0.38 | 0.25 |
| 2004 | 37882 | 44528 | 31236 | 2910 | 3437 | 2383 | 1006 | 348 | 0.40 | 0.48 | 0.32 |
| 2005 | 62932 | 73898 | 51966 | 2960 | 3473 | 2447 | 983 | 375 | 0.37 | 0.44 | 0.29 |
| 2006 | 53446 | 62681 | 44211 | 3582 | 4260 | 2904 | 1092 | 335 | 0.38 | 0.45 | 0.30 |
| 2007 | 38465 | 45197 | 31733 | 3577 | 4270 | 2883 | 1104 | 292 | 0.36 | 0.45 | 0.28 |
| 2008 | 28638 | 33693 | 23583 | 4510 | 5478 | 3542 | 980 | 202 | 0.24 | 0.30 | 0.185 |
| 2009 | 58976 | 69210 | 48743 | 5006 | 6148 | 3863 | 1134 | 279 | 0.29 | 0.36 | 0.22 |
| 2010 | 42113 | 49339 | 34886 | 5350 | 6658 | 4042 | 1297 | 265 | 0.26 | 0.33 | 0.20 |
| 2011 | 46711 | 55008 | 38413 | 4827 | 6087 | 3568 | 1128 | 269 | 0.27 | 0.34 | 0.21 |
| 2012 | 58851 | 70488 | 47213 | 5180 | 6474 | 3886 | 952 | 369 | 0.24 | 0.29 | 0.180 |
| 2013 | 47725 | 58053 | 37397 | 5241 | 6609 | 3873 | 931 | 496 | 0.28 | 0.35 | 0.22 |
| 2014 | 79002 | 97012 | 60993 | 5547 | 7043 | 4051 | 1154 | 788 | 0.30 | 0.37 | 0.23 |
| 2015 | 57962 | 70775 | 45150 | 5567 | 7183 | 3951 | 1148 | 597 | 0.31 | 0.39 | 0.24 |

| Year | Recruitment (age 0) | | | Spawning-stock biomass | | | Landing | Discards | Fishing pressure (ages 2–4) | | |
|------|---------------------|-------|-------|------------------------|-------|------|---------|----------|-----------------------------|-------|-------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | thousands | | | tonnes | | | tonnes | | | | |
| 2016 | 80149 | 98514 | 61784 | 6075 | 7895 | 4255 | 1087 | 332 | 0.197 | 0.26 | 0.139 |
| 2017 | 49510 | 61879 | 37141 | 6651 | 8700 | 4602 | 927 | 246 | 0.171 | 0.22 | 0.120 |
| 2018 | 47715 | 62675 | 32755 | 7705 | 10108 | 5302 | 814 | 92 | 0.105 | 0.136 | 0.073 |
| 2019 | 37332 | 55397 | 19268 | 9803 | 12858 | 6748 | 742 | 201 | 0.110 | 0.141 | 0.079 |
| 2020 | 34906 | 60404 | 9408 | 10743 | 13980 | 7506 | 711 | 81 | 0.080 | 0.103 | 0.058 |
| 2021 | 16219 | 36308 | 0 | 12329 | 16060 | 8598 | 722 | 109 | 0.089 | 0.115 | 0.063 |
| 2022 | 43826* | | | 12259 | | | | | | | |

* Geometric mean (1990–2019).

Sources and references

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Four-spot megrim (*Lepidorhombus boscii*) in divisions 8.c and 9.a (southern Bay of Biscay and Atlantic Iberian waters East). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, Idb.27.8c9a, <https://doi.org/10.17895/ices.advice.19448036>.

Ling (*Molva molva*) in Division 5.a (Iceland grounds)

ICES advice on fishing opportunities

ICES advises that when the Icelandic management plan is applied, catches in the fishing year 1 September 2022 to 31 August 2023 should be no more than 6098 tonnes.

Stock development over time

Fishing pressure on the stock is above F_{MSY} and spawning-stock size is above MSY B_{trigger}, B_{pa}, and B_{lim}.

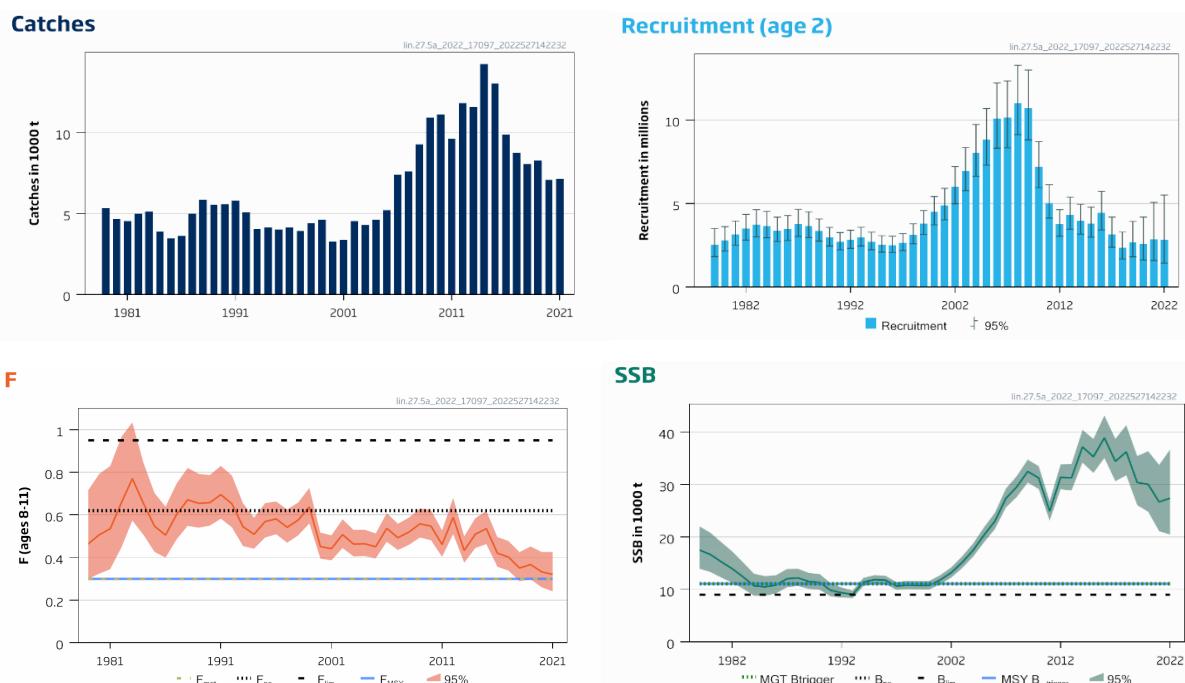


Figure 1 Ling in Division 5.a. Summary of the stock assessment. Top left: total catches; top right: recruitment (age 2); bottom left: fishing mortality (ages 8–11); bottom right: spawning-stock biomass (SSB).

Catch scenarios

The catch scenario is provided for the fishery year from 1 September 2022 to 31 August 2023.

Table 1 Ling in Division 5.a. Assumptions made for the interim year and in the forecast.

| Variable | Value | Notes |
|-------------------------------|--------|--|
| F _{ages 8-11(2022)} | 0.33 | Assuming status quo F (average over the last three years) for the 2022 part of fishing year 2021/2022 and F _{mgt} for the remainder of 2022 |
| SSB (2023) | 26 183 | Short-term forecast; in tonnes |
| R _{age 2 (2023)} | 3292 | Resampled from the years 2013–2022; in thousands |
| Catch (2022) | 6515 | Results from F _{ages 8-11(2022)} ; in tonnes |

Table 2 Ling in Division 5.a. Annual catch scenario. All weights are in tonnes.

| Basis | Total catch (2022/2023) | F (2023) | SSB (2024) | % SSB change* | % TAC change** | % advice change |
|-----------------|-------------------------|----------|------------|---------------|----------------|-----------------|
| Management plan | 6098 | 0.3 | 24 613 | -6 % | +28.8 % | +28.8 % |

* SSB in 2024 relative to SSB in 2023.

** Advice value for 2022/2023 relative to the TAC for 2021/2022 (4 735 t).

The advice for 2022/2023 is higher than the advice in 2021/2022 because of a change in the basis of the advice and reference points.

Basis of the advice

Table 3 Ling in Division 5.a. The basis of the advice.

| Advice basis | Management plan (ICES, 2022c) |
|-----------------|---|
| Management plan | <p>The Icelandic Ministry of Food, Agriculture and Fisheries management plan for Icelandic ling has been evaluated by ICES (ICES, 2022c). It is considered to be precautionary and conforms to ICES MSY approach. According to the management plan, $F_{y/y+1}$, the advice fishing mortality that is applied from 1st September year 'y' to 31st August year 'y+1' is calculated from the HCR as:</p> $F_{Y/Y+1} = \min\left(\frac{SSB_Y}{MGT B_{trigger}}, 1\right) * F_{mgt}$ <p>To calculate the catch in the last four months of the year "y" (September-December), the following F is used in the year "y":</p> $F_Y = \frac{2}{3} * F_{SQ} + \frac{1}{3} * F_{mgt}$ <p>In year "y+1" $F_{Y/Y+1}$ is used.</p> <p>Finally, the catch advice for the year "y/y+1" is calculated using the following formula:</p> $C_{Y/Y+1} = \frac{1}{3} * C[F_Y] + \frac{2}{3} * C[F_{Y/Y+1}]$ <p>Where the catch C[.] is calculated using the Baranov catch equation with the corresponding biomass, natural mortality and fishing mortality values in each year.</p> |

Quality of the assessment

In the evaluation of the management plan (MP) for ling in Icelandic waters (ICES, 2022c), the basis for assessment was revised, and the adopted harvest control rule (HCR) was considered to be in accordance with the precautionary approach and consistent with ICES MSY framework.

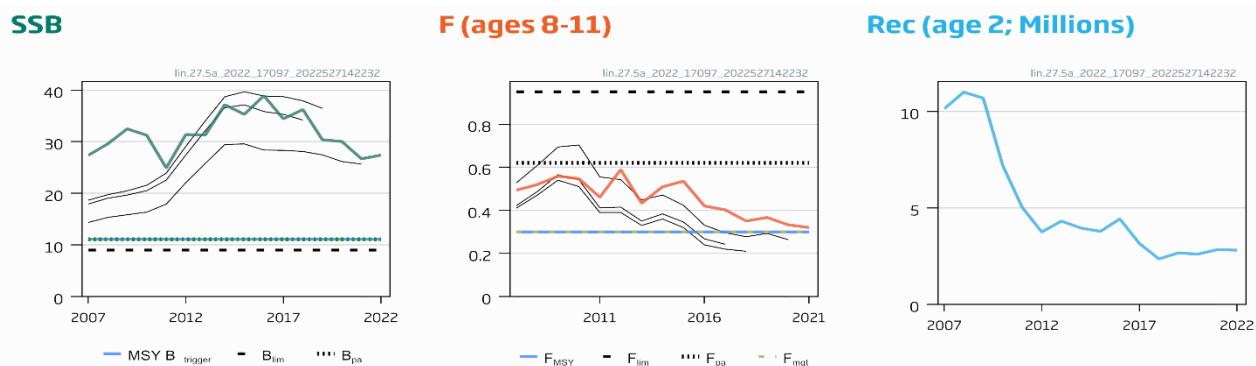


Figure 2 Ling in Division 5.a. Historical assessment results. Final-year recruitment and biomass estimates are included. No ICES assessment was conducted in 2020. Note that this year's assessment was based on a newly benchmarked model. Prior to the benchmark, recruitment was estimated at age 3 and is not shown.

Issues relevant for the advice

This stock is classified as Category 4 in the NEAFC categorization of deep-sea species/stocks (NEAFC, 2016). This implies that fisheries are primarily restricted to coastal state exclusive economic zones (EEZs) and therefore management measures are not taken by NEAFC unless complementary to coastal state conservation and management measures.

Reference points

Table 4 Ling in Division 5.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-------------------|--------|---|--------------|
| MSY Approach | MSY $B_{trigger}$ | 11 100 | B_{pa} | ICES (2022c) |
| | F_{MSY} | 0.30 | Stochastic simulations (EqSim) with segmented regression fixed at B_{lim} | |
| Precautionary Approach | B_{lim} | 9000 | B_{loss} (SSB in 1993) | ICES (2022c) |
| | B_{pa} | 11 100 | $B_{lim} \times e^{1.645 * \sigma_B}$, using the default $\sigma_B = 0.2$ | |
| | F_{lim} | 0.95 | Fishing mortality that in stochastic equilibrium will result in median SSB at B_{lim} | |
| | F_{pa} | 0.62 | Maximum F at which the probability of SSB falling below B_{lim} is < 5% | |
| Management plan | MGT $B_{trigger}$ | 11 100 | From the management plan | |
| | F_{mgt} | 0.30 | From the management plan | |

Basis of the assessment

Table 5 Ling in Division 5.a. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Analytical age-based assessment (SAM model) |
| Input data | Icelandic groundfish survey (G3239), autumn survey (G4493), gillnet survey (N2702) and data from commercial catches |
| Discards and bycatch | Not included; discarding is considered negligible |
| Indicators | None |
| Other information | Last benchmarked in 2022 (ICES, 2022c) |
| Working group | Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP) |

History of the advice, catch, and management

Table 6 Ling in Division 5.a. ICES advice, official landings and TAC. Prior to 2016/2017 ICES advice was for the calendar year. All weights are in tonnes.

| Year* | ICES advice | Catch corresponding to advice | ICES catches Division 5.a** | TAC Icelandic Division 5.a | ICES catches Division 5.a |
|------------|--|-------------------------------|-----------------------------|----------------------------|---------------------------|
| 2003/2004^ | 30% reduction on fishing effort | - | 4621 | 3000 | 4608 |
| 2004/2005^ | Biennial | - | 5195 | 3000 | 5238 |
| 2005/2006^ | 30% reduction on fishing effort | - | 7431 | 4000 | 6961 |
| 2006/2007^ | Biennial | - | 7619 | 5000 | 7617 |
| 2007/2008 | Maintain catches at 2001–2004 level | 3800 | 9279 | 5000 | 8560 |
| 2008/2009 | Biennial | 3800 | 10948 | 7000 | 10489 |
| 2009/2010 | Constrain catches to 2006–2007 average | 7500 | 11150 | 7000 | 10713 |
| 2010/2011 | Biennial | 7500 | 9650 | 7500 | 10095 |
| 2011/2012 | Same advice as previously | 7500 | 11829 | 9000 | 11133 |
| 2012/2013 | F_{proxy} target | 12000 | 11536 | 12000 | 12445 |
| 2013/2014 | No new advice, same as 2013 | 12000 | 14346 | 14000 | 14983 |
| 2014/2015 | Fishing at F_{MSY} | 14362 | 13036 | 14300 | 13166 |
| 2015/2016 | Fishing at F_{MSY} | ≤ 16156 | 9884 | 16200 | 11229 |
| 2016/2017 | Fishing at F_{MSY} | ≤ 9343 | 8765 | 9343 | 8426 |
| 2017/2018 | Management plan | ≤ 8598 | 8062 | 8598 | 8573 |
| 2018/2019 | Management plan | ≤ 6255 | 8269 | 6255 | 8028 |
| 2019/2020 | Management plan | ≤ 6599 | 7061 | 6599 | 7155 |
| 2020/2021 | No ICES advice | | 7128 | 5700*** | 7214 |
| 2021/2022 | Management plan | ≤ 4735 | | 4735 | |
| 2022/2023 | Management plan | ≤ 6098 | | 6098 | |

* Icelandic national fishing year from 1 September ending on 31 August.

** Calendar year (refers to the second year in the national fishing year).

*** Domestic advice and TAC (no ICES advice requested due to the COVID-19 disruption).

^ Prior to 2007/2008 the advice for ling was for the entire Northeast Atlantic and was not split into several assessment units.

History of the catch and landings

This stock is distributed primarily in Icelandic waters and does not extend into the NEAFC Regulatory Area.

Table 7 Ling in Division 5.a. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch (2021) | Landings | | | Discards |
|--------------|---------------|-------------|------------------|----------|
| | Longlines 68% | | Bottom trawl 29% | |
| | 7128 | 7128 tonnes | Other gears 3% | |

Table 8 Ling in Division 5.a. History of official catches by country and calendar year. All weights are in tonnes.

| Year | Belgium | Faroes | France | Germany | Iceland | Norway | UK | Total |
|------|---------|--------|--------|---------|---------|--------|-----|-------|
| 1973 | 1080 | 984 | 0 | 586 | 3615 | 418 | 829 | 7512 |
| 1974 | 681 | 890 | 0 | 486 | 3946 | 318 | 532 | 6853 |
| 1975 | 736 | 732 | 23 | 375 | 3853 | 522 | 562 | 6803 |
| 1976 | 431 | 498 | 0 | 404 | 4634 | 502 | 268 | 6737 |
| 1977 | 442 | 613 | 0 | 254 | 3605 | 506 | 0 | 5420 |
| 1978 | 541 | 534 | 0 | 0 | 3577 | 484 | 0 | 5132 |
| 1979 | 508 | 536 | 0 | 0 | 3872 | 399 | 0 | 5315 |
| 1980 | 445 | 607 | 0 | 0 | 3170 | 423 | 0 | 4645 |
| 1981 | 196 | 489 | 0 | 0 | 34420 | 415 | 0 | 4520 |
| 1982 | 116 | 524 | 0 | 0 | 3738 | 612 | 0 | 4990 |
| 1983 | 128 | 644 | 0 | 0 | 4236 | 115 | 0 | 5123 |
| 1984 | 103 | 450 | 0 | 0 | 3306 | 21 | 0 | 3880 |
| 1985 | 59 | 384 | 0 | 0 | 2989 | 17 | 0 | 3449 |
| 1986 | 88 | 556 | 0 | 0 | 2948 | 4 | 0 | 3596 |
| 1987 | 157 | 657 | 0 | 0 | 4154 | 6 | 0 | 4974 |
| 1988 | 134 | 619 | 0 | 0 | 5083 | 10 | 0 | 5846 |
| 1989 | 95 | 614 | 0 | 0 | 4833 | 5 | 0 | 5547 |
| 1990 | 42 | 399 | 0 | 0 | 5119 | 0 | 0 | 5560 |
| 1991 | 69 | 530 | 0 | 0 | 5181 | 0 | 0 | 5780 |
| 1992 | 34 | 526 | 0 | 0 | 4526 | 0 | 0 | 5086 |
| 1993 | 20 | 501 | 0 | 0 | 3522 | 0 | 0 | 4046 |
| 1994 | 3 | 548 | 0 | 0 | 3561 | 0 | 0 | 4115 |
| 1995 | 0 | 463 | 0 | 0 | 3479 | 0 | 0 | 4015 |
| 1996 | 0 | 358 | 0 | 0 | 3696 | 20 | 0 | 4125 |
| 1997 | 0 | 299 | 0 | 0 | 3606 | 0 | 0 | 3906 |
| 1998 | 0 | 699 | 0 | 0 | 3659 | 0 | 0 | 4394 |
| 1999 | 0 | 500 | 0 | 0 | 4002 | 120 | 1 | 4625 |
| 2000 | 0 | 0 | 0 | 0 | 3209 | 67 | 3 | 3284 |
| 2001 | 0 | 362 | 0 | 2 | 2872 | 116 | 1 | 3362 |
| 2002 | 0 | 1629 | 0 | 0 | 2843 | 45 | 0 | 4519 |
| 2003 | 0 | 565 | 0 | 2 | 3585 | 108 | 5 | 4270 |
| 2004 | 0 | 739 | 0 | 1 | 3727 | 139 | 0 | 4606 |
| 2005 | 0 | 682 | 0 | 1 | 4313 | 180 | 20 | 5198 |
| 2006 | 0 | 960 | 0 | 1 | 6283 | 158 | 0 | 7405 |
| 2007 | 0 | 807 | 0 | 0 | 6599 | 185 | 0 | 7591 |
| 2008 | 0 | 1366 | 0 | 0 | 7738 | 176 | 0 | 9283 |
| 2009 | 0 | 1157 | 0 | 0 | 9616 | 172 | 0 | 10945 |
| 2010 | 0 | 1095 | 0 | 0 | 9868 | 168 | 0 | 11131 |
| 2011 | 0 | 588 | 0 | 0 | 8789 | 249 | 0 | 9626 |
| 2012 | 0 | 875 | 0 | 0 | 10695 | 248 | 0 | 11817 |
| 2013 | 0 | 1030 | 0 | 0 | 10198 | 294 | 0 | 11581 |
| 2014 | 0 | 1738 | 0 | 0 | 12350 | 158 | 0 | 14246 |
| 2015 | 0 | 1233 | 0 | 0 | 11552 | 250 | 0 | 13035 |
| 2016 | 0 | 1072 | 0 | 0 | 8583 | 230 | 0 | 9884 |
| 2017 | 0 | 829 | 0 | 0 | 7692 | 244 | 0 | 8765 |
| 2018 | 0 | 1103 | 0 | 0 | 6756 | 203 | 0 | 8062 |

| Year | Belgium | Faroës | France | Germany | Iceland | Norway | UK | Total |
|------|---------|--------|--------|---------|---------|--------|----|-------|
| 2019 | 0 | 1093 | 0 | 0 | 6992 | 184 | 0 | 8268 |
| 2020 | 0 | 989 | 0 | 0 | 5836 | 237 | 0 | 7061 |
| 2021 | 0 | 926 | 0 | 0 | 6111 | 91 | 0 | 7128 |

Summary of the assessment

Table 9 Ling in Division 5.a. Assessment summary by calendar year. Catches are ICES estimates. ‘High’ and ‘Low’ indicate 95% confidence intervals.

| Year | Recruitment | | | Spawning-stock biomass | | | Total catch | Fishing mortality | | |
|------|-------------|-----------|------|------------------------|--------|-------|-------------|-------------------|------|------|
| | Age 2 | High | Low | SSB | High | Low | | Ages 8–11 | High | Low |
| | | thousands | | | tonnes | | | | | |
| 1979 | 2531 | 3505 | 1827 | 17538 | 22057 | 13946 | 5315 | 0.46 | 0.72 | 0.30 |
| 1980 | 2790 | 3618 | 2152 | 16669 | 20838 | 13335 | 4645 | 0.51 | 0.79 | 0.32 |
| 1981 | 3142 | 3951 | 2499 | 15276 | 19031 | 12263 | 4520 | 0.54 | 0.83 | 0.35 |
| 1982 | 3496 | 4350 | 2810 | 13958 | 17265 | 11284 | 4990 | 0.66 | 0.97 | 0.45 |
| 1983 | 3734 | 4631 | 3010 | 12384 | 15160 | 10117 | 5123 | 0.77 | 1.03 | 0.57 |
| 1984 | 3654 | 4530 | 2947 | 10693 | 12996 | 8799 | 3880 | 0.65 | 0.85 | 0.51 |
| 1985 | 3379 | 4185 | 2728 | 10499 | 12563 | 8775 | 3450 | 0.55 | 0.70 | 0.43 |
| 1986 | 3458 | 4287 | 2789 | 10845 | 12717 | 9248 | 3596 | 0.51 | 0.64 | 0.40 |
| 1987 | 3753 | 4650 | 3029 | 12038 | 13911 | 10418 | 4974 | 0.60 | 0.75 | 0.48 |
| 1988 | 3655 | 4502 | 2967 | 12207 | 13964 | 10672 | 5846 | 0.67 | 0.82 | 0.55 |
| 1989 | 3344 | 4075 | 2744 | 11535 | 13159 | 10111 | 5547 | 0.65 | 0.79 | 0.54 |
| 1990 | 2959 | 3574 | 2449 | 11329 | 12937 | 9920 | 5560 | 0.66 | 0.79 | 0.55 |
| 1991 | 2699 | 3265 | 2231 | 9839 | 11185 | 8655 | 5780 | 0.70 | 0.83 | 0.58 |
| 1992 | 2813 | 3405 | 2324 | 9385 | 10390 | 8478 | 5086 | 0.65 | 0.79 | 0.54 |
| 1993 | 2967 | 3579 | 2459 | 9054 | 9807 | 8358 | 4046 | 0.55 | 0.65 | 0.45 |
| 1994 | 2711 | 3285 | 2237 | 11420 | 12245 | 10651 | 4115 | 0.51 | 0.59 | 0.44 |
| 1995 | 2535 | 3077 | 2088 | 11881 | 12728 | 11091 | 4015 | 0.57 | 0.66 | 0.49 |
| 1996 | 2513 | 3048 | 2072 | 11789 | 12622 | 11011 | 4125 | 0.58 | 0.66 | 0.51 |
| 1997 | 2642 | 3196 | 2183 | 10655 | 11435 | 9928 | 3906 | 0.54 | 0.63 | 0.47 |
| 1998 | 3128 | 3783 | 2586 | 10822 | 11651 | 10051 | 4394 | 0.58 | 0.66 | 0.50 |
| 1999 | 3795 | 4582 | 3144 | 10760 | 11590 | 9989 | 4625 | 0.64 | 0.73 | 0.56 |
| 2000 | 4490 | 5418 | 3721 | 10786 | 11638 | 9996 | 3284 | 0.45 | 0.52 | 0.39 |
| 2001 | 4876 | 5910 | 4023 | 11826 | 12739 | 10978 | 3362 | 0.44 | 0.50 | 0.39 |
| 2002 | 5994 | 7213 | 4981 | 13190 | 14203 | 12249 | 4519 | 0.51 | 0.58 | 0.44 |
| 2003 | 6935 | 8346 | 5762 | 15144 | 16318 | 14055 | 4270 | 0.46 | 0.53 | 0.40 |
| 2004 | 8032 | 9727 | 6633 | 17446 | 18755 | 16228 | 4606 | 0.46 | 0.53 | 0.41 |
| 2005 | 8829 | 10686 | 7294 | 20357 | 21849 | 18967 | 5198 | 0.45 | 0.51 | 0.40 |
| 2006 | 10077 | 12210 | 8316 | 23032 | 24644 | 21526 | 7405 | 0.54 | 0.61 | 0.47 |
| 2007 | 10139 | 12336 | 8334 | 27359 | 29239 | 25599 | 7591 | 0.49 | 0.56 | 0.44 |
| 2008 | 11005 | 13278 | 9121 | 29572 | 31640 | 27640 | 9283 | 0.52 | 0.59 | 0.46 |
| 2009 | 10697 | 12991 | 8808 | 32494 | 34765 | 30372 | 10945 | 0.56 | 0.63 | 0.49 |
| 2010 | 7201 | 8710 | 5953 | 31249 | 33514 | 29137 | 11131 | 0.55 | 0.62 | 0.48 |
| 2011 | 5024 | 6120 | 4125 | 24921 | 26865 | 23118 | 9626 | 0.46 | 0.53 | 0.40 |
| 2012 | 3751 | 4629 | 3040 | 31376 | 33843 | 29089 | 11817 | 0.59 | 0.68 | 0.51 |
| 2013 | 4316 | 5381 | 3462 | 31302 | 33942 | 28867 | 11581 | 0.43 | 0.50 | 0.38 |
| 2014 | 3961 | 4955 | 3167 | 37169 | 40433 | 34169 | 14246 | 0.51 | 0.58 | 0.44 |
| 2015 | 3781 | 4785 | 2988 | 35300 | 38695 | 32203 | 13035 | 0.54 | 0.62 | 0.46 |
| 2016 | 4430 | 5735 | 3421 | 38903 | 43189 | 35042 | 9884 | 0.42 | 0.50 | 0.36 |
| 2017 | 3158 | 4190 | 2380 | 34432 | 38714 | 30624 | 8766 | 0.40 | 0.48 | 0.34 |
| 2018 | 2355 | 3298 | 1681 | 36224 | 41318 | 31759 | 8062 | 0.35 | 0.43 | 0.29 |

| Year | Recruitment | | | Spawning-stock biomass | | | Total catch | Fishing mortality | | |
|------|-------------|------|------|------------------------|-------|-------|-------------|-------------------|------|------|
| | Age 2 | High | Low | SSB | High | Low | | Ages 8–11 | High | Low |
| | thousands | | | tonnes | | | | | | |
| 2019 | 2668 | 3929 | 1812 | 30387 | 35445 | 26050 | 8269 | 0.37 | 0.45 | 0.30 |
| 2020 | 2602 | 4187 | 1617 | 30032 | 36361 | 24804 | 7061 | 0.33 | 0.43 | 0.26 |
| 2021 | 2840 | 5073 | 1590 | 26688 | 33760 | 21097 | 7128 | 0.32 | 0.43 | 0.24 |
| 2022 | 2810 | 5507 | 1434 | 27405 | 36698 | 20464 | | | | |

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Recommended citation: ICES. 2022. Ling (*Molva molva*) in Division 5.a (Iceland grounds). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, lin.27.5a. <https://doi.org/10.17895/ices.advice.19448045>.

Mackerel (*Scomber scombrus*) in subareas 1–8 and 14, and in Division 9.a (Northeast Atlantic and adjacent waters)

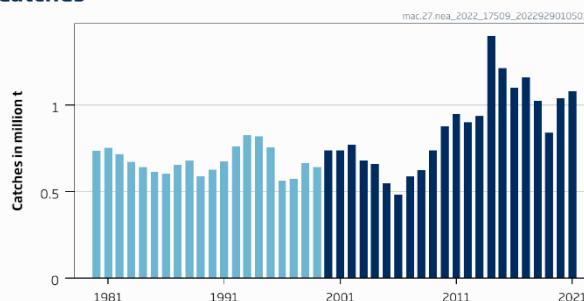
ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 782 066 tonnes.

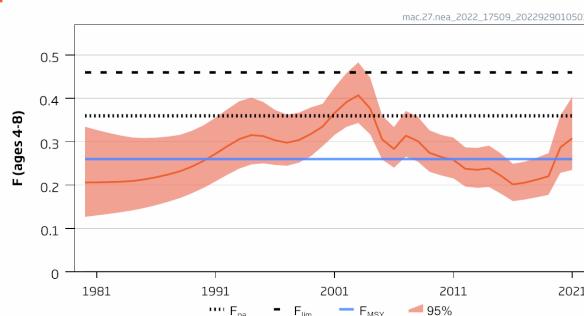
Stock development over time

Fishing pressure on the stock is above F_{MSY} but below F_{pa} and F_{lim} ; spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

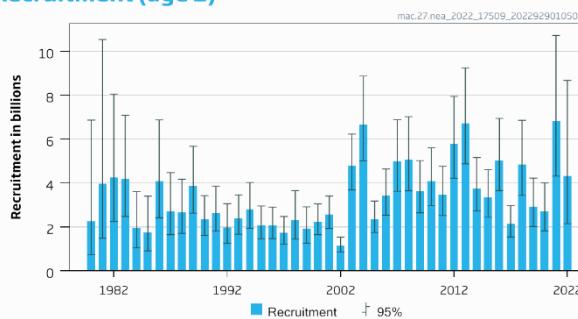
Catches



F



Recruitment (age 2)



SSB

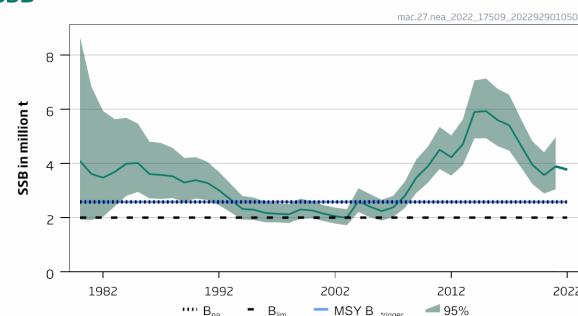


Figure 1

Mackerel in subareas 1–8 and 14, and in Division 9.a. Summary of the stock assessment. Catches prior to 2000 have been down-weighted in the assessment because of the considerable underreporting suspected to have taken place in this period. Abundance estimates of age 0 and 1 from the assessment model poorly reflect year-class strength and therefore recruitment is shown at age 2.

Catch scenarios

Table 1 Mackerel in subareas 1–8 and 14, and in Division 9.a. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|-----------------------------|-----------|--|
| $F_{ages\ 4-8}\ (2022)$ | 0.36 | From the forecast for 2022, based on assumed catch in 2022 |
| SSB (2022) at spawning time | 3 769 326 | From the forecast for 2022; in tonnes |
| $R_{age\ 0}\ (2022-2023)$ | 4 497 060 | Geometric mean of the abundance at age 0 (1990–2020); in thousands |
| Total catch (2022) | 1 131 416 | Sum of expected landings and discards, accounting for the interannual transfers from 2021; in tonnes |

Table 2 Mackerel in subareas 1–8 and 14, and in Division 9.a. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch | F _{ages 4–8} | SSB at spawning time | | % change | | |
|---|-------------|-----------------------|----------------------|---------|----------|---------|-----------|
| | 2023 | 2023–2024 | 2023 | 2024 | SSB* | Catch** | Advice*** |
| ICES advice basis | | | | | | | |
| MSY approach: F = F _{MSY} | 782066 | 0.26 | 3676187 | 3649119 | -1% | -31% | -2% |
| Other scenarios | | | | | | | |
| F = 0 | 0 | 0 | 3834187 | 4442903 | 16% | -100% | -100% |
| Catch ₂₀₂₃ = catch ₂₀₂₂ – 20% | 905133 | 0.31 | 3649147 | 3494839 | -4% | -20% | 14% |
| Catch ₂₀₂₃ = catch ₂₀₂₂ | 1131416 | 0.40 | 3597636 | 3333051 | -7% | 0% | 42% |
| Catch ₂₀₂₃ = catch ₂₀₂₂ + 25% | 1414270 | 0.52 | 3529667 | 3131128 | -11% | 25% | 78% |
| F = F ₂₀₂₂ | 1046177 | 0.36 | 3617323 | 3393970 | -6% | -8% | 32% |
| F _{pa} | 1042720 | 0.36 | 3618114 | 3397266 | -6% | -8% | 31% |
| F _{lim} | 1284085 | 0.46 | 3561472 | 3169986 | -11% | 13% | 62% |
| SSB ₂₀₂₄ = B _{lim} | 2654020 | 1.23 | 3168962 | 1995707 | -37% | 135% | 234% |
| SSB ₂₀₂₄ = B _{pa} ^ | 1945604 | 0.78 | 3389356 | 2577596 | -24% | 72% | 145% |

* SSB 2024 relative to SSB 2023.

** Catch in 2023 relative to estimated catches in 2022 (1 131 416 tonnes). There is no internationally agreed TAC for 2022.

*** Advice value for 2023 relative to the advice value for 2022 (794 920 tonnes).

^ SSB₂₀₂₄ values are the closest available approximation to B_{lim} and B_{pa}.

Basis of the advice

Table 3 Mackerel in subareas 1–8 and 14, and in Division 9.a. The basis of the advice.

| Advice basis | MSY approach |
|-----------------|---|
| Management plan | There is no long-term management strategy for Northeast Atlantic (NEA) mackerel agreed by all parties involved in the mackerel fishery. In 2019 Coastal State delegations from Norway, the EU, and the Faroes requested ICES to review new harvest control rule (HCR) options for a management strategy. ICES delivered the advice from this evaluation in August 2020 (ICES, 2020a). |

Quality of the assessment

The only available catch data from Russian Federation for 2021 was total catch by ICES division from ICES preliminary catch database, and no Russian catch samples were available. Historically, preliminary catches are comparable to ICES final estimated catch. There were adequate samples from other fishing nations operating in the same areas which were used to estimate catch-at-age and weight-at-age.

The inclusion of a new year of data modifies the relative weight of the different data sources in the assessment, which leads to revisions of the perception of the stock. In 2022, there has been an upwards revision of SSB and a downwards revision of fishing mortality for the period 2007 to 2017, and a revision in the opposite direction for the most recent SSB and F estimates (Figure 2). The relative weights of the data sources in the assessment are dependent on both the length of the time-series and the consistency of the information. With the new data included this year, the influence of the tagging data in the assessment model increased slightly.

The abundance index for age 0 from the IBTS surveys could not be updated, and no value was available for 2021; however, this has no effect on the advice.

The SSB index from the 2022 mackerel egg survey used in this year's assessment is a preliminary value, and it is 26% larger than the previous estimate in 2019. The final value will be used in next year's assessment.

The stock assessment and the short-term forecast include ages from 0 to 12. The abundance estimates at ages 0 and 1 are highly uncertain, and year-class strength only becomes apparent when fish enter the fishery at age 2 to 3. Therefore, this year, recruitment is presented for age 2.

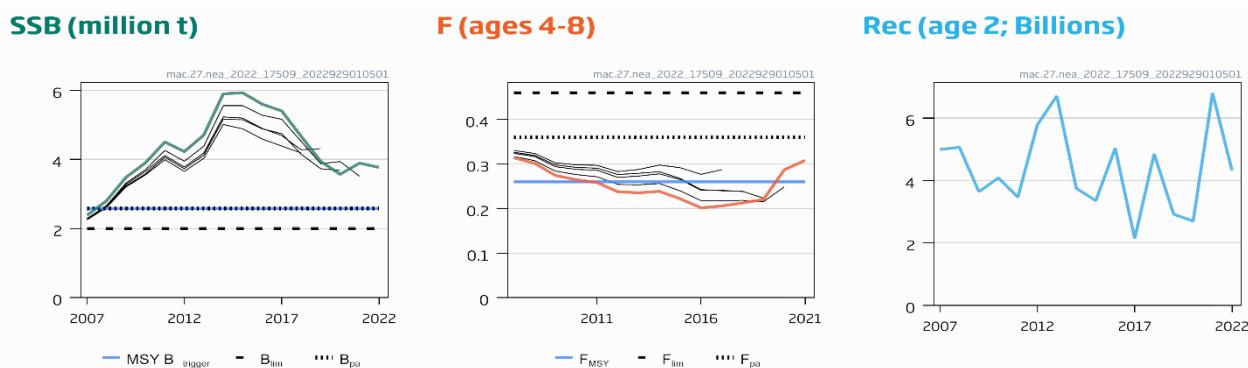


Figure 2 Mackerel in subareas 1–8 and 14, and in Division 9.a. Historical assessment results. Note that this year's assessment presents recruitment at age 2. Prior to this, recruitment was presented as age 0 and is not shown.

Issues relevant for the advice

The sum of the unilateral quotas for mackerel and the resulting catches have exceeded the scientific advice by on average 41% since 2010. The F_{MSY} reference point that is used as a basis for the advice has been derived from an evaluation that assumed that annual catches would be aligned with the scientific advice based on the MSY approach, as the implementation error in the form of a consistent overshoot of the TAC was not included. Therefore, failing to adhere to the advised catches as derived from the application of the MSY approach may not be precautionary. Specifically, this may result in an increased risk for the stock to fall below B_{lim} , loss of catch in the long term, and unsustainable utilization of the resource.

ICES currently considers the NEA mackerel stock to consist of three spawning components – the western, southern, and North Sea (ICES, 2016) – although the stock structure and spawning behaviour is likely to be more dynamic (Jansen and Gislason, 2013). The existing management measures to ensure the protection of the North Sea component (i.e. no mackerel fishing in divisions 3.a and 4.b–c, except for Norway, where a limited amount of the TAC can be fished in Division 3.a; no mackerel fishing in Division 4.a during the period 15 February–31 July; and a 30 cm minimum conservation reference size) should remain in place for precautionary reasons. However, given the new knowledge on stock structure of mackerel that is currently becoming available, a review of the appropriateness of the use of stock components and the associated protection measures should be carried out.

Reference points

Table 4 Mackerel in subareas 1–8 and 14, and in Division 9.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------|-----------|--|--------------|
| MSY approach | $B_{trigger}$ | 2 580 000 | B_{pa} ; in tonnes | ICES (2020b) |
| | F_{MSY} | 0.26 | Stochastic simulations | ICES (2020b) |
| Precautionary approach | B_{lim} | 2 000 000 | B_{loss} in 2003 from the 2019 WGWiDE assessment; in tonnes | ICES (2020b) |
| | B_{pa} | 2 580 000 | $B_{lim} \times \exp(1.645 \times \sigma)$, $\sigma = 0.15$; in tonnes | ICES (2020b) |
| | F_{lim} | 0.46 | The F that on average leads to B_{lim} | ICES (2020b) |
| | F_{pa} | 0.36 | The F that provides a 95% probability for SSB to be above B_{lim} (F_{P05}). | ICES (2020b) |
| Management plan | SSB_{mgt} | | | |
| | F_{mgt} | | | |

Basis of the assessment

Table 5 Mackerel in subareas 1–8 and 14, and in Division 9.a. Basis of the assessment and advice.

| | |
|--------------------------|--|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical model (SAM) that uses catches in the model and in the forecast |
| Input data | Catch data, steel tagging data ([L3182] 1980–2006) and RFID tagging data ([L5543] 2014–2021), and three survey indices: SSB index from the triennial egg survey ([I4189] 1992–2022), abundance indices from the IBTS survey (G1022, G1179, G3239, G4299, G4493, G4748, G4815, G7212 and G9527) (combined Q1 and Q4; age 0, 1998–2020), and from the IESSNS survey ([A7806] ages 3–11, 2010, 2012–2022). Catches prior to 2000 are given a very low weight in the assessment. Natural mortality (0.15 for all ages and years) is based on tagging studies from the early 1980s. |
| Discards | Discarding is known to take place (0.3% of the total catch in weight in 2021), but is only quantified for part of the fisheries; the proportion of the landings covered cannot be calculated. Partial discard estimates are included in the assessment and overall discarding in recent years is assumed negligible. |
| Indicators | None |
| Other information | Interbenchmarked in 2019 (IBPNEAMac; ICES, 2019), a long-term management strategy evaluation was conducted in 2020 (WKMSEMAC; ICES 2020b) |
| Working group | Working Group on Widely Distributed Stocks (WG_WIDE ; ICES 2022b) |

History of the advice, catch, and management

Table 6 Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the TAC, and ICES estimates of catch. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | TAC * | Official landings | Discards and slipping | ICES catch |
|------|------------------------------|-------------------------------|------------------------|----------------------|-----------------------|------------|
| 1987 | Given by stock component | | 442000 | 616000 | 10789 | 654992 |
| 1988 | Given by stock component | | 610000 | 622000 | 35566 | 680491 |
| 1989 | Given by stock component | | 532000 | 576000 | 7090 | 585920 |
| 1990 | Given by stock component | | 562000 | 580000 | 15600 | 626107 |
| 1991 | Given by stock component | | 612000 | 609000 | 30700 | 675665 |
| 1992 | Given by stock component | | 707000 | 729000 | 25000 | 760690 |
| 1993 | Given by stock component | | 767000 | 784000 | 18180 | 824568 |
| 1994 | Given by stock component | | 837000 | 794000 | 5370 | 819087 |
| 1995 | Given by stock component | | 645000 | 729000 | 7721 | 756277 |
| 1996 | Significant reduction in F | - | 452000 | 509000 | 11415 | 563472 |
| 1997 | Significant reduction in F | - | 470000 | 517000 | 18864 | 573029 |
| 1998 | F between 0.15 and 0.2 | 498000 | 549000 | 627000 | 8012 | 666316 |
| 1999 | F of 0.15 consistent with PA | 437000 | 562000 | 585000 | n/a | 640309 |
| 2000 | F = 0.17: F_{pa} | 642000 | 612000 | 655000 | 2084 | 738606 |
| 2001 | F = 0.17: F_{pa} | 665000 | 670000 | 660000 | 1188 | 737463 |
| 2002 | F = 0.17: F_{pa} | 694000 | 683000 | 685000 | 23774 | 771422 |
| 2003 | F = 0.17: F_{pa} | 542000 | 583000 | 600000 | 19427 | 679287 |
| 2004 | F = 0.17: F_{pa} | 545000 | 532000 | 587000 | 19962 | 660491 |
| 2005 | F = 0.15 to 0.20 | 320000–420000 | 422000 | 447000 | 25788 | 549514 |
| 2006 | F = 0.15 to 0.20 | 373000–487000 | 444000 | 420878 | 26594 | 481181 |
| 2007 | F = 0.15 to 0.20 | 390000–509000 | 502000 | 511016 | 15444 | 586206 |
| 2008 | F = 0.15 to 0.20 | 349000–456000 | 458000 | 547506 | 37075 | 623165 |
| 2009 | F = 0.15 to 0.20 | 443000–578000 | 605000 ^{^^} | 631805 | 15934 | 737969 |
| 2010 | Harvest control rule | 527000–572000 | 885000 ^{^^^} | 831825 | 13045 | 877272 |
| 2011 | See scenarios | 529000–672000 | 959000 ^{^^^} | 926258 | 10894 | 948963 |
| 2012 | Follow the management plan | 586000–639000 | 927000 ^{^^^} | 876278 | 15174 | 899551 |
| 2013 | Follow the management plan | 497000–542000 | 906000 ^{^^^} | 935646 | 4732 | 938299 |
| 2014 | Follow the management plan | 927000–1011000 | 1392000 ^{^^^} | 1382772 | 6451 | 1401788 |
| 2015 | Follow the management plan | 831000–906000 | 1229000 ^{^^^} | 1202687 | 10431 | 1215827 |
| 2016 | MSY approach | ≤ 773842 | 1057000 ^{^^^} | 1088664 | 5971 | 1100135 |
| 2017 | MSY approach | ≤ 857185 | 1173000 ^{^^^} | 1170804 | 2832 | 1159641 |
| 2018 | MSY approach | ≤ 550948 | 998000 ^{^^^} | 990715 | 2890 | 1023144 |
| 2019 | MSY approach | ≤ 770358 | 864000 ^{^^^} | 828649 | 7807 | 839727 |
| 2020 | MSY approach | ≤ 922064 | 1090879 ^{^^^} | 1030161 [^] | 9280 | 1039513 |
| 2021 | MSY approach | ≤ 852284 | 1199103 ^{^^^} | 1075763 [^] | 3129 | 1081540 |
| 2022 | MSY approach | ≤ 794920 | 1131416 ^{^^^} | | | |
| 2023 | MSY approach | ≤ 782066 | | | | |

n/a = not available.

* For all areas, except some catches in international waters in Subarea 2.

[^] Preliminary.

^{^^} Does not include the unilateral Norway–Faroe Islands TAC, first declared in 2009, nor the Icelandic quota.

^{^^^} No internationally agreed quotas. Values presented are the sum of unilateral quotas (including quotas and transfers).

Table 7 Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the TAC, and ICES estimates of catch for the **western component**. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | TAC* | Discards and slippage | ICES catch** |
|------|---|-------------------------------|--------|-----------------------|--------------|
| 1987 | SSB = 1.5 million t; TAC | 380000 | 405000 | 11000 | 633000 |
| 1988 | F = F _{0.1} ; TAC; closed area; landing size | 430000 | 573000 | 36000 | 656000 |
| 1989 | Halt SSB decline; TAC | 355000 | 495000 | 7000 | 571000 |
| 1990 | TAC; F = F _{0.1} | 480000 | 525000 | 16000 | 606000 |
| 1991 | TAC; F = F _{0.1} | 500000 | 575000 | 31000 | 647000 |
| 1992 | TAC for both 1992 and 1993 | 670000 | 670000 | 25000 | 742000 |
| 1993 | TAC for both 1992 and 1993 | 670000 | 730000 | 18000 | 805000 |
| 1994 | No long-term gains in increased F | 831000 *** | 800000 | 5000 | 796000 |
| 1995 | 20% reduction in F | 530000 | 608000 | 8000 | 728000 |
| 1996 | No separate advice | - | 422000 | 11000 | 529000 |
| 1997 | No separate advice | - | 416000 | 19000 | 529000 |
| 1998 | No separate advice | - | 514000 | 8000 | 623000 |
| 1999 | No separate advice | - | 520000 | 0 | 597000 |
| 2000 | No separate advice | - | 573000 | 2000 | 703000 |
| 2001 | No separate advice | - | 630000 | 1000 | 694000 |
| 2002 | No separate advice | - | 642000 | 24000 | 723000 |
| 2003 | No separate advice | - | 548000 | 9000 | 644000 |
| 2004 | No separate advice | - | 500000 | 11000 | 615000 |
| 2005 | No separate advice | - | 397000 | 20000 | 494000 |
| 2006 | No separate advice | - | 418000 | 17000 | 420000 |
| 2007 | No separate advice | - | 472000 | 8000 | 519000 |
| 2008 | No separate advice | - | 431000 | 27000 | 552000 |
| 2009 | No separate advice | - | 569000 | 13000 | 627000 |
| 2010 | No separate advice | - | ^ | 4000 | 817000 |
| 2011 | No separate advice | - | ^ | 8000 | 920000 |
| 2012 | No separate advice | - | ^ | 11000 | 864000 |
| 2013 | No separate advice | - | ^ | 2000 | 910000 |
| 2014 | No separate advice | - | ^ | 6000 | 1342000 |
| 2015 | No separate advice | - | ^ | 3000 | 1161000 |
| 2016 | No separate advice | - | ^ | 3000 | 1058000 |
| 2017 | No separate advice | - | ^ | 3000 | 1120298 |
| 2018 | No separate advice | - | ^ | 2372 | 984775 |
| 2019 | No separate advice | - | ^ | 6794 | 792652 |
| 2020 | No separate advice | - | ^ | 9083 | 951176 |
| 2021 | No separate advice | - | ^ | 2855 | 1041882 |
| 2022 | No separate advice | - | ^ | | |
| 2023 | No separate advice | - | | | |

* TAC for mackerel taken in all divisions and subareas 6, 7, 8.a, 8.b, 8.d, 5.b, 2.a, 3.a, and 4.a.

** Landings and discards of the western component; includes some catches from the North Sea component.

*** Catch at *status quo* F.

^ No internationally agreed TAC.

Table 8 Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the TAC, and ICES estimates of catch for the **North Sea component**. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice* | TAC** | ICES catch |
|------|--|--------------------------------|-------|------------|
| 1987 | Lowest practical level (LPL) | LPL | 55000 | 3000 |
| 1988 | Closed areas and seasons; min. landing size; bycatch regulations | LPL | 55000 | 6000 |
| 1989 | Closed areas and seasons; min. landing size; bycatch regulations | LPL | 49200 | 7000 |
| 1990 | Closed areas and seasons; min. landing size; bycatch regulations | LPL | 45200 | 10000 |
| 1991 | Closed areas and seasons; min. landing size; bycatch regulations | LPL | 65500 | n/a |
| 1992 | Closed areas and seasons; min. landing size; bycatch regulations | LPL | 76300 | n/a |
| 1993 | Maximum protection; closed areas and seasons; min. landing size | LPL | 83100 | n/a |
| 1994 | Maximum protection; closed areas and seasons; min. landing size | LPL | 95700 | n/a |
| 1995 | Maximum protection; closed areas and seasons; min. landing size | LPL | 76300 | n/a |
| 1996 | Maximum protection; closed areas and seasons; min. landing size | LPL | 52800 | n/a |
| 1997 | Maximum protection; closed areas and seasons; min. landing size | LPL | 52800 | n/a |
| 1998 | Maximum protection; closed areas and seasons; min. landing size | LPL | 62500 | n/a |
| 1999 | Maximum protection; closed areas and seasons; min. landing size | LPL | 62500 | n/a |
| 2000 | Maximum protection; closed areas and seasons; min. landing size | LPL | 69700 | n/a |
| 2001 | Maximum protection; closed areas and seasons; min. landing size | LPL | 71400 | n/a |
| 2002 | Maximum protection; closed areas and seasons; min. landing size | LPL | 72900 | n/a |
| 2003 | Maximum protection; closed areas and seasons; min. landing size | LPL | 62500 | n/a |
| 2004 | Maximum protection; closed areas and seasons; min. landing size | LPL | 57700 | n/a |
| 2005 | Maximum protection; closed areas and seasons; min. landing size | LPL | 44900 | n/a |
| 2006 | Maximum protection; closed areas and seasons; min. landing size | LPL | 47100 | n/a |
| 2007 | Maximum protection; closed areas and seasons; min. landing size | LPL | 53100 | n/a |
| 2008 | Maximum protection; closed areas and seasons; min. landing size | LPL | 48600 | n/a |
| 2009 | Maximum protection; closed areas and seasons; min. landing size | LPL | 63800 | n/a |
| 2010 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2011 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2012 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2013 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2014 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2015 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2016 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2017 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2018 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2019 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2020 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2021 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2022 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |
| 2023 | Maximum protection; closed areas and seasons; min. landing size | LPL | - | n/a |

LPL = Lowest practical level.

n/a = not available.

* Subarea 4 and Division 3.a.

** TAC for Subarea 4, divisions 3.a and 3.b-d (EU zone), and Division 2.a (EU zone).

Table 9 Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the agreed TAC, and ICES estimates of catch for the **southern component**. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | TAC * | ICES catch |
|------|------------------------------|-------------------------------|-------|------------|
| 1987 | Reduce juvenile exploitation | - | 36570 | 22000 |
| 1988 | Reduce juvenile exploitation | - | 36570 | 25000 |
| 1989 | No advice | - | 36570 | 18000 |
| 1990 | Reduce juvenile exploitation | - | 36570 | 21000 |
| 1991 | Reduce juvenile exploitation | - | 36570 | 21000 |
| 1992 | No advice | - | 36570 | 18000 |
| 1993 | No advice | - | 36570 | 20000 |
| 1994 | No advice | - | 36570 | 25000 |
| 1995 | No advice | - | 36570 | 28000 |
| 1996 | No separate advice | - | 30000 | 34000 |
| 1997 | No separate advice | - | 30000 | 41000 |
| 1998 | No separate advice | - | 35000 | 44000 |
| 1999 | No separate advice | - | 35000 | 44000 |
| 2000 | No separate advice | - | 39200 | 36000 |
| 2001 | No separate advice | - | 40180 | 43000 |
| 2002 | No separate advice | - | 41100 | 50000 |
| 2003 | No separate advice | - | 35000 | 26000 |
| 2004 | No separate advice | - | 32310 | 35000 |
| 2005 | No separate advice | - | 24870 | 50000 |
| 2006 | No separate advice | - | 26180 | 53000 |
| 2007 | No separate advice | - | 29610 | 63000 |
| 2008 | No separate advice | - | 27010 | 60000 |
| 2009 | No separate advice | - | 35830 | 108000 |
| 2010 | No separate advice | - | 33880 | 55466 |
| 2011 | No separate advice | - | 37140 | 28145 |
| 2012 | No separate advice | - | 36740 | 33240 |
| 2013 | No separate advice | - | 31160 | 27322 |
| 2014 | No separate advice | - | 56640 | 57875 |
| 2015 | No separate advice | - | 48140 | 50869 |
| 2016 | No separate advice | - | 40920 | 42276 |
| 2017 | No separate advice | - | 46631 | 36739 |
| 2018 | No separate advice | - | 37305 | 34279 |
| 2019 | No separate advice | - | 29844 | 24764 |
| 2020 | No separate advice | - | 38895 | 37529 |
| 2021 | No separate advice | - | 36306 | 31928 |
| 2022 | No separate advice | - | | |
| 2023 | No separate advice | - | | |

* Division 8.c, subareas 9 and 10, and CECAF Division 34.1.1 (EU waters only).

History of the catch and landings

Table 10 Mackerel in subareas 1–8 and 14, and in Division 9.a. Landings distribution by fleet and discards, as estimated by ICES.

| Catch (2021) | Landings | | | Discards |
|------------------|---------------------|-------------------|-------------|--------------|
| | Pelagic trawl 74.6% | Purse-seine 25.1% | Others 0.3% | |
| 1 081 540 tonnes | 1 078 411 tonnes | | | 3129 tonnes* |

* Only quantified for part of the fisheries.

Table 11 Mackerel in subareas 1–8 and 14, and in Division 9.a. History of commercial catch and landings; the official values are presented by country. All weights are in tonnes. “Misreported” refers to assumed area misreporting between divisions 4.a and 6.a, and “Unallocated” indicates differences between official reported values and ICES estimates.

| Country | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Belgium | 20 | 37 | | 125 | 102 | 191 | 351 | 106 | 62 | 114 | 125 | 177 | 146 | 97 | 22 | 2 |
| Denmark | 36853 | 34264 | 35800 | 41505 | 42164 | 42502 | 50142 | 36780 | 28526 | 21971 | 27416 | 30011 | 29177 | 22522 | 34376 | 27900 |
| Estonia | | | | | 616 | | 3302 | 2286 | 3741 | 4422 | 7356 | 3595 | 2673 | 219 | | |
| Faroe Islands | 2622 | 5032 | 10000 | 11131 | 3347 | 12575 | 21568 | 31199 | 16851 | 11513 | 11229 | 11620 | 21023 | 24184 | 19768 | 14014 |
| France | 10706 | 14911 | 19000 | 6480 | 962 | 3836 | 11573 | 11782 | 15663 | 20916 | 17835 | 16367 | 19445 | 20956 | 21878 | 22906 |
| Germany, Fed. Rep. | 16457 | 22512 | 21600 | 14537 | 13719 | 13236 | 26508 | 24415 | 16227 | 15374 | 21412 | 19949 | 22979 | 25307 | 26532 | 24061 |
| Germany, Dem. Rep. | | 2409 | | | | | | | | | | | | | | |
| Greenland | | | | | | | | | | | | | | | | |
| Guernsey | | | | | | | | | | | | | | | | |
| Iceland | | | | | | | | | 92 | 925 | 357 | | | | 53 | 122 |
| Ireland | 85800 | 69980 | 74300 | 30138 | 35088 | 36982 | 89028 | 78534 | 54313 | 53129 | 66650 | 59675 | 71233 | 70452 | 72172 | 67355 |
| Jersey | | | | | | | | | | | | | | | | |
| Latvia | | | | | 311 | 4700 | 1508 | 389 | 233 | | | | | | | |
| Lithuania | | | | | | | | | | | | | | 2085 | | |
| Netherlands | 28664 | 31343 | 38200 | 69418 | 82860 | 89543 | 44335 | 35789 | 36760 | 23700 | 30163 | 28621 | 32385 | 36095 | 33444 | 30424 |
| Norway | 163450 | 150400 | 151700 | 208266 | 239965 | 257800 | 258094 | 202205 | 136436 | 137523 | 158177 | 160738 | 174098 | 180372 | 184291 | 163406 |
| Poland | | | | | | 600 | | | | 22 | | | | | | |
| Portugal | 4388 | 3112 | 3819 | 2789 | 3576 | 2015 | 2158 | 2893 | 3023 | 2080 | 2897 | 2002 | 2253 | 3119 | 2934 | 2749 |
| Romania | | | | | | | 2903 | | | | | | | | | |
| Spain | 21884 | 16609 | 17892 | 22011 | 17234 | 20864 | 27113 | 29165 | 33371 | 46470 | 44607 | 45915 | 38321 | 44142 | 50123 | 23762 |
| Sweden | 1003 | 6601 | 6400 | 4227 | 5100 | 5934 | 7099 | 6285 | 5307 | 4714 | 5146 | 5233 | 4994 | 5098 | 5232 | 445 |
| United Kingdom | 210815 | 187760 | 193900 | 200019 | 232829 | 256275 | 237841 | 212147 | 146205 | 321821 | 185948 | 160152 | 184902 | 192631 | 194045 | 183008 |
| USSR/Russian Federation | 27924 | 12088 | 28900 | 13361 | 42440 | 49600 | 28041 | 44537 | 44545 | 53732 | 67836 | 51348 | 50772 | 41567 | 45811 | 40026 |
| Misreported | | | | | | | 109625 | 18647 | | | | -211 | 4816 | | 6009 | |
| Unallocated | 34330 | 25361 | 8100 | 12956 | 15038 | | 4632 | 29228 | 10839 | 5679 | 11498 | 38996 | 66235 | 62825 | 50543 | 59172 |
| Discards | 35576 | 7090 | 15600 | 30750 | 25000 | 18380 | 5370 | 7721 | 11415 | 18864 | 8030 | | 3832 | 1188 | 23774 | 9481 |
| Total | 680492 | 589509 | 625211 | 667713 | 760351 | 815033 | 931194 | 774108 | 563610 | 742969 | 666682 | 634545 | 731459 | 730774 | 771007 | 668833 |

Table 11 (cont.)

| Country | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010* | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 ** | 2019 ** | 2020 | 2021 |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|--------|--------|
| Belgium | 5 | 1 | 3 | 1 | 2 | 3 | 29 | 21 | 39 | 62 | 56 | 52 | 143 | 128 | 168 | 66 | 124 | 110 |
| Denmark | 25665 | 23212 | 24219 | 25223 | 26726 | 23491 | 41445 | 35958 | 36501 | 33218 | 42222 | 46871 | 41139 | 40028 | 30690 | 30563 | 38485 | 32796 |
| Estonia | | | | | | | | | | 1367 | | | | | | | | |
| Faroe Islands | 13030 | 9769 | 12067 | 13430 | 11289 | 14062 | 70987 | 122050 | 107630 | 143001 | 150236 | 108412 | 93267 | 99667 | 81079 | 62665 | 69064 | 105096 |
| France | 20266 | 16338 | 14953 | 20038 | 15602 | 18340 | 11379 | 12766 | 20467 | 14643 | 21719 | 25704 | 20189 | 22950 | 21471 | 17869 | 21878 | 16442 |
| Germany, Fed. Rep | 23244 | 19040 | 16608 | 18221 | 15502 | 22703 | 19055 | 24083 | 18944 | 20931 | 28456 | 28257 | 23411 | 24858 | 19883 | 16904 | 25030 | 11996 |
| Germany, Dem. Rep | | | | | | | | | | | | | | | | | | |
| Greenland | | | | | | | | 62 | 7402 | 54148 | 78581 | 30351 | 36142 | 46388 | 62973 | 30241 | 26577 | 33360 |
| Guernsey | | | 10 | | | | | 10 | 5 | 9 | 9 | 4 | | | 12 | 9 | | |
| Iceland | | 363 | 4222 | 36706 | 112286 | 116160 | 121008 | 159263 | 149282 | 151235 | 172960 | 169333 | 170374 | 167366 | 168330 | 128077 | 151534 | 132109 |
| Ireland | 61102 | 45687 | 40664 | 49259 | 44760 | 61056 | 57994 | 61596 | 63049 | 56511 | 103178 | 88744 | 76526 | 84915 | 66747 | 53312 | 74114 | 60752 |
| Jersey | | 9 | 8 | 6 | 7 | 8 | 6 | 7 | 8 | 8 | 7 | 3 | 3 | | 3 | 2 | 5 | |
| Latvia | | | | | | | | | | | | | | | | | | |
| Lithuania | | | 95 | 7 | | | | 23 | | | 9598 | 554 | 2540 | | | | 815 | 6655 |
| Netherlands | 27532 | 22734 | 24157 | 24244 | 19972 | 23568 | 23088 | 28395 | 25817 | 21159 | 46665 | 39807 | 37929 | 43766 | 30392 | 22698 | 30321 | 24594 |
| Norway | 157363 | 119678 | 121993 | 131691 | 121524 | 121229 | 233952 | 208065 | 176023 | 164607 | 277731 | 242231 | 209352 | 222356 | 187207 | 159107 | 211672 | 270653 |
| Poland | | 570 | 1368 | 978 | | | | | | | | 24 | | 1 | 4057 | 3706 | 5302 | 1779 |
| Portugal | 2289 | 1509 | 2620 | 2605 | 2381 | 1753 | 4120* | 3263* | 5691* | 5388* | 7950* | 8295* | 6688* | 4331* | 4565* | 3940* | 4799 | 4723 |
| Romania | | | | | | | | | | | | | | | | | | |
| Spain | | | 54136 | 62946 | 64637 | 114074 | 52737 | 18725 | 19386 | 16414 | 37806 | 34530 | 30036 | 32885 | 30036 | 21112 | 34307 | 27783 |
| Sweden | 4437 | 3204 | 3209 | 3858 | 3664 | 7303 | 3429 | 3248 | 4564 | 2906 | 4422 | 3930 | 3663 | 3701 | 3966 | 2958 | 3671 | 3513 |
| United Kingdom | 214771 | 152801 | 95815 | 133688 | 112394 | 157010 | 160417 | 180972 | 169745 | 163807 | 287851 | 247986 | 217638 | 225409 | 190028 | 152146 | 203716 | 209876 |
| USSR/Russian Federation | 49489 | 40495 | 33580 | 35408 | 32728 | 41414 | 59310 | 73601 | 74587 | 80817 | 116433 | 128433 | 121644 | 138061 | 118255 | 126544 | 128817 | 136176 |
| Misreported | | | | | | | | | | | | | | | | | | |
| Unallocated | 41335 | 68414 | 4954 | 12453 | 1069 | -139 | 5271 | 5961 | 5237 | 3336 | 9457 | 1876 | 3480 | | 392 | | | |
| Discards | 19962 | 25788 | 26594 | 15444 | 37075 | 15934 | 13045 | 10894 | 15174 | 4732 | 6451 | 10430 | 5971 | 2832 | 2890 | 7807 | 9280 | 3129 |
| Total | 660491 | 549514 | 481276 | 586206 | 621618 | 737969 | 877272 | 948963 | 899551 | 938299 | 140178 | 121582 | 110013 | 115964 | 102314 | 839727 | 103951 | 108154 |

* Catch data revised in 2021.

** Catch and discards data revised in 2021.

Table 12 Mackerel in subareas 1–8 and 14, and in Division 9.a. History of catch and landings; the ICES estimates are presented by area. All weights are in tonnes.

| Year | Subarea 6 | | | Subarea 7 and divisions 8.a, 8.b, 8.d, and 8.e | | | Subareas 3 and 4 | | | Subareas 1, 2, 5, and 14 | | | Divisions 8.c and 9.a | | | Total | | |
|------|-----------|-------|--------|---|-------|--------|------------------|-------|--------|--------------------------|-------|--------|-----------------------|-------|-------|--------|-------|--------|
| | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch |
| 1969 | 4800 | | 4800 | 47404 | | 47404 | 739175 | | 739175 | 7 | | 7 | 42526 | | 42526 | 833912 | | 833912 |
| 1970 | 3900 | | 3900 | 72822 | | 72822 | 322451 | | 322451 | 163 | | 163 | 70172 | | 70172 | 469508 | | 469508 |
| 1971 | 10200 | | 10200 | 89745 | | 89745 | 243673 | | 243673 | 358 | | 358 | 32942 | | 32942 | 376918 | | 376918 |
| 1972 | 13000 | | 13000 | 130280 | | 130280 | 188599 | | 188599 | 88 | | 88 | 29262 | | 29262 | 361229 | | 361229 |
| 1973 | 52200 | | 52200 | 144807 | | 144807 | 326519 | | 326519 | 21600 | | 21600 | 25967 | | 25967 | 571093 | | 571093 |
| 1974 | 64100 | | 64100 | 207665 | | 207665 | 298391 | | 298391 | 6800 | | 6800 | 30630 | | 30630 | 607586 | | 607586 |
| 1975 | 64800 | | 64800 | 395995 | | 395995 | 263062 | | 263062 | 34700 | | 34700 | 25457 | | 25457 | 784014 | | 784014 |
| 1976 | 67800 | | 67800 | 420920 | | 420920 | 305709 | | 305709 | 10500 | | 10500 | 23306 | | 23306 | 828235 | | 828235 |
| 1977 | 74800 | | 74800 | 259100 | | 259100 | 259531 | | 259531 | 1400 | | 1400 | 25416 | | 25416 | 620247 | | 620247 |
| 1978 | 151700 | 15100 | 166800 | 355500 | 35500 | 391000 | 148817 | | 148817 | 4200 | | 4200 | 25909 | | 25909 | 686126 | 50600 | 736726 |
| 1979 | 203300 | 20300 | 223600 | 398000 | 39800 | 437800 | 152323 | 500 | 152823 | 7000 | | 7000 | 21932 | | 21932 | 782555 | 60600 | 843155 |
| 1980 | 218700 | 6000 | 224700 | 386100 | 15600 | 401700 | 87931 | | 87931 | 8300 | | 8300 | 12280 | | 12280 | 713311 | 21600 | 734911 |
| 1981 | 335100 | 2500 | 337600 | 274300 | 39800 | 314100 | 64172 | 3216 | 67388 | 18700 | | 18700 | 16688 | | 16688 | 708960 | 45516 | 754476 |
| 1982 | 340400 | 4100 | 344500 | 257800 | 20800 | 278600 | 35033 | 450 | 35483 | 37600 | | 37600 | 21076 | | 21076 | 691909 | 25350 | 717259 |
| 1983 | 320500 | 2300 | 322800 | 235000 | 9000 | 244000 | 40889 | 96 | 40985 | 49000 | | 49000 | 14853 | | 14853 | 660242 | 11396 | 671638 |
| 1984 | 306100 | 1600 | 307700 | 161400 | 10500 | 171900 | 43696 | 202 | 43898 | 98222 | | 98222 | 20208 | | 20208 | 629626 | 12302 | 641928 |
| 1985 | 388140 | 2735 | 390875 | 75043 | 1800 | 76843 | 46790 | 3656 | 50446 | 78000 | | 78000 | 18111 | | 18111 | 606084 | 8191 | 614275 |
| 1986 | 104100 | | 104100 | 128499 | | 128499 | 23309 | 7431 | 243740 | 101000 | | 101000 | 24789 | | 24789 | 594697 | 7431 | 602128 |
| 1987 | 183700 | | 183700 | 100300 | | 100300 | 290829 | 10789 | 301618 | 47000 | | 47000 | 22187 | | 22187 | 644016 | 10789 | 654805 |
| 1988 | 115600 | 3100 | 118700 | 75600 | 2700 | 78300 | 308550 | 29766 | 338316 | 120404 | | 120404 | 24772 | | 24772 | 644926 | 35566 | 680492 |
| 1989 | 121300 | 2600 | 123900 | 72900 | 2300 | 75200 | 279410 | 2190 | 281600 | 90488 | | 90488 | 18321 | | 18321 | 582419 | 7090 | 589509 |
| 1990 | 114800 | 5800 | 120600 | 56300 | 5500 | 61800 | 300800 | 4300 | 305100 | 118700 | | 118700 | 21311 | | 21311 | 611911 | 15600 | 627511 |
| 1991 | 109500 | 10700 | 120200 | 50500 | 12800 | 63300 | 358700 | 7200 | 365900 | 97800 | | 97800 | 20683 | | 20683 | 637183 | 30700 | 667883 |
| 1992 | 141906 | 9620 | 151526 | 72153 | 12400 | 84553 | 364184 | 2980 | 367164 | 139062 | | 139062 | 18046 | | 18046 | 735351 | 25000 | 760351 |
| 1993 | 133497 | 2670 | 136167 | 99828 | 12790 | 112618 | 387838 | 2720 | 390558 | 165973 | | 165973 | 19720 | | 19720 | 806856 | 18180 | 825036 |
| 1994 | 134338 | 1390 | 135728 | 113088 | 2830 | 115918 | 471247 | 1150 | 472397 | 72309 | | 72309 | 25043 | | 25043 | 816025 | 5370 | 821395 |
| 1995 | 145626 | 74 | 145700 | 117883 | 6917 | 124800 | 321474 | 730 | 322204 | 135496 | | 135496 | 27600 | | 27600 | 748079 | 7721 | 755800 |
| 1996 | 129895 | 255 | 130150 | 73351 | 9773 | 83124 | 211451 | 1387 | 212838 | 103376 | | 103376 | 34123 | | 34123 | 552196 | 11415 | 563611 |
| 1997 | 65044 | 2240 | 67284 | 114719 | 13817 | 128536 | 226680 | 2807 | 229487 | 103598 | | 103598 | 40708 | | 40708 | 550749 | 18864 | 569613 |
| 1998 | 110141 | 71 | 110212 | 105181 | 3206 | 108387 | 264947 | 4735 | 269682 | 134219 | | 134219 | 44164 | | 44164 | 658652 | 8012 | 666664 |
| 1999 | 116362 | | 116362 | 94290 | | 94290 | 313014 | | 313014 | 72848 | | 72848 | 43796 | | 43796 | 640311 | | 640311 |
| 2000 | 187595 | 1 | 187595 | 115566 | 1918 | 117484 | 285567 | 165 | 304898 | 92557 | | 92557 | 36074 | | 36074 | 736524 | 2084 | 738608 |
| 2001 | 143142 | 83 | 143142 | 142890 | 1081 | 143971 | 327200 | 24 | 339971 | 67097 | | 67097 | 43198 | | 43198 | 736274 | 1188 | 737462 |
| 2002 | 136847 | 12931 | 149778 | 102484 | 2260 | 104744 | 375708 | 8583 | 394878 | 73929 | | 73929 | 49576 | | 49576 | 749131 | 23774 | 772905 |
| 2003 | 135690 | 1399 | 137089 | 90356 | 5712 | 96068 | 354109 | 11785 | 365894 | 53883 | | 53883 | 25823 | 531 | 26354 | 659831 | 19427 | 679288 |

| Year | Subarea 6 | | | Subarea 7 and divisions 8.a, 8.b, 8.d, and 8.e | | | Subareas 3 and 4 | | | Subareas 1, 2, 5, and 14 | | | Divisions 8.c and 9.a | | | Total | | |
|-------|-----------|-------|--------|---|-------|--------|------------------|-------|--------|--------------------------|-------|--------|-----------------------|-------|--------|---------|-------|---------|
| | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch | Land. | Disc. | Catch |
| 2004 | 134033 | 1705 | 134738 | 103703 | 5991 | 109694 | 306040 | 11329 | 317369 | 62913 | 9 | 62922 | 34840 | 928 | 35769 | 640529 | 19962 | 660491 |
| 2005 | 79960 | 8201 | 88162 | 90278 | 12158 | 102436 | 249741 | 4633 | 254374 | 54129 | | 54129 | 49618 | 796 | 50414 | 523726 | 25788 | 549514 |
| 2006 | 88077 | 6081 | 94158 | 66209 | 8642 | 74851 | 200929 | 8263 | 209192 | 46716 | | 46716 | 52751 | 3607 | 56358 | 454587 | 26594 | 481181 |
| 2007 | 110788 | 2450 | 113238 | 71235 | 7727 | 78962 | 253013 | 4195 | 257208 | 72891 | | 72891 | 62834 | 1072 | 63906 | 570762 | 15444 | 586206 |
| 2008 | 76358 | 21889 | 98247 | 73954 | 5462 | 79416 | 227252 | 8862 | 236113 | 148669 | 112 | 148781 | 59859 | 750 | 60609 | 586090 | 37075 | 623165 |
| 2009 | 135468 | 3927 | 139395 | 88287 | 2921 | 91208 | 226928 | 8120 | 235049 | 163604 | | 163604 | 107747 | 966 | 108713 | 722035 | 15934 | 737969 |
| 2010* | 106732 | 2904 | 109636 | 104128 | 4614 | 108741 | 246818 | 883 | 247700 | 355725 | 5 | 355729 | 50826 | 4640 | 55466 | 864229 | 13045 | 877272 |
| 2011* | 160756 | 1836 | 162592 | 51098 | 5317 | 56415 | 301746 | 1906 | 303652 | 398132 | 28 | 398160 | 26337 | 1807 | 28144 | 938070 | 10894 | 948963 |
| 2012* | 121115 | 952 | 122067 | 65728 | 9701 | 75429 | 218400 | 1089 | 219489 | 449325 | 1 | 449326 | 29809 | 3431 | 33240 | 884377 | 15174 | 899551 |
| 2013* | 132062 | 273 | 132335 | 49871 | 1652 | 51523 | 260921 | 337 | 261258 | 465846 | 15 | 465861 | 24867 | 2455 | 27322 | 933567 | 4732 | 938299 |
| 2014* | 180068 | 340 | 180408 | 93709 | 1402 | 95111 | 383887 | 334 | 384221 | 684082 | 91 | 684173 | 53591 | 4284 | 57875 | 1395337 | 6451 | 1401788 |
| 2015* | 134728 | 30 | 134757 | 98563 | 3155 | 101718 | 295877 | 34 | 295911 | 632493 | 78 | 632571 | 43735 | 7133 | 50869 | 1205396 | 10431 | 1215827 |
| 2016* | 206326 | 200 | 206526 | 37300 | 1927 | 39227 | 248041 | 570 | 248611 | 563440 | 54 | 563494 | 39056 | 3220 | 42276 | 1094163 | 5971 | 1100135 |
| 2017* | 225959 | 151 | 226110 | 21128 | 1992 | 23119 | 269404 | 400 | 269804 | 603806 | 62 | 603869 | 36512 | 227 | 36739 | 1156809 | 2832 | 1159641 |
| 2018* | 157239 | 90 | 157329 | 32037 | 1611 | 33649 | 341527 | 620 | 342147 | 455689 | 51 | 455740 | 33761 | 518 | 34279 | 1020254 | 2890 | 1023144 |
| 2019* | 122995 | 144 | 123139 | 32840 | 5902 | 38742 | 307235 | 812 | 308047 | 345019 | 18 | 345037 | 23832 | 931 | 24763 | 831920 | 7807 | 839727 |
| 2020* | 130577 | 341 | 130918 | 48806 | 8065 | 56871 | 456479 | 732 | 457211 | 356985 | | 356985 | 37386 | 143 | 37529 | 1030233 | 9280 | 1039513 |
| 2021 | 146519 | 117 | 146635 | 15901 | 2524 | 18425 | 221019 | 423 | 221442 | 663111 | | 663111 | 31862 | 65 | 31928 | 1078411 | 3129 | 1081540 |

* Catch data revised in 2021

Table 13 Mackerel in subareas 1–8 and 14, and in Division 9.a. Catches inside and outside the NEAFC Regulatory Area (RA), as estimated by ICES, as well as total catches. Weights are in tonnes.

| Year | Inside the NEAFC RA | Outside the NEAFC RA | Total catch | Percentage inside the NEAFC RA |
|-------|---------------------|----------------------|-------------|--------------------------------|
| 2018 | 213608 | 809536 | 1023144 | 21% |
| 2019 | 207200 | 632527 | 839727 | 25% |
| 2020 | 247901 | 791612 | 1039513 | 24% |
| 2021* | 195938 | 749427 | 945365 | 21% |

* Without catches from the Russian Federation, as it did not report catches inside/outside the NEAFC RA for 2021. In the past, around 90% of Russian catches were taken inside the NEAFC RA.

Summary of the assessment

Table 14 Mackerel in subareas 1–8 and 14, and in Division 9.a. Assessment summary. Weights are in tonnes and recruitment in thousands.

| Year | Recruitment (age 2) | | | SSB at spawning time | | | Total catch | F (ages 4–8) | | |
|------|---------------------|---------|----------|----------------------|---------|---------|-------------|--------------|-------|------|
| | Low | Value | High | Low | Value | High | | Low | Value | High |
| 1980 | 741662 | 2256379 | 6864651 | 1931692 | 4095763 | 8684237 | 734950 | 0.13 | 0.21 | 0.33 |
| 1981 | 1483866 | 3954164 | 10536946 | 1908690 | 3610917 | 6831242 | 754045 | 0.13 | 0.21 | 0.33 |
| 1982 | 2251174 | 4258180 | 8054508 | 2034611 | 3475244 | 5935937 | 716987 | 0.13 | 0.21 | 0.32 |
| 1983 | 2476430 | 4189394 | 7087228 | 2412006 | 3685894 | 5632577 | 672283 | 0.14 | 0.21 | 0.31 |
| 1984 | 1048672 | 1945021 | 3607518 | 2800858 | 3989717 | 5683201 | 641928 | 0.14 | 0.21 | 0.31 |
| 1985 | 911867 | 1761799 | 3403932 | 2949017 | 4015844 | 5468602 | 614371 | 0.15 | 0.21 | 0.31 |
| 1986 | 2414771 | 4075432 | 6878145 | 2709488 | 3608231 | 4805089 | 602201 | 0.15 | 0.22 | 0.31 |
| 1987 | 1645418 | 2713304 | 4474253 | 2689623 | 3575982 | 4754438 | 654992 | 0.16 | 0.22 | 0.31 |
| 1988 | 1704717 | 2668074 | 4175837 | 2719049 | 3526114 | 4572730 | 680491 | 0.17 | 0.23 | 0.32 |
| 1989 | 2626296 | 3859714 | 5672396 | 2586241 | 3297725 | 4204941 | 585920 | 0.18 | 0.24 | 0.33 |
| 1990 | 1615372 | 2352987 | 3427412 | 2703312 | 3381620 | 4230127 | 626107 | 0.19 | 0.26 | 0.34 |
| 1991 | 1806495 | 2640685 | 3860081 | 2648612 | 3278987 | 4059393 | 675665 | 0.21 | 0.27 | 0.36 |
| 1992 | 1255408 | 1959426 | 3058250 | 2453803 | 3005914 | 3682253 | 760690 | 0.22 | 0.29 | 0.38 |
| 1993 | 1667703 | 2400478 | 3455227 | 2192074 | 2665757 | 3241797 | 824568 | 0.24 | 0.31 | 0.39 |
| 1994 | 1937535 | 2792997 | 4026163 | 1924591 | 2323071 | 2804054 | 819087 | 0.25 | 0.32 | 0.40 |
| 1995 | 1447844 | 2068160 | 2954245 | 1914732 | 2290278 | 2739483 | 756277 | 0.25 | 0.31 | 0.39 |
| 1996 | 1465444 | 2062647 | 2903224 | 1825764 | 2174598 | 2590081 | 563472 | 0.25 | 0.30 | 0.37 |
| 1997 | 1220370 | 1738105 | 2475486 | 1824264 | 2144607 | 2521204 | 573029 | 0.24 | 0.30 | 0.36 |
| 1998 | 1445736 | 2299083 | 3656118 | 1799608 | 2120261 | 2498049 | 666316 | 0.25 | 0.30 | 0.37 |
| 1999 | 1262250 | 1918742 | 2916672 | 1958221 | 2301530 | 2705027 | 640309 | 0.27 | 0.32 | 0.38 |
| 2000 | 1646261 | 2242303 | 3054147 | 1970480 | 2266622 | 2607272 | 738606 | 0.29 | 0.34 | 0.39 |
| 2001 | 1930231 | 2565296 | 3409305 | 1874159 | 2147511 | 2460732 | 737463 | 0.32 | 0.37 | 0.43 |
| 2002 | 863381 | 1152032 | 1537189 | 1778419 | 2054100 | 2372516 | 771422 | 0.33 | 0.39 | 0.46 |
| 2003 | 3687488 | 4794496 | 6233834 | 1718635 | 1993516 | 2312361 | 679287 | 0.34 | 0.41 | 0.48 |
| 2004 | 5011045 | 6668900 | 8875242 | 2204914 | 2608232 | 3085323 | 660491 | 0.32 | 0.38 | 0.45 |
| 2005 | 1745850 | 2356809 | 3181573 | 2013569 | 2404435 | 2871174 | 549514 | 0.26 | 0.31 | 0.36 |
| 2006 | 2532416 | 3427824 | 4639829 | 1888395 | 2242585 | 2663208 | 481181 | 0.24 | 0.28 | 0.33 |
| 2007 | 3624149 | 4994825 | 6883900 | 2021689 | 2380749 | 2803579 | 586206 | 0.27 | 0.31 | 0.37 |
| 2008 | 3651784 | 5064453 | 7023604 | 2354473 | 2800351 | 3330667 | 623165 | 0.25 | 0.30 | 0.36 |
| 2009 | 2640841 | 3641939 | 5022536 | 2915680 | 3480016 | 4153581 | 737969 | 0.23 | 0.27 | 0.33 |
| 2010 | 2971798 | 4083427 | 5610870 | 3290915 | 3901258 | 4624797 | 877272 | 0.22 | 0.26 | 0.32 |
| 2011 | 2520467 | 3464819 | 4762994 | 3791504 | 4504765 | 5352206 | 948963 | 0.22 | 0.26 | 0.31 |
| 2012 | 4214540 | 5786958 | 7946034 | 3548472 | 4225513 | 5031731 | 899551 | 0.20 | 0.24 | 0.29 |
| 2013 | 4871399 | 6709016 | 9239829 | 3935828 | 4705814 | 5626437 | 938299 | 0.19 | 0.24 | 0.29 |
| 2014 | 2729554 | 3753792 | 5162367 | 4924869 | 5898500 | 7064615 | 1401788 | 0.20 | 0.24 | 0.29 |
| 2015 | 2437757 | 3352679 | 4610983 | 4928398 | 5928946 | 7132621 | 1215827 | 0.18 | 0.22 | 0.27 |
| 2016 | 3652137 | 5035066 | 6941658 | 4638104 | 5598144 | 6756902 | 1100135 | 0.16 | 0.20 | 0.25 |

| Year | Recruitment (age 2) | | | SSB at spawning time | | | Total catch | F (ages 4–8) | | |
|------|---------------------|---------|----------|----------------------|----------|---------|-------------|--------------|-------|------|
| | Low | Value | High | Low | Value | High | | Low | Value | High |
| 2017 | 1541675 | 2141687 | 2975221 | 4469022 | 5404599 | 6536037 | 1159641 | 0.17 | 0.21 | 0.25 |
| 2018 | 3434902 | 4853899 | 6859101 | 3859967 | 4667166 | 5643167 | 1023144 | 0.17 | 0.21 | 0.26 |
| 2019 | 2020927 | 2923019 | 4227783 | 3233573 | 3945436 | 4814014 | 839727 | 0.18 | 0.22 | 0.27 |
| 2020 | 1816780 | 2698510 | 4008168 | 2888782 | 3570188 | 4412324 | 1039513 | 0.23 | 0.29 | 0.36 |
| 2021 | 4313470 | 6801162 | 10723570 | 3044947 | 3891546 | 4973528 | 1081540 | 0.23 | 0.31 | 0.40 |
| 2022 | 2148239 | 4317473 | 8677141 | | 3769326† | | | | | |

† Estimated value from the forecast.

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Mackerel (*Scomber scombrus*) in subareas 1–8 and 14 and division 9.a (the Northeast Atlantic and adjacent waters). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, mac.27.nea. <https://doi.org/10.17895/ices.advice.7789>

Megrim (*Lepidorhombus whiffiagonis*) in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay)

ICES advice on fishing opportunities

Please note: the present advice replaces the advice given in June 2022.

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 23 596 tonnes.

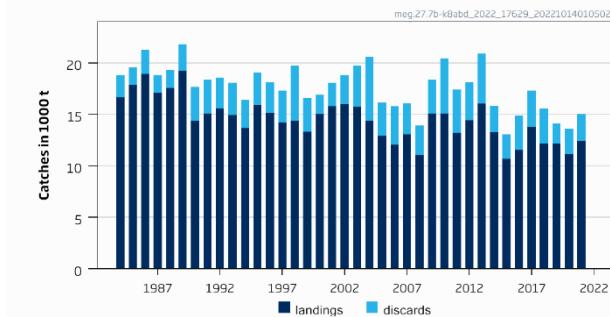
ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

Management of catches of the two megrim species—megrim (*Lepidorhombus whiffiagonis*) and four-spot megrim (*Lepidorhombus boscii*)—under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species.

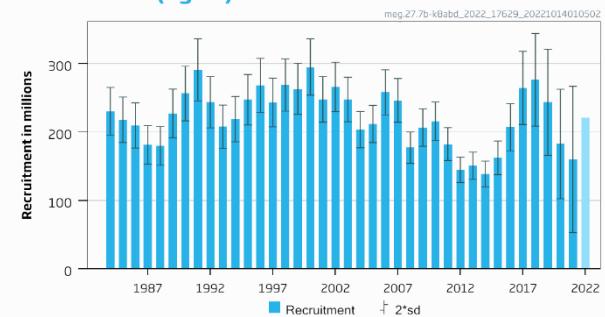
Stock development over time

Fishing pressure on the stock is below F_{MSY} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

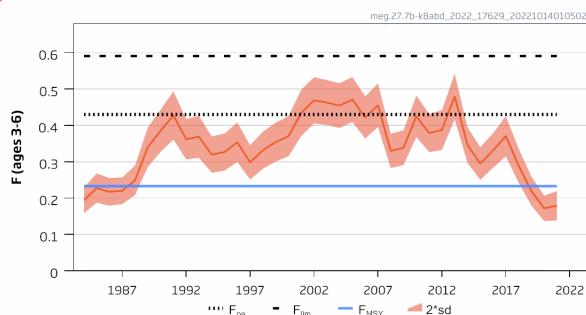
Catches



Recruitment (age 1)



F



SSB

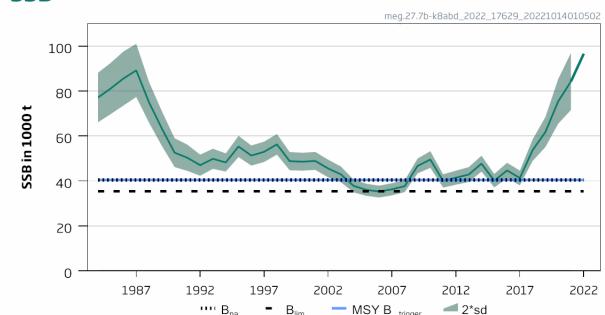


Figure 1 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. The 2022 SSB value is a model forecast.

Catch scenarios

Table 1 Megrim in divisions 7.b–k, 8.a–b, and 8.d. The basis of the catch scenarios.

| Variable | Value | Notes |
|---------------------------|--------|--|
| $F_{ages\ 3-6}(2022)$ | 0.190 | Average F (2019–2021). |
| SSB (2023) | 96184 | Short-term forecast (STF); in tonnes. |
| $R_{age\ 1}$ (2022–2023) | 221058 | Geometric mean of recruitment (1984–2019); in thousands. |
| Catch (2022) | 19412 | STF; in tonnes. |
| Projected landings (2022) | 16612 | STF; average (2019–2021) landings ratio at age; in tonnes. |

| Variable | Value | Notes | | | | |
|---------------------------|-------|--|--|--|--|--|
| Projected discards (2022) | 2800 | STF; average (2019–2021) discards ratio at age; in tonnes. | | | | |

Table 2 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Annual catch scenarios. All weights are in tonnes. Note: The % change in TAC is not computed because the TAC is for the two megrim species combined.

| Basis | Total catch (2023) | Projected landings* (2023) | Projected discards**(2023) | F _{ages 3–6} Total (2023) | SSB (2024) | % SSB change*** | % advice change^ |
|--|--------------------|----------------------------|----------------------------|------------------------------------|------------|-----------------|------------------|
| ICES advice basis | | | | | | | |
| MSY approach: F _{MSY} | 23596 | 20264 | 3332 | 0.23 | 90976 | -5.4 | 2.8 |
| Other scenarios | | | | | | | |
| EU MAP ^{^^} = F _{MSY} | 23596 | 20264 | 3332 | 0.23 | 90976 | -5.4 | 2.8 |
| F = MAP ^{^^} F _{MSY} lower | 15101 | 12982 | 2119 | 0.14 | 99893 | 3.9 | -34 |
| F = MAP ^{^^} F _{MSY} upper | 38191 | 32733 | 5457 | 0.41 | 75788 | -21 | 66 |
| F = 0 | 0 | 0 | 0 | 0 | 115855 | 20 | -100 |
| F _{pa} | 39638 | 33966 | 5672 | 0.43 | 74293 | -23 | 73 |
| F _{lim} | 50197 | 42939 | 7258 | 0.591 | 63458 | -34 | 119 |
| SSB (2024) = B _{lim} | 78477 | 66677 | 11800 | 1.241 | 35398 | -63 | 242 |
| SSB (2024) = B _{pa} | 73241 | 62327 | 10914 | 1.084 | 40444 | -58 | 219 |
| SSB (2024) = MSY B _{trigger} | 73241 | 62327 | 10914 | 1.084 | 40444 | -58 | 220 |
| SSB (2024) = SSB (2023) | 18629 | 16008 | 2621 | 0.176 | 96184 | 0 | -18.9 |
| F = F ₂₀₂₂ | 19945 | 17136 | 2809 | 0.19 | 94803 | -1.44 | -13.1 |

* Marketable landings, assuming recent discard rate.

** Including BMS landings (EU stocks), assuming recent discard rate.

*** SSB 2024 relative to SSB 2023.

^ Advice value for 2023 relative to advice value for 2022 (22 964 tonnes).

^^ EU multiannual plan (MAP) for the Western Waters (EU, 2019).

The advice for 2023 is higher than the advice for 2022 because of a re-estimation of F_{MSY}.

Basis of the advice

Table 3 Megrim in divisions 7.b–k, 8.a–b, and 8.d. The basis of the advice.

| Advice basis | MSY approach |
|-----------------|--|
| Management plan | ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2019) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F _{MSY} ranges are provided. |

Quality of the assessment

This stock was benchmarked in 2022 and this resulted in a different assessment model and data revisions, including the removal of all commercial abundance indices and revision and raising of discard estimates (ICES, 2022a). These changes triggered the calculation of new reference points. Such changes have led to a different picture of the historical assessment results in comparison with previous years' assessments. However, the perception of stock status, in relation to reference points, does not change in comparison to previous years' assessments.

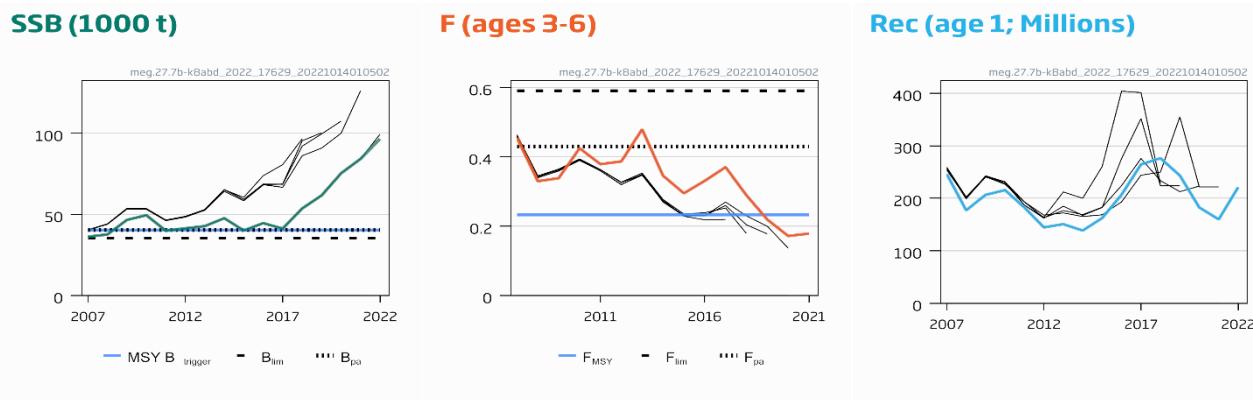


Figure 2 Megrin in divisions 7.b–k, 8.a–b, and 8.d. Historical assessment results (final-year recruitment assumptions included for each line). The reference points were revised in 2022 following a benchmark, and only the last assessment results should be compared to the reference points indicated.

Issues relevant for the advice

The two megrim species are not separated in the landings statistics. The TACs are set separately for subarea 7 and divisions 8.a–b,d,e with each TAC covering catches of both species. Species specific landings are estimated by ICES. ICES considers that management of the catches of these two species under a combined TAC prevents effective control of single-species exploitation rates and could lead to overexploitation of either species.

Reference points

Table 4 Megrin in divisions 7.b–k, 8.a–b, and 8.d. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|-------------------------------------|------------------------------|-------|--|--------------|
| MSY Approach | MSY B _{trigger} | 40444 | B _{pa} ; in tonnes. | ICES (2022a) |
| | F _{MSY} | 0.233 | F giving maximum yield at equilibrium. Median EqSim estimate for landings. | ICES (2022a) |
| EU Management plan (MAP); EU (2019) | MAP MSY B _{trigger} | 40444 | MSY B _{trigger} ; in tonnes. | ICES (2022a) |
| | MAP F _{MSY} | 0.233 | F _{MSY} | ICES (2022a) |
| | MAP range F _{lower} | 0.140 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2022a) |
| | MAP range F _{upper} | 0.414 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2022a) |
| Precautionary Approach | B _{lim} | 35398 | B _{loss} , which is the lowest biomass observed; in tonnes. | ICES (2022a) |
| | B _{pa} | 40444 | B _{lim} * exp(1.645 * σ), with σ = 0.081 ; in tonnes. | ICES (2022a) |
| | F _{lim} | 0.591 | The F that gives 50% probability of SSB being above B _{lim} . | ICES (2022a) |
| | F _{pa} | 0.430 | F _{P05} with Advice Rule (AR) (F that gives 5% probability of SSB below B _{lim}). | ICES (2022a) |

Basis of the assessment

Table 5 Megrin in divisions 7.b–k, 8.a–b, and 8.d. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022b). |
| Assessment type | A4a statistical catch at age (ICES, 2022a, 2022c) using catches in the model and forecast. |
| Input data | Commercial catches (international landings, ages, and length frequencies from catch sampling). Three survey indices: Spanish Porcupine Bottom Trawl Survey [G5768], IE-IGFS [G7212] and EVHOE [G9527]; the latter two surveys are combined into a single index. Natural mortality, a fixed value of 0.2 is used for all age groups and all years, and histologically derived maturity ogives are described in ICES (2022a). |
| Discards and bycatch | Discards are included in the assessment. |
| Indicators | None. |
| Other information | Last benchmarked in 2022 (ICES, 2022a). |
| Working group | Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE). |

History of the advice, catch, and management

Table 6 Megrin in divisions 7.b–k, 8.a–b, and 8.d. ICES advice and landings. All weights are in tonnes.

| Year | ICES advice | Catch/landings corresponding to advice *** | Agreed TAC* | ICES landings | Discards | ICES catch |
|------|---|--|-------------|---------------|----------|------------|
| 1987 | Not assessed | - | 16460 | 17114 | 1705 | 18819 |
| 1988 | Not assessed | - | 18100 | 17577 | 1725 | 19302 |
| 1989 | Not assessed | - | 18100 | 19233 | 2582 | 21815 |
| 1990 | Not assessed | - | 18100 | 14370 | 3284 | 17654 |
| 1991 | No advice | - | 18100 | 15094 | 3282 | 18376 |
| 1992 | No advice | - | 18100 | 15600 | 2988 | 18588 |
| 1993 | Within safe biological limits | - | 21460 | 14929 | 3108 | 18037 |
| 1994 | Within safe biological limits | - | 20330 | 13684 | 2700 | 16384 |
| 1995 | No particular concern | - | 22590 | 15862 | 3206 | 19068 |
| 1996 | No long-term gain in increased F | 16600 | 21200 | 15109 | 3026 | 18135 |
| 1997 | No advice | 14300 | 25000 | 14230 | 3066 | 17296 |
| 1998 | No increase in F | 15200 | 25000 | 14345 | 5371 | 19716 |
| 1999 | Reduce F below F_{pa} | 14600 | 20000 | 13305 | 3297 | 16601 |
| 2000 | Reduce F below F_{pa} | < 14200 | 20000 | 15031 | 1870 | 16750 |
| 2001 | Reduce F below F_{pa} | < 14100 | 16800 | 15778 | 2262 | 18040 |
| 2002 | Reduce F below F_{pa} | < 13000 | 14900 | 15987 | 2813 | 18800 |
| 2003 | Reduce F below F_{pa} | < 16100 | 16000 | 15711 | 4008 | 19719 |
| 2004 | Reduce F below F_{pa} | < 20200 | 20200 | 14358 | 6243 | 20602 |
| 2005 | Reduce F below F_{pa} | < 22600 | 21500 | 12888 | 3275 | 16163 |
| 2006 | Reduce F below F_{pa} | < 13600 | 20425 | 12037 | 3751 | 15788 |
| 2007 | Less than average landings 2003–2005 | < 14200 | 20425 | 13060 | 3033 | 16092 |
| 2008 | Less than average landings 2004–2006 | < 13000 | 20425 | 11048 | 2860 | 13908 |
| 2009 | Same advice as last year | < 13000 | 20425 | 15064 | 3278 | 18342 |
| 2010 | No increase in effort | < 13000 | 20425 | 15101 | 5343 | 20444 |
| 2011 | See scenarios | - | 20106 | 13226 | 4187 | 17413 |
| 2012 | Catch and effort reduction | - | 19101 | 14433 | 3704 | 18137 |
| 2013 | Decrease landings by 4% (20% increase, followed by 20% PA reduction) | < 12000 | 19101 | 16025 | 4885 | 20910 |
| 2014 | Same advice as 2013 | < 12000 | 19101 | 13277 | 2569 | 15846 |
| 2015 | Increase landings by no more than 13% | < 15180 | 19101 | 11569 | 1507 | 13076 |
| 2016 | Precautionary approach (increase recent advised landings by no more than 20%) | ≤ 18216 | 20056 | 11548 | 2445 | 13992 |
| 2017 | MSY approach (catch advice) | ≤ 16021 | 15043 | 13784 | 2173 | 15957 |
| 2018 | MSY approach (catch advice) | ≤ 15720 | 13528 | 12147 | 1738 | 13528 |
| 2019 | MSY approach (catch advice) | ≤ 18976 | 19836 | 12164 | 989 | 13153 |
| 2020 | Management plan | 19982 (range 13218–28838) ** | 20526 | 11141 | 885 | 12026 |
| 2021 | Management plan | 19184 (range 12706–27748) ** | 20181^ | 12417 | 2603 | 15020 |
| 2022 | MSY approach | ≤ 22964 | 20786 | | | |
| 2023 | MSY approach | ≤ 23596 | | | | |

* Includes *L. boscii* and divisions 7.a and 8.e.

** Catches corresponding to F, EU MAP range in brackets (EU, 2019).

*** Advice is for catches starting in 2017.

^ EU (2021).

History of catch and landings

Table 7 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

| Catch | Landings | | | | Discards |
|-------|-----------|--|----------------|--|----------|
| 15020 | 98% trawl | | 2% other gears | | 2603 |
| | | | 12417 | | |

Table 8 Megrim in divisions 7.b–k, 8.a–b, and 8.d. History of commercial catch and landings; ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Year | France | Spain | UK (England & Wales) | UK (Scotland) | Ireland | Northern Ireland | Belgium | Unallocated | ICES estimated landings | ICES estimated discards | ICES estimated catch |
|------|--------|-------|----------------------|---------------|---------|------------------|---------|-------------|-------------------------|-------------------------|----------------------|
| 1984 | | | | | | | | | 16659 | 2169 | 18828 |
| 1985 | | | | | | | | | 17865 | 1732 | 19597 |
| 1986 | 4896 | 10242 | 2048 | | 1563 | | 178 | | 18927 | 2321 | 21248 |
| 1987 | 5056 | 8772 | 1600 | | 1561 | | 125 | | 17114 | 1705 | 18819 |
| 1988 | 5206 | 9247 | 1956 | | 995 | | 173 | | 17577 | 1725 | 19302 |
| 1989 | 5452 | 9482 | 1451 | | 2548 | | 300 | | 19233 | 2582 | 21815 |
| 1990 | 4336 | 7127 | 1380 | | 1381 | | 147 | | 14370 | 3284 | 17654 |
| 1991 | 3709 | 7780 | 1617 | | 1956 | | 32 | | 15094 | 3282 | 18376 |
| 1992 | 4104 | 7349 | 1982 | | 2113 | | 52 | | 15600 | 2988 | 18588 |
| 1993 | 3640 | 6526 | 2131 | | 2592 | | 40 | | 14929 | 3108 | 18037 |
| 1994 | 3214 | 5624 | 2309 | | 2420 | | 117 | | 13684 | 3284 | 16968 |
| 1995 | 3945 | 6129 | 2658 | | 2927 | | 203 | | 15862 | 2652 | 18514 |
| 1996 | 4146 | 5572 | 2493 | | 2699 | | 199 | | 15109 | 3026 | 18135 |
| 1997 | 4333 | 5472 | 2875 | | 1420 | | 130 | | 14230 | 3066 | 17296 |
| 1998 | 4232 | 4870 | 2492 | | 2621 | | 129 | | 14345 | 5371 | 19716 |
| 1999 | 3751 | 4615 | 2193 | | 2597 | | 149 | | 13305 | 3297 | 16601 |
| 2000 | 4173 | 6047 | 2185 | | 2512 | | 115 | | 15031 | 1870 | 16901 |
| 2001 | 3645 | 7575 | 1710 | | 2767 | | 80 | | 15778 | 2262 | 18040 |
| 2002 | 2929 | 8797 | 1787 | | 2413 | | 62 | | 15987 | 2813 | 18800 |
| 2003 | 3227 | 8340 | 1732 | | 2249 | | 163 | | 15711 | 4008 | 19719 |
| 2004 | 2817 | 7526 | 1622 | | 2288 | | 106 | | 14358 | 6243 | 20602 |
| 2005 | 2972 | 5841 | 1764 | | 2155 | | 156 | | 12888 | 3275 | 16163 |
| 2006 | 2763 | 5916 | 1509 | | 1751 | | 99 | | 12037 | 3751 | 15788 |
| 2007 | 2745 | 6895 | 1462 | | 1763 | | 195 | | 13060 | 3033 | 16092 |
| 2008 | 2578 | 5402 | 1387 | | 1514 | | 167 | | 11048 | 2860 | 13908 |
| 2009 | 3032 | 8062 | 1840 | | 1918 | 2 | 209 | | 15064 | 3278 | 18342 |
| 2010 | 3651 | 7095 | 1805 | | 2283 | 5 | 261 | | 15101 | 5343 | 20444 |
| 2011 | 3235 | 3500 | 1845 | | 2227 | | 330 | 2089 | 13226 | 4187 | 17413 |
| 2012 | 4012 | 4055 | 1744 | | 3047 | | 609 | 966 | 14433 | 3704 | 18137 |
| 2013 | 4549 | 4982 | 2918 | | 3038 | | 538 | | 16025 | 4885 | 20910 |
| 2014 | 4311 | 3318 | 2753 | 176 | 2391 | | 179 | 150 | 13277 | 2569 | 15846 |
| 2015 | 3073 | 2863 | 2804 | 147 | 2436 | | 246 | 1 | 11569 | 2393** | 13962 |
| 2016 | 3141 | 2672 | 2694 | 145 | 2593 | | 302 | 1 | 11548 | 3315** | 14863 |
| 2017 | 5101 | 3178 | 2512 | 176 | 2458 | | 360 | | 13784 | 3518** | 17303 |
| 2018 | 4680 | 2276 | 2337 | 112 | 2128 | 6 | 347 | 261 | 12147 | 3415** | 15562 |
| 2019 | 4332 | 2617 | 2150 | 129 | 2454 | 1 | 481 | | 12164 | 1966** | 14130 |
| 2020 | 4387 | 2420 | 1883 | 5 | 1797 | 1 | 649 | | 11141 | 2485** | 13626 |
| 2021 | 4380 | 2896 | 2199 | 144 | 2075 | 5 | 718 | | 12417 | 2603 | 15020 |

**Updated including imported and raised discards (ICES, 2022a).

Summary of the assessment

Table 9 Megrim in divisions 7.b–k, 8.a–b, and 8.d. Assessment summary. ‘High’ and ‘Low’ refer to two standard deviations (sd) confidence intervals

| Year | Recruitment (age 1) | | | Spawning-stock biomass | | | Landings | Discards | Fishing pressure (ages 3–6) | | |
|------|---------------------|--------|--------|------------------------|--------|-------|----------|----------|-----------------------------|------|-------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | thousands | | | tonnes | | | tonnes | | | | |
| 1984 | 230209 | 265242 | 195175 | 77102 | 88124 | 66080 | 16659 | 2169 | 0.194 | 0.23 | 0.158 |
| 1985 | 218022 | 251314 | 184730 | 81159 | 92574 | 69743 | 17865 | 1732 | 0.23 | 0.27 | 0.187 |
| 1986 | 209635 | 242605 | 176665 | 85603 | 97663 | 73543 | 18927 | 2321 | 0.22 | 0.26 | 0.179 |
| 1987 | 181309 | 209443 | 153175 | 89217 | 101067 | 77367 | 17114 | 1705 | 0.22 | 0.26 | 0.184 |
| 1988 | 179649 | 207940 | 151357 | 74999 | 84090 | 65908 | 17577 | 1725 | 0.25 | 0.29 | 0.21 |
| 1989 | 227252 | 262902 | 191602 | 63394 | 71172 | 55616 | 19233 | 2582 | 0.34 | 0.39 | 0.29 |
| 1990 | 256378 | 296286 | 216469 | 52602 | 59042 | 46162 | 14370 | 3284 | 0.39 | 0.44 | 0.33 |
| 1991 | 290949 | 336422 | 245475 | 50325 | 56172 | 44477 | 15094 | 3282 | 0.43 | 0.49 | 0.36 |
| 1992 | 243615 | 281171 | 206060 | 47032 | 51751 | 42313 | 15600 | 2988 | 0.36 | 0.42 | 0.31 |
| 1993 | 207721 | 239400 | 176041 | 49875 | 54361 | 45390 | 14929 | 3108 | 0.37 | 0.43 | 0.31 |
| 1994 | 218801 | 251945 | 185658 | 48238 | 52317 | 44160 | 13684 | 2700 | 0.32 | 0.37 | 0.27 |
| 1995 | 247262 | 284147 | 210376 | 55356 | 60110 | 50601 | 15862 | 3206 | 0.33 | 0.38 | 0.28 |
| 1996 | 268341 | 307884 | 228797 | 51311 | 55809 | 46813 | 15109 | 3026 | 0.35 | 0.41 | 0.30 |
| 1997 | 243209 | 278827 | 207590 | 52984 | 57523 | 48445 | 14230 | 3066 | 0.30 | 0.35 | 0.25 |
| 1998 | 268759 | 306946 | 230572 | 56305 | 60912 | 51698 | 14345 | 5371 | 0.33 | 0.38 | 0.28 |
| 1999 | 263151 | 300474 | 225827 | 48825 | 52897 | 44753 | 13305 | 3297 | 0.35 | 0.41 | 0.30 |
| 2000 | 295083 | 336301 | 253865 | 48578 | 52588 | 44569 | 15031 | 1870 | 0.37 | 0.43 | 0.32 |
| 2001 | 247844 | 281141 | 214546 | 48929 | 52933 | 44924 | 15778 | 2262 | 0.43 | 0.50 | 0.37 |
| 2002 | 266020 | 302166 | 229874 | 45578 | 49530 | 41626 | 15987 | 2813 | 0.47 | 0.53 | 0.41 |
| 2003 | 247611 | 280197 | 215025 | 42966 | 46478 | 39453 | 15711 | 4008 | 0.46 | 0.52 | 0.40 |
| 2004 | 203492 | 230060 | 176925 | 37800 | 40694 | 34906 | 14358 | 6243 | 0.45 | 0.52 | 0.39 |
| 2005 | 211827 | 239074 | 184579 | 36054 | 38755 | 33352 | 12888 | 3275 | 0.47 | 0.53 | 0.41 |
| 2006 | 257924 | 290979 | 224868 | 35289 | 37947 | 32632 | 12037 | 3751 | 0.42 | 0.48 | 0.36 |
| 2007 | 246254 | 278248 | 214260 | 36299 | 39009 | 33590 | 13060 | 3033 | 0.46 | 0.52 | 0.40 |
| 2008 | 177204 | 200255 | 154153 | 37711 | 40365 | 35056 | 11048 | 2860 | 0.33 | 0.38 | 0.28 |
| 2009 | 206609 | 233900 | 179318 | 46675 | 50012 | 43338 | 15064 | 3278 | 0.34 | 0.39 | 0.29 |
| 2010 | 215687 | 243973 | 187402 | 49553 | 53284 | 45821 | 15101 | 5343 | 0.43 | 0.48 | 0.37 |
| 2011 | 182433 | 206464 | 158401 | 39998 | 42973 | 37024 | 13226 | 4187 | 0.38 | 0.43 | 0.33 |
| 2012 | 144699 | 163308 | 126091 | 41474 | 44617 | 38330 | 14433 | 3704 | 0.39 | 0.44 | 0.33 |
| 2013 | 150806 | 170656 | 130955 | 42850 | 46187 | 39512 | 16025 | 4885 | 0.48 | 0.54 | 0.42 |
| 2014 | 138656 | 157627 | 119685 | 47716 | 51282 | 44150 | 13277 | 2569 | 0.35 | 0.40 | 0.30 |
| 2015 | 162385 | 186943 | 137826 | 40129 | 43137 | 37121 | 10682 | 2393 | 0.30 | 0.34 | 0.25 |
| 2016 | 206961 | 241614 | 172308 | 44679 | 48131 | 41228 | 11548 | 3315 | 0.33 | 0.38 | 0.28 |
| 2017 | 264621 | 318140 | 211103 | 41330 | 44631 | 38029 | 13784 | 3518 | 0.37 | 0.43 | 0.32 |
| 2018 | 276376 | 344190 | 208563 | 53716 | 58558 | 48873 | 12147 | 3415 | 0.29 | 0.34 | 0.24 |
| 2019 | 243439 | 320924 | 165954 | 61793 | 68522 | 55065 | 12164 | 1966 | 0.22 | 0.26 | 0.179 |
| 2020 | 182574 | 262595 | 102554 | 75432 | 85413 | 65450 | 11141 | 2485 | 0.172 | 0.21 | 0.137 |
| 2021 | 159912 | 266826 | 52998 | 84327 | 97067 | 71587 | 12418 | 2603 | 0.179 | 0.22 | 0.139 |
| 2022 | 221058* | | | 96645 | | | | | | | |

* Geometric mean (1984–2019).

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Megrim (*Lepidorhombus whiffagonis*) in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, meg.27.7b-k8abd, <https://doi.org/10.17895/ices.advice.21333687>

Megrim (*Lepidorhombus whiffiagonis*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for Western Waters and adjacent waters is applied, catches in 2023 that correspond to the F ranges in the MAP are between 654 tonnes and 1456 tonnes. According to the MAP, catches higher than those corresponding to F_{MSY} (968 tonnes) can only be taken under conditions specified in the MAP, while the entire range is considered precautionary when applying the ICES advice rule.

Management of catches of the two megrim species—megrim (*Lepidorhombus whiffiagonis*) and four-spot megrim (*Lepidorhombus boscii*)—under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species.

Stock development over time

Fishing pressure on the stock is below F_{MSY} ; spawning-stock size is above MSY B_{trigger}, B_{pa}, and B_{lim}.

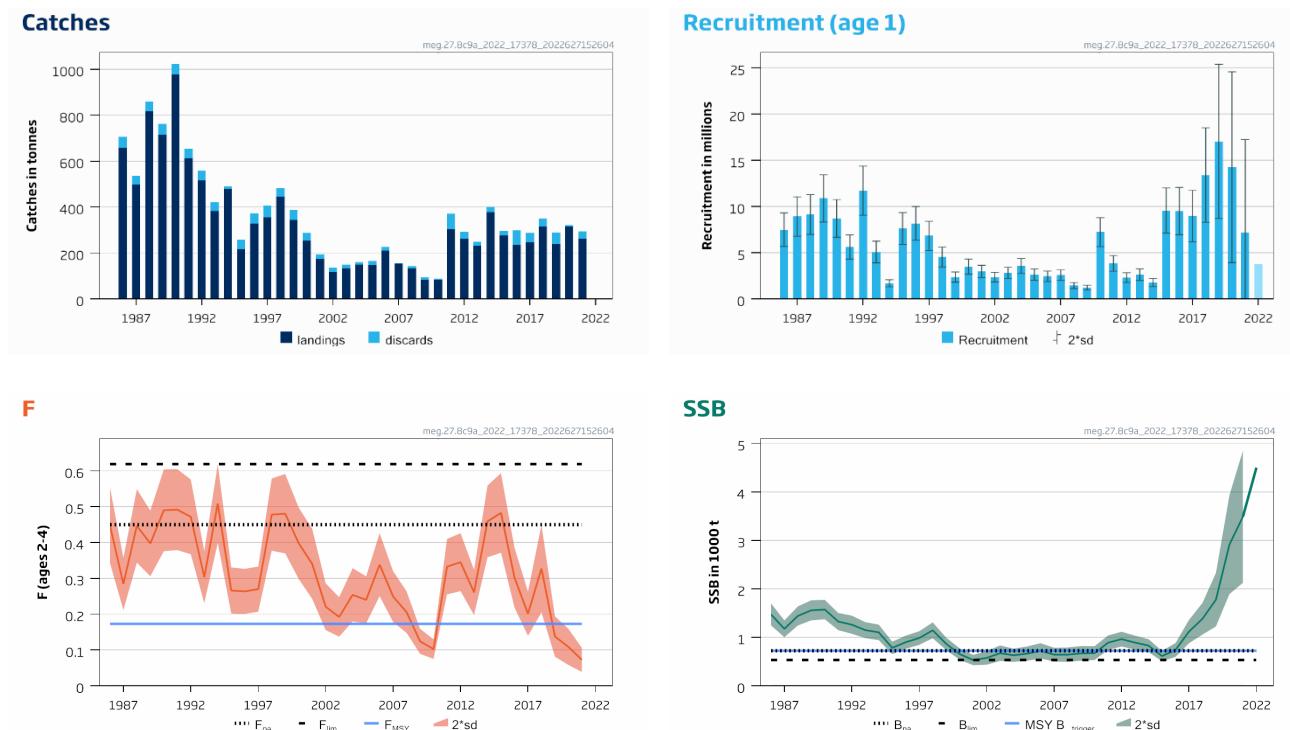


Figure 1 Megrim in divisions 8.c and 9.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. The 2022 SSB estimate is a model forecast.

Catch scenarios

Table 1 Megrim in divisions 8.c and 9.a. The basis of the catch scenarios.

| Variable | Value | Notes |
|---------------------------|-------|---|
| $F_{ages\ 2-4}(2022)$ | 0.106 | F_{sq} = average F (2019–2021). |
| SSB (2023) | 4650 | Short-term forecast (STF); in tonnes. |
| $R_{age\ 1}(2022–2023)$ | 3760 | Geometric mean 1998–2019; in thousands. |
| Total catch (2022) | 553 | STF using F_{sq} ; in tonnes. |
| Projected landings (2022) | 531 | STF assuming average landings ratio at age, 2019–2021; in tonnes. |
| Projected discards (2022) | 22 | STF assuming average discards ratio at age, 2019–2021; in tonnes. |

Table 2 Megrim in divisions 8.c and 9.a. Annual catch scenarios. All weights are in tonnes. Note: the % change in TAC is not computed because the TAC is for the two megrim species combined.

| Basis | Total catch (2023) | Projected landings (2023) | Projected discards (2023) | F _{ages 2–4} Total (2023) | F _{ages 2–4} Projected landings (2023) | F _{ages 1–2} Projected discards (2023) | SSB (2024) | % SSB change* | % advice change ^{^^} |
|---|--------------------|---------------------------|---------------------------|------------------------------------|---|---|------------|---------------|-------------------------------|
| ICES advice basis | | | | | | | | | |
| EU MAP [^] : F _{MSY} | 968 | 943 | 25 | 0.173 | 0.147 | 0.058 | 4140 | -11.0 | 75 |
| F = MAP [^] F _{MSY} lower | 654 | 638 | 16 | 0.112 | 0.095 | 0.037 | 4510 | -3.0 | 18.2 ^{^^} |
| F = MAP [^] F _{MSY} upper | 1456 | 1418 | 38 | 0.28 | 0.24 | 0.093 | 3566 | -23 | 163 ^{^^} |
| Other scenarios | | | | | | | | | |
| F = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5283 | 13.6 | -100 |
| F _{pa} | 2095 | 2038 | 57 | 0.45 | 0.38 | 0.150 | 2823 | -39 | 279 |
| F _{lim} | 2594 | 2520 | 74 | 0.62 | 0.52 | 0.21 | 2248 | -52 | 369 |
| SSB (2024) = B _{pa} | 3964 | 3828 | 136 | 1.51 | 1.28 | 0.50 | 725 | -84 | 617 |
| SSB (2024) = B _{lim} | 4150 | 4002 | 148 | 1.77 | 1.50 | 0.59 | 532 | -89 | 650 |
| SSB (2024) = MSY B _{trigger} | 3964 | 3828 | 136 | 1.51 | 1.28 | 0.50 | 725 | -84 | 617 |
| SSB ₂₀₂₄ = SSB ₂₀₂₃ | 535 | 522 | 13 | 0.093 | 0.074 | 0.031 | 4650 | 0 | -3.3 |
| F = F ₂₀₂₂ | 608 | 593 | 15 | 0.104 | 0.088 | 0.035 | 4564 | -1.85 | 10 |

* SSB 2024 relative to SSB 2023.

[^] The EU multiannual plan (MAP; EU, 2019).

^{^^} Advice value for 2023 relative to the advice value for 2022 for the MAP F_{MSY} lower (371 tonnes) and MAP F_{MSY} upper (672 tonnes).

^{^^^} Advice value for 2023 relative to advice value for 2022 (553 tonnes).

The advice for 2023 is 75% higher than the advice for 2022 because the stock was benchmarked in 2022 and a new model estimates a higher recruitment and SSB in recent years.

Basis of the advice

Table 3 Megrim in divisions 8.c and 9.a. The basis of the advice.

| Advice basis | Management plan approach |
|-----------------|---|
| Management plan | <p>The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock.</p> <p>In accordance with the MAP, “provided that the stock is above MSY B_{trigger}:</p> <ul style="list-style-type: none"> (a) if, on the basis of scientific advice or evidence, it is necessary for the achievement of the objectives laid down in Article 3 in the case of mixed fisheries; (b) if, on the basis of scientific advice or evidence, it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; or (c) in order to limit variations in fishing opportunities between consecutive years to not more than 20 %.” <p>ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary.</p> <p>Full details of the plan are described in Regulation 2019/472 (EU, 2019).</p> |

Quality of the assessment

The benchmark changed the assessment model and data revisions were made, including the removal of all commercial abundance indices (ICES, 2022a). Fishing mortality and SSB show similar trends to historical assessments but recruitment has been revised upwards since 2018 in comparison with the previous year's assessment. These changes triggered the calculation of new reference points. However, the perception of stock status, in relation to reference points, does not change in comparison to previous years' assessments.

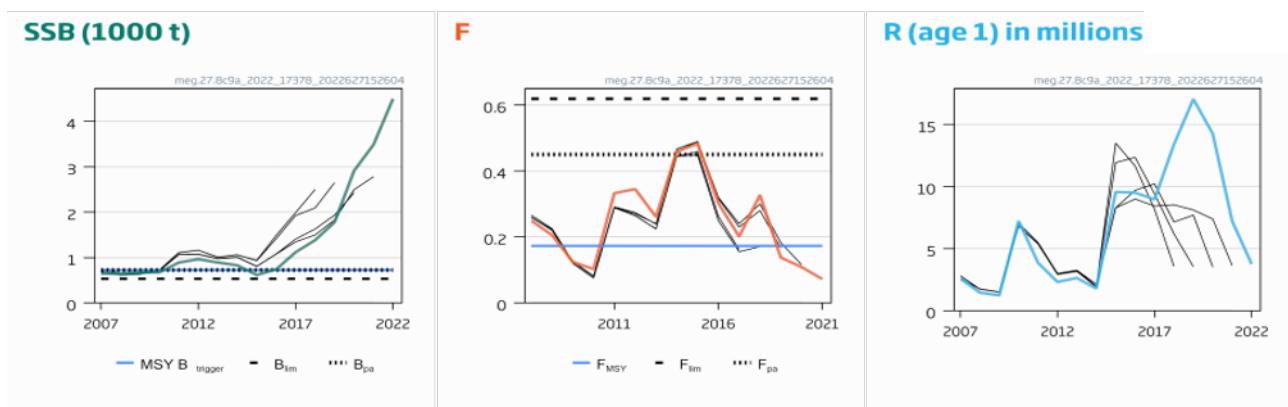


Figure 2 Megrim in divisions 8.c and 9.a. Historical assessment results (final-year recruitment assumptions included for each line). The reference points were revised in 2022 following a benchmark and only the last assessment results should be compared to the reference points indicated.

Issues relevant for the advice

The two megrim species are not totally separated in the landings statistics, and species-specific landings are estimated by ICES. A single TAC covers both species. ICES considers that management of the catches of the two megrim species under a combined TAC prevents effective control of single-species exploitation rates and could lead to the overexploitation of either species. Mixed-fisheries scenarios for the two megrim species will be provided in the Iberian waters fisheries overview later in the year.

Reference points

Table 4 Megrim in divisions 8.c and 9.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------|----------------|--|-------------------------|
| MSY approach | MSY $B_{trigger}$ | 725 | B_{pa} ; in tonnes. | ICES (2022a) |
| | F_{MSY} | 0.173 | Stochastic simulations (EqSim) based on the recruitment period 1986–2020. | ICES (2022a) |
| Precautionary approach | B_{lim} | 532 | B_{loss} , biomass in 2001 as estimated in 2022; in tonnes. | ICES (2022a) |
| | B_{pa} | 725 | $B_{lim} * \exp(1.645 * \sigma)$, with $\sigma = 0.188$; in tonnes. | ICES (2022a) |
| | F_{lim} | 0.619 | The F that results in long-term probability ($SSB < B_{lim}$) = 50% (EqSim). | ICES (2022a) |
| | F_{pa} | 0.45 | F_{POS} with Advice Rule (AR): the F that provides a 95% probability for SSB to be above B_{lim} . | ICES (2022a) |
| Management plan | SSB_{mgt} | Not applicable | | |
| | F_{mgt} | Not applicable | | |
| | MAP MSY $B_{trigger}$ | 725 | MSY $B_{trigger}$; in tonnes. | ICES (2022a), EU (2019) |
| | MAP B_{lim} | 532 | B_{lim} ; in tonnes. | ICES (2022a), EU (2019) |
| | MAP F_{MSY} | 0.173 | F_{MSY} | ICES (2022a), EU (2019) |
| | MAP range F_{lower} | 0.112 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2022a), EU (2019) |
| | MAP range F_{upper} | 0.284 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2022a), EU (2019) |

Basis of the assessment

Table 5 Megrim in divisions 8.c and 9.a. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022b). |
| Assessment type | Age-based assessment (a4a; ICES, 2022a, 2022c) that uses catches in the model and in the forecast. |
| Input data | Commercial catches (international landings, ages, and length frequencies from catch sampling); one survey index, the Spanish North Coast Bottom Trawl Survey (SP-NSGFS-Q4 [G2784]), from 1988 to 2020 but excluding 2003 and 2013; constant maturity ogive; assumed natural mortality of 0.2 (ICES, 2022a). |
| Discards and bycatch | Included in the assessment for the full time-series for the majority of the fleets. |
| Indicators | None. |
| Other information | Last benchmarked in 2022 (ICES, 2022a). |
| Working group | Working Group for the Bay of Biscay and Iberian Waters Ecoregion (WGBIE). |

History of the advice, catch, and management

Table 6 Megrim in divisions 8.c and 9.a. ICES advice and official landings. All weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice for combined <i>Lepidorhombus</i> species * , ** , ^ | Catches corresponding to advice <i>L. whiffi</i> . ** , ^ | Agreed TAC * , *** | ICES landings (combined <i>Lepidorhombus</i> species)* | ICES landings <i>L. whiffi</i> . | Discards |
|------|--|---|---|--------------------|--|----------------------------------|----------|
| 1987 | Not assessed | | | 13000 | 2185 | 497 | 40 |
| 1988 | Not assessed | | | 13000 | 3040 | 817 | 42 |
| 1989 | Not assessed | | | 13000 | 3343 | 714 | 47 |
| 1990 | Not assessed | | | 13000 | 2922 | 977 | 45 |
| 1991 | No advice | | | 14300 | 2296 | 614 | 41 |
| 1992 | No advice | | | 14300 | 2432 | 516 | 42 |
| 1993 | L. boscii no gain in increasing F; <i>L. whiffi</i> . safe biological limits | | | 8000 | 1767 | 383 | 38 |
| 1994 | No gains in increasing F | | | 6000 | 1882 | 479 | 13 |
| 1995 | Concern about low SSB | | | 6000 | 1870 | 218 | 40 |
| 1996 | Mixed fishing aspects | | | 6000 | 1426 | 329 | 44 |
| 1997 | Reduce F by at least 50% | | | 6000 | 1252 | 356 | 52 |
| 1998 | Reduce F by at least 50% | 900 | | 6000 | 1569 | 446 | 36 |
| 1999 | Reduce F by at least 50% | 1000 | | 6000 | 1468 | 343 | 43 |
| 2000 | Reduce F by at least 20% | ≤ 1500 | | 5000 | 1294 | 253 | 35 |
| 2001 | No increase in F | 1610 | | 5000 | 1105 | 175 | 19 |
| 2002 | No increase in F | 1550 | | 4000 | 837 | 117 | 19 |
| 2003 | No increase in F | 1550 | | 2400 | 1009 | 134 | 15 |
| 2004 | No increase in F | 1380 | | 1336 | 1155 | 149 | 11 |
| 2005 | No increase in F | 1090 | | 1336 | 1130 | 147 | 19 |
| 2006 | No increase in F | 1200 | | 1269 | 1302 | 210 | 16 |
| 2007 | No increase in F | 1440 | | 1440 | 1259 | 155 | 0.4 |
| 2008 | No increase in F | 1430 | | 1430 | 1113 | 133 | 11 |
| 2009 | Same advice as last year | 1430 | | 1430 | 1218 | 84 | 11 |
| 2010 | Reduce F to $F_{0.1}$ | 900 | | 1287 | 1381 | 83 | 5 |
| 2011 | MSY framework | < 890 | < 110 | 1094 | 1430 | 302 | 69 |
| 2012 | MSY framework | < 860 | < 100 | 1214 | 1214 | 262 | 31 |
| 2013 | MSY framework | < 890 | < 110 | 1214 | 1163 | 231 | 18 |
| 2014 | MSY approach | < 2257 | < 300 | 2257 | 1531 | 377 | 23 |
| 2015 | MSY approach | < 1013 | < 192 | 1377 | 1424 | 276 | 21 |
| 2016 | MSY approach | ≤ 1259 | ≤ 186 | 1363 | 1322 | 235 | 63 |
| 2017 | MSY approach | | ≤ 211 | 1159 | 1173 | 247 | 41 |
| 2018 | MSY approach | | ≤ 292 | 1387 | 1129 | 315 | 37 |
| 2019 | MSY approach | | ≤ 431 | 1872 | 981 | 239 | 51 |
| 2020 | Management plan ^^ | | 534 (range 357–648) # | 2322 | 1026 | 315 | 5 |

| Year | ICES advice | Landings corresponding to advice for combined <i>Lepidorhombus</i> species * , ** , ^ | Catches corresponding to advice <i>L. whiffi.</i> ** , ^ | Agreed TAC * , *** | ICES landings (combined <i>Lepidorhombus</i> species)* | ICES landings <i>L. whiffi.</i> | Discards |
|------|--------------------|---|--|--------------------|--|---------------------------------|----------|
| 2021 | Management plan ^^ | | 468 (range 312–571) # | 2158 | 985 | 262 | 32 |
| 2022 | Management plan ^^ | | 553 (range 371–672) # | 2445 | | | |
| 2023 | Management plan^^ | | 968 (range 654–1456) | | | | |

* For both megrim species combined.

** Advice was provided for landings until 2015, and for catches from 2016 onward.

*** For Division 8.c and subareas 9 and 10; EU waters of CECAF 34.1.1.

Catches corresponding to F_{MSY} ; EU MAP range in brackets.

^ The advice for 2017 onward is for single species only.

^^ EU multiannual plan (MAP) for the Western Waters (EU, 2019).

History of the catch and landings

Table 7 Megrim in divisions 8.c and 9.a. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

| Catch | Landings | | | Discards |
|-------|----------|------------------------|----------------------|----------|
| | 294 | 89% bottom otter trawl | 11% other gear types | |
| | | 262 | | 32 |

Table 8 Megrim in divisions 8.c and 9.a. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Year | Official landings | | | | ICES landings** | Discards | ICES catch** |
|------|-------------------|---------------|----------|--------------|-----------------|----------|--------------|
| | Spain | | Portugal | | | | |
| | Division 8.c | Division 9.a* | Total | Division 9.a | | | |
| 1986 | 508 | 98 | 606 | 53 | 659 | 46 | 705 |
| 1987 | 404 | 46 | 450 | 47 | 497 | 40 | 537 |
| 1988 | 657 | 59 | 716 | 101 | 817 | 42 | 859 |
| 1989 | 533 | 45 | 578 | 136 | 714 | 47 | 761 |
| 1990 | 841 | 25 | 866 | 111 | 977 | 45 | 1022 |
| 1991 | 494 | 16 | 510 | 104 | 614 | 41 | 655 |
| 1992 | 474 | 5 | 479 | 37 | 516 | 42 | 558 |
| 1993 | 338 | 7 | 345 | 38 | 383 | 38 | 421 |
| 1994 | 440 | 8 | 448 | 31 | 479 | 13 | 492 |
| 1995 | 173 | 20 | 193 | 25 | 218 | 40 | 258 |
| 1996 | 283 | 21 | 305 | 24 | 329 | 44 | 373 |
| 1997 | 298 | 12 | 310 | 46 | 356 | 52 | 408 |
| 1998 | 372 | 8 | 380 | 66 | 446 | 36 | 482 |
| 1999 | 332 | 44 | 336 | 7 | 343 | 43 | 386 |
| 2000 | 238 | 5 | 243 | 10 | 253 | 35 | 288 |
| 2001 | 167 | 2 | 169 | 5 | 175 | 19 | 193 |
| 2002 | 112 | 3 | 115 | 3 | 117 | 19 | 137 |
| 2003 | 113 | 3 | 116 | 17 | 134 | 15 | 148 |
| 2004 | 142 | 1 | 144 | 5 | 149 | 11 | 159 |
| 2005 | 120 | 1 | 121 | 26 | 147 | 19 | 166 |
| 2006 | 173 | 2 | 175 | 35 | 210 | 16 | 226 |
| 2007 | 139 | 2 | 141 | 14 | 155 | 0.4 | 155 |
| 2008 | 114 | 2 | 116 | 17 | 133 | 11 | 144 |
| 2009 | 74 | 2 | 77 | 7 | 84 | 11 | 94 |
| 2010 | 66 | 8 | 74 | 10 | 83 | 5 | 88 |
| 2011 | 242 | 0 | 242 | 34 | 302 | 69 | 371 |

| Year | Official landings | | | | ICES landings** | Discards | ICES catch** |
|------|-------------------|---------------|-------|--------------|-----------------|----------|--------------|
| | Spain | | | Portugal | | | |
| | Division 8.c | Division 9.a* | Total | Division 9.a | | | |
| 2012 | 151 | 11 | 161 | 18 | 262 | 31 | 293 |
| 2013 | 128 | 3 | 131 | 11 | 231 | 18 | 250 |
| 2014 | 225 | 5 | 231 | 30 | 377 | 23 | 399 |
| 2015 | 188 | 2 | 190 | 23 | 276 | 21 | 297 |
| 2016 | 171 | 1 | 172 | 15 | 235 | 63 | 298 |
| 2017 | 189 | 4 | 193 | 16 | 247 | 41 | 288 |
| 2018 | 227 | 8 | 234 | 7 | 315 | 37 | 352 |
| 2019 | 226 | 7 | 233 | 6 | 239 | 51 | 289 |
| 2020 | 278# | 26# | 305# | 10# | 315 | 5 | 320 |
| 2021 | 236# | 16# | 252# | 10# | 262 | 32 | 294 |

* Division 9.a, excluding the Gulf of Cadiz until 2016.

** Unallocated/unreported landings included.

Preliminary.

Summary of the assessment

Table 9* Megrim in divisions 8.c and 9.a. Assessment summary. ‘High’ and ‘Low’ refer to two standard deviations. All weights are in tonnes and recruitment is in thousands.

| Year | Recruitment (age 1) | | | Stock size | | | Landings | Discards | Fishing pressure (ages 2–4) | | |
|------|---------------------|-----------|-----------|------------|--------|--------|----------|----------|-----------------------------|-------|-------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | thousands | thousands | thousands | tonnes | tonnes | tonnes | | | | | |
| 1986 | 7500 | 9324 | 5676 | 1477 | 1704 | 1249 | 659 | 46 | 0.45 | 0.56 | 0.34 |
| 1987 | 8921 | 11052 | 6790 | 1176 | 1351 | 1001 | 497 | 40 | 0.28 | 0.36 | 0.21 |
| 1988 | 9150 | 11306 | 6993 | 1442 | 1640 | 1244 | 817 | 42 | 0.45 | 0.55 | 0.34 |
| 1989 | 10885 | 13442 | 8328 | 1558 | 1766 | 1351 | 714 | 47 | 0.40 | 0.49 | 0.31 |
| 1990 | 8719 | 10759 | 6679 | 1573 | 1774 | 1372 | 977 | 45 | 0.49 | 0.60 | 0.38 |
| 1991 | 5625 | 6934 | 4315 | 1325 | 1504 | 1147 | 614 | 41 | 0.49 | 0.60 | 0.38 |
| 1992 | 11717 | 14373 | 9061 | 1262 | 1450 | 1074 | 516 | 42 | 0.47 | 0.58 | 0.37 |
| 1993 | 5084 | 6253 | 3915 | 1149 | 1315 | 984 | 383 | 38 | 0.30 | 0.38 | 0.23 |
| 1994 | 1703 | 2086 | 1319 | 1103 | 1264 | 941 | 479 | 13 | 0.51 | 0.62 | 0.40 |
| 1995 | 7630 | 9350 | 5910 | 784 | 912 | 656 | 219 | 40 | 0.27 | 0.33 | 0.20 |
| 1996 | 8180 | 10004 | 6356 | 900 | 1036 | 764 | 329 | 44 | 0.26 | 0.33 | 0.20 |
| 1997 | 6832 | 8412 | 5251 | 986 | 1127 | 844 | 356 | 52 | 0.27 | 0.33 | 0.21 |
| 1998 | 4537 | 5617 | 3457 | 1146 | 1310 | 981 | 446 | 36 | 0.48 | 0.58 | 0.38 |
| 1999 | 2370 | 2928 | 1812 | 866 | 995 | 737 | 343 | 43 | 0.48 | 0.59 | 0.37 |
| 2000 | 3507 | 4325 | 2688 | 655 | 774 | 537 | 253 | 35 | 0.40 | 0.50 | 0.30 |
| 2001 | 2984 | 3656 | 2313 | 532 | 639 | 425 | 175 | 19 | 0.34 | 0.44 | 0.24 |
| 2002 | 2370 | 2888 | 1852 | 576 | 717 | 436 | 117 | 19 | 0.22 | 0.29 | 0.156 |
| 2003 | 2810 | 3429 | 2192 | 674 | 835 | 513 | 134 | 15 | 0.192 | 0.25 | 0.137 |
| 2004 | 3576 | 4385 | 2766 | 631 | 768 | 494 | 149 | 11 | 0.25 | 0.33 | 0.180 |
| 2005 | 2639 | 3243 | 2034 | 665 | 813 | 516 | 147 | 19 | 0.24 | 0.31 | 0.174 |
| 2006 | 2458 | 3030 | 1886 | 722 | 880 | 564 | 210 | 16 | 0.34 | 0.43 | 0.25 |
| 2007 | 2584 | 3160 | 2007 | 643 | 786 | 500 | 155 | 0 | 0.25 | 0.32 | 0.178 |
| 2008 | 1449 | 1770 | 1127 | 643 | 792 | 495 | 133 | 11 | 0.21 | 0.26 | 0.147 |
| 2009 | 1231 | 1494 | 968 | 670 | 822 | 518 | 84 | 11 | 0.124 | 0.159 | 0.089 |
| 2010 | 7231 | 8800 | 5662 | 675 | 818 | 531 | 83 | 5 | 0.103 | 0.130 | 0.075 |
| 2011 | 3857 | 4705 | 3008 | 890 | 1040 | 740 | 302 | 69 | 0.33 | 0.41 | 0.26 |
| 2012 | 2313 | 2838 | 1788 | 964 | 1117 | 811 | 262 | 31 | 0.35 | 0.43 | 0.26 |
| 2013 | 2632 | 3265 | 1999 | 892 | 1036 | 748 | 231 | 18 | 0.26 | 0.32 | 0.197 |
| 2014 | 1781 | 2217 | 1345 | 830 | 964 | 697 | 377 | 23 | 0.46 | 0.56 | 0.36 |
| 2015 | 9572 | 12019 | 7124 | 614 | 723 | 506 | 276 | 21 | 0.48 | 0.59 | 0.37 |

* Version 2: previous version had minor error (negative confidence interval changed to zero).

| Year | Recruitment (age 1) | | | Stock size | | | Landings | Discards | Fishing pressure (ages 2–4) | | |
|------|---------------------|-------|------|------------|------|------|----------|----------|-----------------------------|-------|-------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | thousands | | | tonnes | | | tonnes | | | | |
| 2016 | 9515 | 12072 | 6958 | 740 | 883 | 597 | 235 | 63 | 0.30 | 0.39 | 0.22 |
| 2017 | 8972 | 11757 | 6187 | 1119 | 1360 | 878 | 247 | 41 | 0.20 | 0.26 | 0.139 |
| 2018 | 13405 | 18517 | 8292 | 1383 | 1710 | 1056 | 315 | 37 | 0.33 | 0.45 | 0.20 |
| 2019 | 17053 | 25393 | 8713 | 1779 | 2333 | 1225 | 239 | 51 | 0.138 | 0.194 | 0.081 |
| 2020 | 14261 | 24582 | 3939 | 2913 | 3934 | 1891 | 315 | 5 | 0.109 | 0.159 | 0.058 |
| 2021 | 7221 | 17252 | 0 | 3489 | 4854 | 2124 | 262 | 32 | 0.072 | 0.106 | 0.039 |
| 2022 | 3761* | | | 4500 | | | | | | | |

* Geometric mean (1998–2019).

Sources and references

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Megrim (*Lepidorhombus whiffagonis*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, meg.27.8c9a, <https://doi.org/10.17895/ices.advice.19448060>.

White anglerfish (*Lophius piscatorius*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters)

ICES advice on fishing opportunities

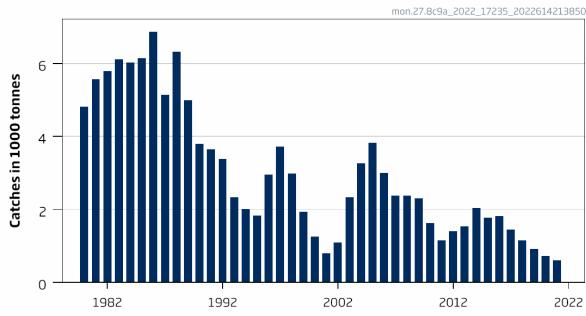
ICES advises that when the EU multiannual plan (MAP) for Western waters and adjacent waters is applied, catches in 2023 that correspond to the F ranges in the plan are between 1613 tonnes and 2986 tonnes. According to the MAP, catches higher than those corresponding to F_{MSY} (2271 tonnes) can only be taken under conditions specified in the MAP, while the entire range is considered precautionary when applying the ICES advice rule.

Management of catches of the two anglerfish species—black-bellied anglerfish (*Lophius budegassa*) and white anglerfish (*Lophius piscatorius*)—under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species.

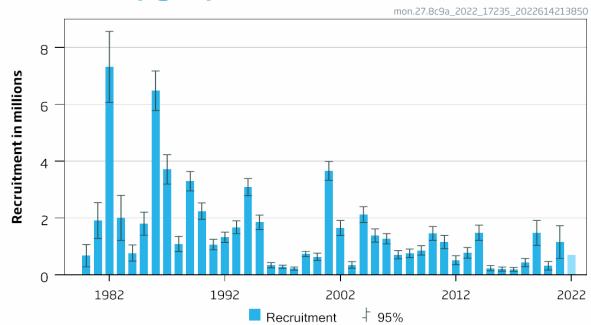
Stock development over time

Fishing pressure on the stock is below F_{MSY} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

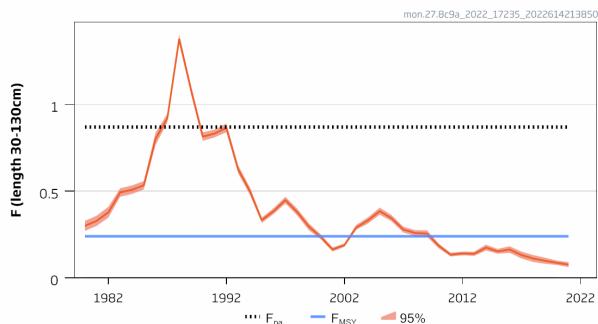
Catches



Recruitment (age 0)



F



SSB

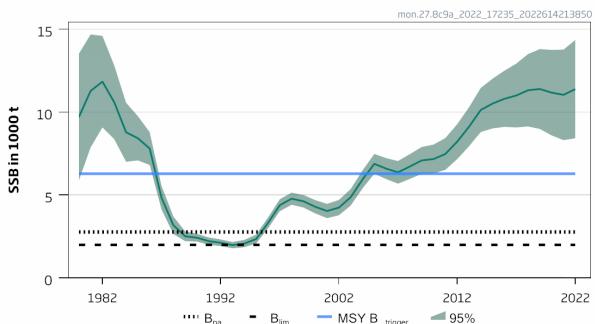


Figure 1 White anglerfish in divisions 8.c and 9.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 White anglerfish in divisions 8.c and 9.a. The basis of the catch scenarios.

| Variable | Value | Notes |
|------------------------------|--------|--|
| $F_{30-130\text{ cm}}(2022)$ | 0.088 | $F_{sg} = F_{average}(2019-2021)$. |
| SSB (2023) | 11 943 | Short-term forecast (STF); in tonnes. |
| $R_{age\ 0}(2022, 2023)$ | 706 | Geometric mean of recruitment (GM, 2003–2021); in thousands. |
| Total catch (2022) | 792 | STF. Discarding assumed to be negligible; in tonnes. |
| Projected landings (2022) | 792 | STF; in tonnes. |
| Projected discards (2022) | | Discarding is assumed to be negligible. |

Table 2 White anglerfish in divisions 8.c and 9.a. Annual catch scenarios. All weights are in tonnes. The % change in TAC is not computed because the TAC is for the two species (*L. piscatorius* and *L. budegassa*) combined.

| Basis | Total catch (2023) | F _{30–130 cm} Total (2023) | SSB (2024) | % SSB change** | % advice change^ |
|---|--------------------|-------------------------------------|------------|----------------|------------------|
| ICES advice basis | | | | | |
| EU MAP*: F _{MSY} | 2271 | 0.24 | 11163 | -6.5 | 19.6 |
| F = MAP* F _{MSY} lower | 1613 | 0.164 | 11858 | -0.71 | 19.9^^ |
| F = MAP* F _{MSY} upper | 2986 | 0.33 | 10404 | -12.9 | 19.1^^ |
| Other options | | | | | |
| F = 0 | 0 | 0 | 13549 | 13.4 | -100 |
| F _{pa} | 6140 | 0.87 | 6985 | -42 | 223 |
| SSB (2024) = B _{lim} | 10347 | 3.02 | 1993 | -83 | 445 |
| SSB (2024) = B _{pa} | 9753 | 2.4 | 2769 | -77 | 414 |
| SSB (2024) = MSY B _{trigger} | 6770 | 1.02 | 6283 | -47 | 257 |
| SSB ₂₀₂₄ = SSB ₂₀₂₃ | 1532 | 0.155 | 11943 | 0 | -19.3 |
| F = F ₂₀₂₂ | 898 | 0.088 | 12610 | 5.6 | -53 |

* The EU multiannual plan (MAP; EU, 2019).

** SSB 2024 relative to SSB 2023 (11 943 tonnes).

^ Advice value for 2023 relative to advice value for 2022 (1899 tonnes).

^^ Advice value for 2023 relative to the advice value for 2022 for the MAP F_{MSY} lower (1345 tonnes) and MAP F_{MSY} upper (2507 tonnes).

The advice for 2023 is about 20% higher than the advice for 2022 because of an upward revision of recruitment in recent years.

Basis of the advice

Table 3 White anglerfish in divisions 8.c and 9.a. The basis of the advice.

| Advice basis | Management plan approach |
|-----------------|--|
| Management plan | <p>The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock.</p> <p>In accordance with the MAP, “provided that the stock is above MSY B_{trigger}:</p> <ul style="list-style-type: none"> (a) if, on the basis of scientific advice or evidence, it is necessary for the achievement of the objectives laid down in Article 3 in the case of mixed fisheries; (b) if, on the basis of scientific advice or evidence, it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; or (c) in order to limit variations in fishing opportunities between consecutive years to not more than 20%.” <p>ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary.</p> <p>Full details of the plan are described in Regulation 2019/472 (EU, 2019).</p> |

Quality of the assessment

Results of the assessment rely on assumptions regarding the exploitation pattern on older fish, for which no abundance index is available, and the estimates of their biomass are thus uncertain. To improve the quality of the assessment, fishery-independent information on large fish would be required.

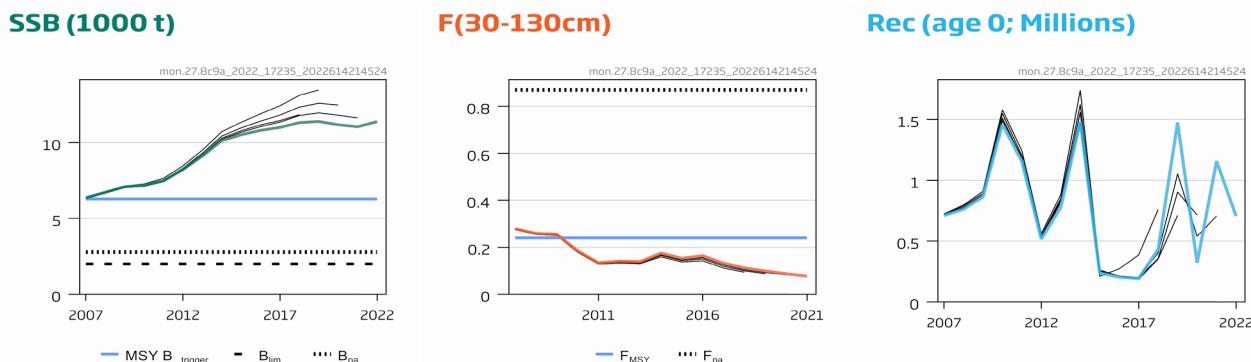


Figure 2 White anglerfish in divisions 8.c and 9.a. Historical assessment results (final-year recruitment assumptions included).

Issues relevant for the advice

The two anglerfish species are not separated in the landings statistics. A single TAC covers both species, with species-specific landings being estimated by ICES (ICES, 2018). ICES considers that management of the two anglerfish species under a combined TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species.

Reference points

Table 4 White anglerfish in divisions 8.c and 9.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|------------------------------|-----------|---|------------------------|
| MSY approach | MSY B_{trigger} | 6283 | 5th percentile of the SSB when fishing at F_{MSY} ; in tonnes. | ICES (2018) |
| | F_{MSY} | 0.24 | Stochastic simulations based on a segmented regression. | ICES (2018) |
| Precautionary approach | B_{lim} | 1993 | B_{loss} (lowest observed SSB value); in tonnes. | ICES (2018) |
| | B_{pa} | 2769 | $B_{\text{lim}} \times \exp(\sigma \times 1.645)$, where $\sigma = 0.2$; in tonnes. | ICES (2018) |
| | F_{lim} | Undefined | F_{lim} (0.56) is no longer considered appropriate given the estimate of F_{pa} . | ICES (2021) |
| | F_{pa} | 0.87 | F_{POS} with advice rule: the F that provides a 95% probability for SSB to be above B_{lim} . | ICES (2021) |
| Management plan | MAP MSY B_{trigger} | 6283 | MSY B_{trigger} ; in tonnes. | ICES (2018), EU (2019) |
| | MAP B_{lim} | 1993 | B_{lim} ; in tonnes. | ICES (2018), EU (2019) |
| | MAP F_{MSY} | 0.24 | F_{MSY} | ICES (2018), EU (2019) |
| | MAP range F_{lower} | 0.164 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2018), EU (2019) |
| | MAP range F_{upper} | 0.33 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY. | ICES (2018), EU (2019) |

Basis of the assessment

Table 5 White anglerfish in divisions 8.c and 9.a. Basis of the assessment and advice.

| | |
|--------------------------|--|
| ICES stock data category | 1 (ICES, 2022a). |
| Assessment type | Length-based analytical assessment model (Stock Synthesis) that uses landings in the model and in the forecast (ICES, 2022b). |
| Input data | Commercial landings, one index from the Spanish North Coast Bottom Trawl Survey (SP-NSGFS-Q4 [G2784]) between 1983 and 2021 and two commercial indices (LPUE series from SP-CORUTR8c 1982–2012 and SP-CEDGNS8c 1999–2011); assumed constant natural mortality. |
| Discards and bycatch | Discarding is not quantified, assumed to be negligible. |
| Indicators | None. |
| Other information | The most recent benchmark was in 2018 (ICES, 2018). |
| Working group | Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE). |

History of the advice, catch, and management

Table 6 White anglerfish in divisions 8.c and 9.a. ICES advice and official catches. All weights are in tonnes.

| Year | ICES advice | Catches corresponding to advice for combined <i>Lophius</i> species | Catches corresponding to advice for <i>L. piscatorius</i> | Agreed TAC* | ICES catches for combined <i>Lophius</i> species | ICES catches for <i>L. piscatorius</i> |
|------|---------------------------------------|---|---|-------------|--|--|
| 1987 | Not assessed | - | | 12000 | 8973 | 5141 |
| 1988 | Not assessed | - | | 12000 | 10021 | 6321 |
| 1989 | Not assessed | - | | 12000 | 7574 | 4996 |
| 1990 | Not assessed | - | | 12000 | 6124 | 3790 |
| 1991 | No advice | - | | 12000 | 5802 | 3640 |
| 1992 | No advice | - | | 12000 | 5493 | 3382 |
| 1993 | No long-term gain in increasing F | - | | 13000 | 4556 | 2329 |
| 1994 | No advice | - | | 13000 | 3587 | 2007 |
| 1995 | If required a precautionary TAC | - | | 13000 | 3677 | 1834 |
| 1996 | If required a precautionary TAC | - | | 13000 | 4584 | 2955 |
| 1997 | If required a precautionary TAC | - | | 13000 | 5527 | 3714 |
| 1998 | Restrict catch to < 80% recent levels | | | 10000 | 5070 | 2981 |
| 1999 | Reduce F to F_{pa} | 4200 | | 8500 | 3817 | 1938 |
| 2000 | 60% reduction in F | 1600 | | 6800 | 2628 | 1259 |
| 2001 | 50% reduction in F | 2800 | | 6000 | 1801 | 788 |
| 2002 | 30% reduction in F | 3500 | | 4800 | 1900 | 1090 |
| 2003 | 5% reduction in F | 3200 | | 4000 | 3258 | 2324 |
| 2004 | $F = 0$ or recovery plan** | 0** | | 2300 | 4250 | 3257 |
| 2005 | $F = 0$ or recovery plan | 0 | | 2000 | 4757 | 3824 |
| 2006 | $F = 0$ or recovery plan | 0 | | 2000 | 4158 | 2997 |
| 2007 | $F = 0$ or recovery plan | 0 | | 2000 | 3684 | 2378 |
| 2008 | $F = 0$ or recovery plan | 0 | | 2000 | 3328 | 2371 |
| 2009 | Same advice as last year | 0 | | 1800 | 3080 | 2306 |
| 2010 | $F = 0$ or management plan | 0 | | 1500 | 2372 | 1618 |
| 2011 | MSY framework | 1500 | 1000 | 1571 | 2179 | 1157 |
| 2012 | MSY framework | 3300 | 2200 | 3300 | 2645 | 1395 |
| 2013 | MSY transition | 2090 | 1350 | 2475 | 2710 | 1541 |
| 2014 | MSY approach | 2629 | 1476 | 2629 | 3130 | 2032 |
| 2015 | MSY approach | 2987 | 1937 | 2987 | 2970 | 1771 |
| 2016 | MSY approach^ | ≤ 2413 | ≤ 1343 | 2569 | 2948 | 1809 |
| 2017 | MSY approach^ | | ≤ 2253 | 3955 | 2307 | 1446 |
| 2018 | MSY approach^ | | ≤ 2197 | 3955 | 1916 | 1144 |
| 2019 | MSY approach^ | | ≤ 2153 | 4166 | 1577 | 909 |
| 2020 | Management plan## | | 2146 (range 1519–2813) [#] | 4023 | 1515 | 722 |
| 2021 | Management plan## | | 1872 (range 1295–2472) [#] | 3672 | 1326 | 608 |

| Year | ICES advice | Catches corresponding to advice for combined <i>Lophius</i> species | Catches corresponding to advice for <i>L. piscatorius</i> | Agreed TAC* | ICES catches for combined <i>Lophius</i> species | ICES catches for <i>L. piscatorius</i> |
|------|-------------------|---|---|-------------|--|--|
| 2022 | Management plan## | | 1899 (range 1345–2507) [#] | 3868 | | |
| 2023 | Management plan## | | 2271 (range 1613–2986) [#] | | | |

* Combined TAC for *Lophius piscatorius* and *L. budegassa*. For Division 8.c and subareas 9 and 10; EU waters of CECAF 34.1.1.

** Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries, protecting stocks outside safe biological limits.

[^] Advice is for catch.

[#] Catches corresponding to F_{MSY} , EU MAP range in brackets (EU, 2019).

^{##} EU multiannual plan (MAP) for the Western Waters (EU, 2019).

History of catch and landings

Table 7 White anglerfish in divisions 8.c and 9.a. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

| Catch | Landings | | | | | Discards |
|-------|----------|-------------|-----------|---------------|-----------|----------|
| | 608 | 39% gillnet | 47% trawl | 13% artisanal | 1% others | |
| | | 608 | | | | |

Table 8 White anglerfish in divisions 8.c and 9.a. History of commercial landings; the ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Year | Division 8.c | | | | | Division 9.a | | | | | Sub-total | ICES estimated totals | | |
|------|--------------|---------|-------|--------|---------|--------------|-------|---------|-------|-----------|-----------|-----------------------|----------------|--------|
| | Spain | | | France | | Total | Spain | | | Portugal | | Unallocated | Total landings | |
| | Trawl | Gillnet | Other | Trawl | Gillnet | | Trawl | Gillnet | Other | Artisanal | Total | | | |
| 1980 | 2806 | 1270 | | | | 4076 | 401 | | | 339 | 740 | 4816 | 0 4816 | |
| 1981 | 2750 | 1931 | | | | 4681 | 535 | | | 352 | 887 | 5568 | 0 5568 | |
| 1982 | 1915 | 2682 | | | | 4597 | 875 | | | 310 | 1185 | 5782 | 0 5782 | |
| 1983 | 3205 | 1723 | | | | 4928 | 726 | | | 460 | 1186 | 6114 | 0 6114 | |
| 1984 | 3086 | 1690 | | | | 4776 | 578 | | | 186 | 492 | 1256 | 0 6032 | |
| 1985 | 2313 | 2372 | | | | 4685 | 540 | | | 212 | 702 | 1454 | 0 6139 | |
| 1986 | 2499 | 2624 | | | | 5123 | 670 | | | 167 | 910 | 1747 | 0 6870 | |
| 1987 | 2080 | 1683 | | | | 3763 | 320 | | | 194 | 864 | 1378 | 0 5141 | |
| 1988 | 2525 | 2253 | | | | 4778 | 570 | | | 157 | 817 | 1543 | 0 6321 | |
| 1989 | 1643 | 2147 | | | | 3790 | 347 | | | 259 | 600 | 1206 | 0 4996 | |
| 1990 | 1439 | 985 | | | | 2424 | 435 | | | 326 | 606 | 1366 | 0 3790 | |
| 1991 | 1490 | 778 | | | | 2268 | 319 | | | 224 | 829 | 1372 | 0 3640 | |
| 1992 | 1217 | 1011 | | | | 2228 | 301 | | | 76 | 778 | 1154 | 0 3382 | |
| 1993 | 844 | 666 | | | | 1510 | 72 | | | 111 | 636 | 819 | 0 2329 | |
| 1994 | 690 | 827 | | | | 1517 | 154 | | | 70 | 266 | 490 | 0 2007 | |
| 1995 | 830 | 572 | | | | 1403 | 199 | | | 66 | 166 | 431 | 0 1834 | |
| 1996 | 1306 | 745 | | | | 2050 | 407 | | | 133 | 365 | 905 | 0 2955 | |
| 1997 | 1449 | 1191 | | | | 2640 | 315 | | | 110 | 650 | 1075 | 0 3714 | |
| 1998 | 912 | 1359 | | | | 2271 | 184 | | | 28 | 497 | 710 | 0 2981 | |
| 1999 | 545 | 1013 | | | | 1558 | 79 | | | 9 | 285 | 374 | 0 1932 | |
| 2000 | 269 | 538 | | | | 808 | 107 | | | 4 | 340 | 451 | 0 1259 | |
| 2001 | 231 | 294 | | | | 525 | 57 | | | 16 | 190 | 263 | 0 788 | |
| 2002 | 385 | 341 | 51 | 7 | 784 | 110 | | | | 29 | 168 | 307 | 0 1090 | |
| 2003 | 911 | 722 | 46 | 0 | 1679 | 312 | | | | 29 | 305 | 645 | 0 2324 | |
| 2004 | 1262 | 1269 | 73 | 27 | 2631 | 264 | | | | 27 | 335 | 626 | 0 3257 | |
| 2005 | 1378 | 1622 | 134 | 46 | 3180 | 371 | | | | 29 | 244 | 643 | 0 3824 | |
| 2006 | 1166 | 1247 | 60 | 5 | 2478 | 260 | | | | 29 | 230 | 519 | 0 2997 | |
| 2007 | 955 | 1009 | 22 | 6 | 1992 | 181 | | | | 13 | 192 | 386 | 0 2378 | |
| 2008 | 894 | 1168 | 26 | 8 | 2096 | 138 | | | | 11 | 127 | 275 | 0 2371 | |
| 2009 | 850 | 1058 | 17 | 9 | 1935 | 213 | | | | 10 | 148 | 371 | 0 2306 | |
| 2010 | 370 | 955 | 12 | 2 | 1339 | 158 | | | | 2 | 119 | 279 | 0 1618 | |
| 2011 | 243 | 483 | 73 | 15 | 2 | 816 | 59 | 28 | 48 | 46 | 80 | 260 | 1077 | 0 1157 |

| Year | Division 8.c | | | | | | Division 9.a | | | | | | Sub-total | ICES estimated totals | |
|------|--------------|---------|-------|--------|---------|-------|--------------|---------|-------|----------|-----------|-------|-------------|-----------------------|------|
| | Spain | | | France | | Total | Spain | | | Portugal | | Total | Unallocated | Total landings | |
| | Trawl | Gillnet | Other | Trawl | Gillnet | | Trawl | Gillnet | Other | Trawl | Artisanal | | | | |
| 2012 | 271 | 527 | 67 | 12 | 2 | 880 | 54 | 20 | 42 | 6 | 163 | 285 | 1165 | 230 | 1395 |
| 2013 | 274 | 718 | 38 | 19 | 6 | 1054 | 47 | 30 | 50 | 15 | 154 | 296 | 1350 | 190 | 1541 |
| 2014 | 358 | 947 | 28 | 25 | 9 | 1368 | 91 | 47 | 4 | 27 | 122 | 291 | 1659 | 374 | 2032 |
| 2015 | 324 | 802 | 4 | 11 | 12 | 1152 | 86 | 53 | 2 | 34 | 200 | 375 | 1527 | 244 | 1771 |
| 2016 | 376 | 846 | 3 | 10 | 8 | 1243 | 76 | 67 | 1 | 8 | 120 | 273 | 1516 | 294 | 1809 |
| 2017 | 248 | 726 | 1 | 3 | 8 | 986 | 106 | 66 | 1 | 30 | 138 | 341 | 1327 | 119 | 1446 |
| 2018 | 227 | 614 | 34 | 5 | 6 | 886 | 117 | 35 | 1 | 6 | 94 | 253 | 1139 | 4 | 1144 |
| 2019 | 161 | 435 | 0 | 0 | 0 | 597 | 74 | 33 | 1 | 22 | 104 | 233 | 830 | 78 | 909 |
| 2020 | 175 | 256 | 1 | 8 | 3 | 443 | 84 | 40 | 2 | 28 | 125 | 279 | 722 | 0 | 722 |
| 2021 | 178 | 233 | 1 | 3 | 0 | 415 | 88 | 7 | 2 | 16 | 80 | 193 | 608 | 0 | 608 |

Summary of the assessment

Table 9 White anglerfish in divisions 8.c and 9.a. Assessment summary. ‘High’ and ‘Low’ refer to 95% confidence intervals. All weights are in tonnes and recruitment is in thousands.

| Year | Recruitment | | | Stock size | | | Catch | Fishing pressure | | |
|------|-------------|------|------|------------|-------|------|-------|------------------------|-------|-------|
| | R (age 0) | High | Low | SSB | High | Low | | F _{30–130 cm} | High | Low |
| 1980 | 676 | 1068 | 283 | 9688 | 13518 | 5858 | 4817 | 0.30 | 0.33 | 0.27 |
| 1981 | 1910 | 2539 | 1281 | 11276 | 14688 | 7865 | 5566 | 0.33 | 0.36 | 0.30 |
| 1982 | 7313 | 8562 | 6065 | 11840 | 14601 | 9078 | 5782 | 0.38 | 0.41 | 0.35 |
| 1983 | 2004 | 2798 | 1211 | 10595 | 12824 | 8366 | 6113 | 0.49 | 0.52 | 0.47 |
| 1984 | 768 | 1052 | 484 | 8786 | 10570 | 7003 | 6031 | 0.51 | 0.53 | 0.48 |
| 1985 | 1800 | 2204 | 1396 | 8424 | 9761 | 7088 | 6139 | 0.53 | 0.56 | 0.51 |
| 1986 | 6473 | 7170 | 5775 | 7800 | 8792 | 6808 | 6870 | 0.80 | 0.84 | 0.77 |
| 1987 | 3709 | 4226 | 3192 | 4835 | 5553 | 4117 | 5139 | 0.92 | 0.95 | 0.90 |
| 1988 | 1090 | 1357 | 823 | 3179 | 3711 | 2647 | 6321 | 1.38 | 1.40 | 1.35 |
| 1989 | 3294 | 3635 | 2953 | 2511 | 2810 | 2212 | 4995 | 1.09 | 1.11 | 1.06 |
| 1990 | 2242 | 2531 | 1953 | 2425 | 2660 | 2190 | 3790 | 0.82 | 0.84 | 0.79 |
| 1991 | 1066 | 1252 | 880 | 2219 | 2443 | 1995 | 3640 | 0.83 | 0.86 | 0.81 |
| 1992 | 1319 | 1502 | 1137 | 2120 | 2324 | 1917 | 3382 | 0.87 | 0.89 | 0.84 |
| 1993 | 1676 | 1903 | 1449 | 1978 | 2170 | 1786 | 2329 | 0.63 | 0.65 | 0.60 |
| 1994 | 3086 | 3387 | 2786 | 2072 | 2295 | 1848 | 2007 | 0.50 | 0.52 | 0.48 |
| 1995 | 1852 | 2106 | 1598 | 2345 | 2615 | 2075 | 1835 | 0.33 | 0.35 | 0.32 |
| 1996 | 340 | 432 | 248 | 3312 | 3642 | 2982 | 2956 | 0.39 | 0.40 | 0.37 |
| 1997 | 282 | 341 | 222 | 4384 | 4746 | 4021 | 3715 | 0.45 | 0.47 | 0.43 |
| 1998 | 222 | 277 | 166 | 4778 | 5146 | 4410 | 2981 | 0.38 | 0.40 | 0.36 |
| 1999 | 735 | 829 | 642 | 4625 | 5006 | 4244 | 1933 | 0.30 | 0.31 | 0.27 |
| 2000 | 635 | 764 | 507 | 4292 | 4695 | 3888 | 1256 | 0.24 | 0.25 | 0.22 |
| 2001 | 3657 | 3989 | 3326 | 4036 | 4468 | 3604 | 788 | 0.164 | 0.176 | 0.152 |
| 2002 | 1652 | 1914 | 1391 | 4241 | 4706 | 3776 | 1093 | 0.189 | 0.199 | 0.179 |
| 2003 | 349 | 465 | 233 | 4865 | 5368 | 4362 | 2326 | 0.29 | 0.31 | 0.28 |
| 2004 | 2120 | 2397 | 1842 | 5941 | 6489 | 5394 | 3258 | 0.33 | 0.35 | 0.31 |
| 2005 | 1384 | 1617 | 1151 | 6882 | 7480 | 6283 | 3827 | 0.39 | 0.41 | 0.36 |
| 2006 | 1270 | 1452 | 1089 | 6593 | 7228 | 5958 | 2998 | 0.34 | 0.36 | 0.33 |
| 2007 | 710 | 856 | 564 | 6369 | 7054 | 5683 | 2377 | 0.28 | 0.30 | 0.26 |
| 2008 | 761 | 912 | 610 | 6718 | 7469 | 5968 | 2372 | 0.26 | 0.28 | 0.24 |
| 2009 | 863 | 1029 | 697 | 7086 | 7897 | 6275 | 2307 | 0.26 | 0.28 | 0.24 |
| 2010 | 1459 | 1702 | 1215 | 7169 | 8044 | 6293 | 1620 | 0.185 | 0.199 | 0.171 |
| 2011 | 1154 | 1390 | 919 | 7473 | 8432 | 6515 | 1156 | 0.134 | 0.145 | 0.124 |
| 2012 | 516 | 673 | 358 | 8212 | 9269 | 7156 | 1396 | 0.141 | 0.152 | 0.130 |
| 2013 | 777 | 965 | 590 | 9110 | 10287 | 7934 | 1540 | 0.139 | 0.152 | 0.127 |
| 2014 | 1482 | 1749 | 1214 | 10129 | 11460 | 8797 | 2033 | 0.175 | 0.192 | 0.158 |
| 2015 | 238 | 331 | 144 | 10517 | 12021 | 9014 | 1771 | 0.153 | 0.167 | 0.139 |
| 2016 | 203 | 275 | 130 | 10804 | 12500 | 9109 | 1809 | 0.164 | 0.183 | 0.144 |
| 2017 | 194 | 263 | 125 | 11002 | 12927 | 9076 | 1447 | 0.132 | 0.152 | 0.112 |

| Year | Recruitment | | | Stock size | | | Catch | Fishing pressure | | |
|------|-------------|------|------|------------|-------|------|-------|------------------------|-------|-------|
| | R (age 0) | High | Low | SSB | High | Low | | F _{30–130 cm} | High | Low |
| 2018 | 434 | 579 | 289 | 11320 | 13506 | 9134 | 1144 | 0.112 | 0.132 | 0.092 |
| 2019 | 1476 | 1914 | 1038 | 11394 | 13807 | 8982 | 908 | 0.099 | 0.117 | 0.081 |
| 2020 | 321 | 470 | 172 | 11174 | 13755 | 8593 | 720 | 0.087 | 0.100 | 0.075 |
| 2021 | 1157 | 1731 | 582 | 11043 | 13775 | 8310 | 608 | 0.077 | 0.091 | 0.062 |
| 2022 | 706* | | | 11388 | 14356 | 8421 | | | | |

* Geometric mean 2003–2021.

Sources and references

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[Download the stock assessment data and figures](#).

Recommended citation: ICES. 2022. White anglerfish (*Lophius piscatorius*) in divisions 8.c and 9.a (Cantabrian Sea and Atlantic Iberian waters). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, mon.27.8c9a, <https://doi.org/10.17895/ices.advice.19453454>.

Norway pout (*Trisopterus esmarkii*) in Subarea 4 and Division 3.a (North Sea, Skagerrak, and Kattegat)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches from 1 November 2022 to 31 October 2023 should be no more than 116 823 tonnes.

Stock development over time

Spawning-stock size is above B_{pa} and B_{lim} ; no reference points for fishing pressure or for MSY $B_{trigger}$ have been defined for this stock.



Fishing pressure



SSB

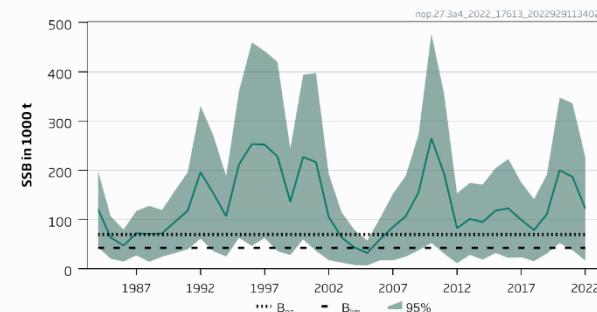


Figure 1 Norway pout in Subarea 4 and Division 3.a. Summary of the stock assessment. Catches in 2022 (unshaded) are up to mid-September. SSB is estimated at the beginning of quarter 4.

Catch scenarios

Table 1 Norway pout in Subarea 4 and Division 3.a. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|------------------------------------|---------|--|
| $F_{ages\ 1-2}$ | 0.218 | Fishing mortality from the 4th quarter of 2021 to the 3rd quarter of 2022; from the assessment model |
| SSB (4 th quarter 2022) | 122 199 | From the assessment model; tonnes |
| $R_{age\ 0}\ (2022)$ | 76 654 | Age 0 in the 3rd quarter of 2022. From the assessment model; millions. |
| $R_{age\ 0}\ (2023)$ | 48 099 | Resampled from estimated historical recruitments; millions |
| Catch | 43701 | Based on landings statistics from the 4th quarter of 2021 to 15 September 2022; tonnes |
| Discards | 0 | Industrial fishery with negligible discarding; tonnes |

Table 2 Norway pout in Subarea 4 and Division 3.a. Annual catch scenarios. All weights are in tonnes.

| Basis | Catch (1 November 2022– 31 October 2023)* | F (1 November 2022– 31 October 2023) | 5th percentile SSB (4th quarter 2023) | Median SSB (4th quarter 2023) | % SSB change ** | % catch change *** | % advice change ^ |
|---|---|--|--|-------------------------------------|-----------------------|--------------------------|-------------------------|
| ICES advice basis | | | | | | | |
| MSY approach: (escapement strategy) 95% probability of SSB being above B_{lim} in the 4 th quarter of 2023 | 116 823 | 0.635 | 42 570 | 133 480 | 9.2 | 167 | -1.23 |
| Other options | | | | | | | |
| F = 0 | 0 | 0.000 | 80 120 | 190 620 | 56 | -100 | -100 |
| F = $F_{status quo}$ | 45 564 | 0.220 | 63 550 | 165 940 | 36 | 4.3 | -61 |
| F = 0.3 | 61 133 | 0.303 | 58 530 | 158 540 | 30 | 40 | -48 |
| F = 0.4 | 79 162 | 0.405 | 52 850 | 149 820 | 23 | 81 | -33 |
| F = 0.5 | 95 769 | 0.503 | 48 010 | 142 220 | 16.4 | 119 | -19.0 |
| F = 0.6 | 111 636 | 0.603 | 43 870 | 135 600 | 11.0 | 155 | -5.6 |
| F = 0.7 | 126 284 | 0.705 | 40 520 | 129 060 | 5.6 | 189 | 6.8 |

* The catch forecast is for the period 1 October to 30 September.

** SSB at the beginning of the 4th quarter of 2023 relative to SSB at the beginning of the 4th quarter of 2022 (= 122 199 tonnes).

*** Catches 1 October 2022–30 September 2023 relative to catches 1 October 2021–15 September 2022 (= 43 701 tonnes).

^ Advice value 2023 relative to the advice value 2022 (= 118 273 tonnes).

Basis of the advice

Table 3 Norway pout in Subarea 4 and Division 3.a. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach (escapement strategy based on stochastic projections) with an F_{cap} ($F_{bar[1-2]}$) = 0.7 |
| Management plan | ICES is not aware of any agreed precautionary management plan for Norway pout in this area. ICES has previously evaluated a proposed management plan from Norway and EU (ICES, 2018a, 2018b, 2018c). ICES escapement strategy was found only to be precautionary with an F_{cap} at or below 0.7. |

Quality of the assessment

The assessment shows a tendency in recent years to overestimate SSB and to underestimate F.

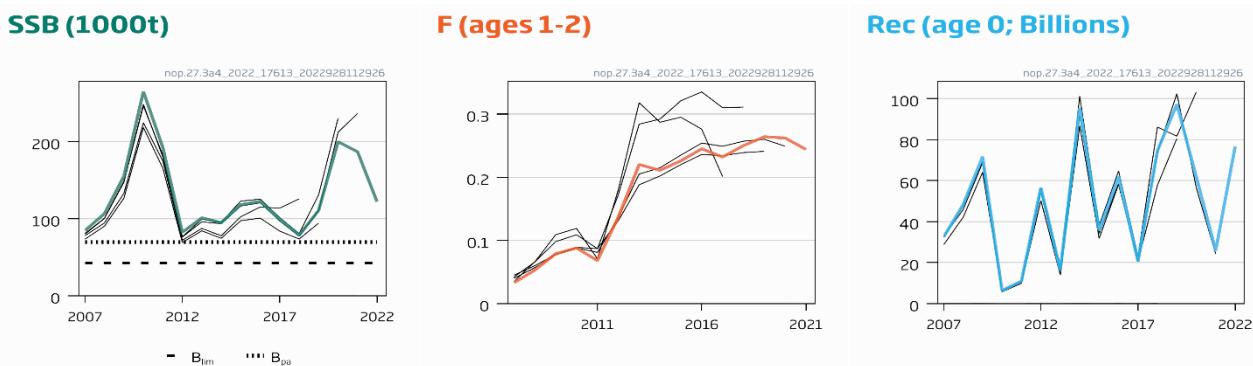


Figure 2 Norway pout in Subarea 4 and Division 3.a. Historical assessment results. Fishing pressure (F) for 2022 is not shown because it can be estimated only up to quarter 3. The SSB shown is for the beginning of quarter 4, and the recruitment (rec) is for quarter 3. The reference points were revised in 2020 because there was a change to the survey index input data, and only the last three assessment results should be compared to the reference points indicated.

Issues relevant for the advice

Norway pout is a short-lived species. Recruitment is highly variable and strongly influences both the spawning-stock and total biomass. ICES approach to MSY-based management for short-lived species has been used here in the form of an escapement strategy based on a stochastic forecast, i.e. to maintain, with 95% probability, SSB above B_{lim} after the fishery has taken place. This includes an F_{cap} at 0.7, which was not required this year because the advised F is below 0.7.

For the implementation of the escapement strategy SSB is calculated at the beginning of quarter 4 as a proxy for SSB at spawning time (quarter 1).

The catch forecast is for the period 1 October to 30 September. ICES considers that this forecast sufficiently approximates the TAC period and that it can be used directly for management purposes for the period 1 November 2021–31 October 2022.

Reference points

Table 4 Norway pout in Subarea 4 and Division 3.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|----------------------|-----------------------------|---|-------------|
| MSY approach | MSY $B_{escapement}$ | Not defined* | | |
| | F_{MSY} | Not defined | | |
| | F_{cap} | 0.70 | A long-term management strategy evaluation, indicating that an escapement strategy for Norway pout is only precautionary with the addition of an upper limit on fishing mortality = F_{cap} ($F_{bar[1-2]}$) at 0.7 | ICES (2020) |
| Precautionary approach | B_{lim} | 42 573 tonnes (4th quarter) | $B_{lim} = B_{loss}$, the lowest observed biomass in 2005 (as estimated in the updated benchmark assessment) | ICES (2020) |
| | B_{pa} | 69 736 tonnes (4th quarter) | $B_{pa} = B_{lim} e^{0.3 \times 1.645}$ | ICES (2020) |
| | F_{lim} | Not defined | | |
| | F_{pa} | Not defined | | |
| Management plan | SSB _{mgt} | Not applicable | | |
| | F_{mgt} | Not applicable | | |

* MSY $B_{escapement}$ has not been defined, as the escapement strategy uses directly the 95% probability of SSB being above B_{lim} .

Basis of the assessment

Table 5 Norway pout in Subarea 4 and Division 3.a. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical assessment (quarterly SAM model, called SESAM) |
| Input data | Commercial catches (quarterly catches; catch-at-age and mean weight-at-age from catch sampling from the main Danish and Norwegian fisheries), four survey indices (IBTS Q1 [G1022], IBTS Q3 [G2829], EngGFS-IBTS-Q3 [G2829], and ScoGFS-IBTS-Q3 [G2829]). Constant maturity data from survey estimates, constant natural mortality estimated from survey indices (IBTS Q1&3), and constant mean weight-at-age in the stock from long-term commercial catch estimates. |
| Discards and bycatch | Discarding and bycatch of Norway pout is considered negligible and not included in the assessment |
| Indicators | None |
| Other information | Benchmarked in 2016 (ICES, 2016) |
| Working group | Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) |

History of the advice, catch, and management

Table 6 Norway pout in Subarea 4 and Division 3.a. History of ICES advice, agreed TACs, official catch, and ICES catch estimate. All weights are in tonnes. Catch values prior to 2004 are presented to the nearest thousand tonnes.

| Year | ICES advice | Predicted catch corresponding to advice ^{^^} | TAC Norway | TAC EU [^] | TAC UK [^] | Official catch (including bycatch of other species) | ICES catch |
|----------|---|---|------------|---------------------|---------------------|---|------------|
| 1987 | No advice | - | No TAC | 200000 | | 215000 | 149300 |
| 1988 | No advice | - | No TAC | 200000 | | 187000 | 109300 |
| 1989 | No advice | - | No TAC | 200000 | | 276000 | 166400 |
| 1990 | No advice | - | No TAC | 200000 | | 212000 | 163300 |
| 1991 | No advice | - | No TAC | 200000 | | 223000 | 186600 |
| 1992 | No advice | - | No TAC | 200000 | | 335000 | 296800 |
| 1993 | No advice | - | No TAC | 220000 | | 241000 | 183100 |
| 1994 | No advice | - | No TAC | 220000 | | 214000 | 182000 |
| 1995 | Can sustain current F | - | No TAC | 180000 | | 289000 | 236800 |
| 1996 | Can sustain current F; take bycatches into consideration | - | No TAC | 220000 | | 197000 | 163800 |
| 1997 | Can sustain current F; take bycatches into consideration | - | No TAC | 220000 | | 155000 | 169700 |
| 1998 | Can sustain current F; take bycatches into consideration | - | No TAC | 220000 | | 72000 | 79800 |
| 1999 | Can sustain current F; take bycatches into consideration | - | No TAC | 220000 | | 93000 | 94500 |
| 2000 | Can sustain current F; take bycatches into consideration | - | No TAC | 220000 | | 182000 | 184400 |
| 2001 | Can sustain current F; take bycatches into consideration | - | No TAC | 211200 | | 63000 | 65600 |
| 2002 | Can sustain current F; take bycatches into consideration | - | No TAC | 198000 | | 93000 | 80000 |
| 2003 | Can sustain current F; take bycatches into consideration | - | No TAC | 198000 | | 24000 | 27100 |
| 2004 | The stock is at risk of decreasing below B_{lim} | - | No TAC | 198000 | | 7640 | 13500 |
| 2005 | Fishery should be closed | | 1000 | 5000 | | 1927 | 1927 |
| 2006 | Fishery closed until 4th August, where a TAC of 95 000 tonnes was set | | 1000 | 95000 | | 53599 | 46626 |
| 2007 | Fishery closed because SSB < B_{pa} in 2008 | 0 | 1000 | 5000 | | 5792 | 5792 |
| 2008 | F = 0.35 or 50 000 tonnes for first half of 2008 | < 50000 in first six months | | 41000 | | | |
| In-year* | Maintain SSB > B_{pa} | < 148000 | 37500 | 114616 | | 39222 | 36138 |
| 2009 | Reduce F to increase SSB > B_{pa} | < 35000 | | 28300 | | | |
| In-year* | Maintain SSB > B_{pa} | < 157000 | 128170 | 116279 | | 57170 | 54500 |
| 2010 | Maintain SSB > B_{pa} | < 307000 | 86000 | 76000 | | | |
| In-year* | Maintain SSB > MSY $B_{escapement}$ | < 434000 | | 162950 | | 136974 | 125955 |
| 2011 | No directed fisheries | 0 | | | | | |
| In-year* | Maintain SSB > MSY $B_{escapement}$ | < 6000 | 3150 | 4500 | | 7283 | 6524 |

| Year | ICES advice | Predicted catch corresponding to advice ^{^^} | TAC Norway | TAC EU [^] | TAC UK [^] | Official catch (including bycatch of other species) | ICES catch |
|-----------|---|--|------------|---------------------|---------------------|---|------------|
| 2012 | No fisheries | 0 | | 0 | | | |
| In-year* | No fisheries | 0 | | | | 30148 | 27073 |
| In-year** | Maintain SSB > MSY $B_{\text{escapement}}$ | < 101000 | 25000 | 70683 | | | |
| 2013 | Maintain SSB > MSY $B_{\text{escapement}}$ | < 458000 (Catch ₂₀₁₂ = 0) < 393000 (Catch ₂₀₁₂ = 101) | 157000 | 165700 | | 84969 | 82100 |
| In-year* | Maintain SSB > MSY $B_{\text{escapement}}$ | < 457000 | | | | | |
| 2014 | Maintain SSB > MSY $B_{\text{escapement}}$ | < 216000 | 108000 | 128250 | | 47120 | 44170 |
| In-year* | Maintain SSB > MSY $B_{\text{escapement}}$ | < 108000 | 123000 | | | | |
| 2015 | Precautionary considerations ($F = 0.6$) | < 326000 | 178000 | 150000 | | 63430 | 63400 |
| 2016 | MSY approach (escapement biomass with F_{cap}) | < 390000 | 210000 | 150000 | | 62770 | 63400 |
| 2017 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) | ≤ 358471 | 204235 | 141950 | | 33847 | 33933 |
| 2018 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) | ≤ 212531 | 90978 | 85265 | | 36060 | 36147 |
| 2019 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) with $F_{\text{cap}} = 0.7$ | ≤ 135459 | 82230 | 55000 | | 100279 | 97654 |
| 2020 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) with $F_{\text{cap}} = 0.7$ | ≤ 167105 | 98053 | 72500 | | 129609 | 129497 |
| 2021 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) with $F_{\text{cap}} = 0.7$ | ≤ 254038 | 127019 | 116555 | 11745 | 72479 | 71954 |

| Year | ICES advice | Predicted catch corresponding to advice ^{^^} | TAC Norway | TAC EU [^] | TAC UK [^] | Official catch (including bycatch of other species) | ICES catch |
|------|--|---|------------|---------------------|---------------------|---|------------|
| 2022 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) | ≤ 118273 | 59137 | 49524 | 10204 | | |
| 2023 | MSY approach (escapement strategy; probability of SSB falling below B_{lim} is less than 5%) | ≤ 116823 | | | | | |

* Between 2008 and 2014, advice was provided in autumn, while the in-year advice was given in June on the basis of the first surveys and catches in the TAC year.

** Update of in-year advice in October 2012.

[^] From 2018, the TAC for EU Member States and UK fishing in EU and UK waters is provided for the period 1 November of the previous year to 31 October of the current year. The EU TAC included UK up to 2020.

^{^^} Starting with the advice for 2016, ICES advice has been provided for the period 1 November of the previous year to 31 October of the current year.

History of the catch and landings

Table 7 Norway pout in Subarea 4 and Division 3.a. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch | Landings | | Discards |
|-------|-------------------------------|---------------|------------|
| | Small-meshed trawl fleet 100% | | |
| | 71 954 tonnes | 71 954 tonnes | Negligible |

Table 8a Norway pout in Division 3.a. History of commercial catch as officially reported to ICES; values are presented for each country participating in the fishery. All weights are in tonnes.

| Division 3.a | Denmark | Faroe Islands | Norway | Sweden | Germany | Total |
|--------------|---------|---------------|--------|--------|---------|-------|
| 2004 | 110 | 45 | 41 | - | 54 | 250 |
| 2005 | - | - | - | - | - | 0 |
| 2006 | 18 | - | 2 | - | - | 20 |
| 2007 | 24 | - | - | - | - | 24 |
| 2008 | 156 | - | - | - | - | 156 |
| 2009 | - | - | 209 | - | - | 209 |
| 2010 | 51 | - | 711 | 10 | - | 772 |
| 2011 | 2 | - | - | - | - | 2 |
| 2012 | 118 | - | - | - | - | 118 |
| 2013 | 6945 | - | 147 | 1 | - | 7093 |
| 2014 | 538 | - | 9 | 1 | - | 548 |
| 2015 | 2220 | - | 41 | 1 | - | 2262 |
| 2016 | 918 | - | 82 | 1 | - | 1001 |
| 2017 | 110 | - | 72 | 4 | 2 | 188 |
| 2018 | 159 | - | 6 | 1 | - | 166 |
| 2019 | 1125 | - | 6 | 181 | - | 1312 |
| 2020 | 585 | - | 16 | 13 | - | 614 |
| 2021 | 1942 | - | 1 | 2 | - | 1945 |

Table 8b Norway pout in Subarea 4 (Division 4.a). History of commercial catch as officially reported to ICES; values are presented for each country participating in the fishery. All weights are in tonnes.

| Division 4.a | Denmark | Faroe Islands | Netherlands | Germany | Norway | Sweden | UK (Scotland) | Total |
|--------------|---------|---------------|-------------|---------|--------|--------|---------------|--------|
| 2004 | 10762 | 1085 | - | - | 4953 | - | - | 16800 |
| 2005 | 941* | 24 | - | - | 962 | - | - | 1927 |
| 2006 | 39531 | - | - | 15 | 13618 | - | - | 53164 |
| 2007 | 59 | - | - | - | 4712 | - | - | 4771 |
| 2008 | 32158 | - | - | - | 6650 | 10 | - | 38818 |
| 2009 | 19226 | - | 22 | - | 36961 | - | - | 56209 |
| 2010 | 71032 | - | 18 | - | 64303 | ** | 29 | 135382 |
| 2011 | 4038 | - | - | - | 3189 | 1 | - | 7228 |
| 2012 | 25431 | - | - | - | 4528 | 3 | - | 29962 |
| 2013 | 31375 | - | - | - | 45839 | 4 | - | 77218 |
| 2014 | 27894 | - | - | - | 18647 | 1 | 8 | 46550 |
| 2015 | 10760 | 5270 | 17 | 22 | 43742 | 12 | 3 | 59826 |
| 2016 | 21125 | 3156 | 8 | 27 | 35959 | - | 12 | 60287 |
| 2017 | 12312 | - | 1 | 1 | 21275 | - | - | 33589 |
| 2018 | 10367 | - | 2 | - | 25498 | 4 | - | 35871 |
| 2019 | 35647 | 3034 | - | - | 59546 | 32 | - | 98259 |
| 2020 | 59402 | - | 88 | 4 | 63726 | 35 | 82 | 123337 |
| 2021 | 39871 | - | 23 | 486 | 29863 | 2 | 10 | 70255 |

Table 8c Norway pout in Subarea 4 (Division 4.b). History of commercial catch as officially reported to ICES; values are presented for each country participating in the fishery. All weights are in tonnes.

| Division 4.b | Denmark | Faroe Islands | Germany | Netherlands | Norway | Sweden | UK (E/W/NI) | UK (Scotland) | Total |
|--------------|---------|---------------|---------|-------------|--------|--------|-------------|---------------|-------|
| 2004 | 473 | 29 | - | - | - | 88 | - | - | 590 |
| 2005 | - | - | - | - | - | - | - | - | 0 |
| 2006 | 394 | - | 19 | - | 2 | - | - | - | 415 |
| 2007 | - | - | - | - | - | - | - | - | 0 |
| 2008 | 244 | - | - | - | - | - | - | - | 244 |
| 2009 | 595 | - | 75 | - | 82 | - | - | - | 752 |
| 2010 | 229 | - | - | - | 620 | - | - | - | 849 |
| 2011 | 32 | - | - | - | 21 | - | - | - | 53 |
| 2012 | 9 | - | - | - | 59 | - | - | - | 68 |
| 2013 | 43 | - | - | - | 615 | - | - | - | 658 |
| 2014 | 16 | - | - | - | 8 | - | - | 6 | 30 |
| 2015 | 53 | - | - | 1 | 577 | 714 | - | - | 1345 |
| 2016 | 1463 | - | - | - | 11 | 1 | - | 18 | 1493 |
| 2017 | 45 | - | 13 | - | 10 | 2 | - | - | 70 |
| 2018 | 20 | - | 3 | - | - | - | - | - | 23 |
| 2019 | 573 | - | - | 1 | 109 | 25 | - | - | 708 |
| 2020 | 620 | - | - | - | 35 | - | 3 | - | 658 |
| 2021 | 189 | - | - | - | 88 | 2 | - | - | 279 |

Table 8d Norway pout in Subarea 4 (Division 4.c). History of commercial catch as officially reported to ICES; values are presented for each country participating in the fishery. All weights are in tonnes.

| Division 4.c | Denmark | France | Netherlands | UK (E/W/NI) | Total |
|--------------|---------|--------|-------------|-------------|-------|
| 2004 | - | - | - | - | 0 |
| 2005 | - | - | - | - | 0 |
| 2006 | - | - | - | - | 0 |
| 2007 | - | ** | - | - | 0 |
| 2008 | - | ** | - | - | 0 |
| 2009 | - | - | - | - | 0 |
| 2010 | - | - | - | - | 0 |
| 2011 | - | - | - | - | 0 |
| 2012 | - | - | - | - | 0 |
| 2013 | - | - | - | - | 0 |
| 2014 | - | - | - | - | 0 |
| 2015 | - | - | - | - | 0 |
| 2016 | 1 | - | - | - | 1 |
| 2017 | - | - | - | - | 0 |
| 2018 | - | - | - | - | 0 |
| 2019 | - | - | - | - | 0 |
| 2020 | - | - | - | - | 0 |
| 2021 | - | - | - | - | 0 |

Table 8e Norway pout in Subarea 4 and Division 3.a combined. History of commercial catch as officially reported to ICES; values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Subarea 4 and Division 3.a combined | Denmark | Faroe Islands | Norway | Sweden | Netherlands | Germany | UK | Total nominal landings | Unallocated catches*** | ICES estimate of total landings (Subarea 4 + Division 3.a) |
|-------------------------------------|---------|---------------|--------|--------|-------------|---------|----|------------------------|------------------------|--|
| 2004 | 11345 | 1159 | 4994 | 88 | 0 | 54 | 0 | 17640 | -4140 | 13500 |
| 2005 | 941* | 24 | 962 | 0 | 0 | 0 | 0 | 1927 | -24 | 1903 |
| 2006 | 39943 | 0 | 13622 | 0 | 0 | 34 | 0 | 53599 | -6973 | 46626 |
| 2007 | 83 | 0 | 4712 | 0 | 0 | 0 | 0 | 4795 | 997 | 5792 |
| 2008 | 32558 | 0 | 6650 | 10 | 0 | 0 | 0 | 39218 | -3080 | 36138 |
| 2009 | 19821 | 0 | 37252 | 0 | 22 | 75 | 0 | 57170 | -2645 | 54525 |
| 2010 | 71312 | 0 | 65634 | 10 | 18 | 0 | 29 | 137003 | -11048 | 125955 |
| 2011 | 4072 | 0 | 3210 | 1 | 0 | 0 | 0 | 7283 | -759 | 6524 |
| 2012 | 25558 | 0 | 4587 | 3 | 0 | 0 | 0 | 30148 | -3145 | 27003 |
| 2013 | 38363 | 0 | 46601 | 5 | 0 | 0 | 0 | 84969 | -2869 | 82100 |
| 2014 | 28448 | 0 | 18664 | 2 | 0 | 0 | 14 | 47128 | -2958 | 44170 |
| 2015 | 13033 | 5270 | 44360 | 727 | 18 | 22 | 3 | 63433 | -33 | 63400 |
| 2016 | 23507 | 3156 | 36052 | 2 | 8 | 27 | 30 | 62782 | 618 | 63400 |
| 2017 | 12467 | 0 | 21357 | 6 | 1 | 16 | 0 | 33847 | 86 | 33933 |
| 2018 | 10546 | 0 | 25504 | 5 | 2 | 3 | 0 | 36060 | 87 | 36147 |
| 2019 | 37345 | 3034 | 59661 | 238 | 1 | 0 | 0 | 100279 | -2625 | 97654 |
| 2020 | 65607 | 0 | 63777 | 48 | 88 | 4 | 85 | 129609 | -112 | 129497 |
| 2021 | 42002 | 0 | 29952 | 6 | 23 | 486 | 10 | 72479 | -525 | 71954 |

* 781 tonnes from trial fishery (directed fishery); 160 tonnes from bycatches in other fisheries.

** Landings less than one tonne.

*** Difference between total nominal landings and ICES estimates of total landings including bycatch of other species.

Summary of the assessment

Table 9 Norway pout in Subarea 4 and Division 3.a. Assessment summary. Weights are in tonnes. High and low correspond to 95% confidence intervals.

| Year | Recruitment in Q3 (age 0) | High | Low | SSB in Q4 | High | Low | Catches* Q1–Q4 | Fishing pressure Q1–Q4 (ages 1–2) | High | Low |
|------|---------------------------|--------|-------|-----------|--------|-------|----------------|-----------------------------------|---------|--------|
| 1984 | 39817 | 75428 | 21019 | 122073 | 199835 | 44312 | 376555 | 1.13 | 2.0 | 0.63 |
| 1985 | 28819 | 54815 | 15152 | 63597 | 106791 | 20403 | 227482 | 1.09 | 2.0 | 0.58 |
| 1986 | 48432 | 93687 | 25037 | 47400 | 79861 | 14939 | 180508 | 0.80 | 1.49 | 0.43 |
| 1987 | 9969 | 19953 | 4981 | 72359 | 117585 | 27133 | 148894 | 0.75 | 1.44 | 0.39 |
| 1988 | 45725 | 88488 | 23627 | 71139 | 127959 | 14318 | 109295 | 0.55 | 1.00 | 0.30 |
| 1989 | 47217 | 91710 | 24310 | 72029 | 119603 | 24455 | 166559 | 0.56 | 1.02 | 0.31 |
| 1990 | 58282 | 113542 | 29917 | 95268 | 158663 | 31873 | 139095 | 0.53 | 0.97 | 0.29 |
| 1991 | 103234 | 201650 | 52850 | 117948 | 196320 | 39575 | 190406 | 0.51 | 0.95 | 0.28 |
| 1992 | 54476 | 105121 | 28231 | 196110 | 331158 | 61062 | 302490 | 0.49 | 0.92 | 0.26 |
| 1993 | 47192 | 92196 | 24156 | 153588 | 271213 | 35963 | 181265 | 0.50 | 1.04 | 0.24 |
| 1994 | 134913 | 267514 | 68039 | 106838 | 188773 | 24903 | 183585 | 0.43 | 0.86 | 0.21 |
| 1995 | 52801 | 105471 | 26433 | 211839 | 360866 | 62812 | 231772 | 0.32 | 0.65 | 0.156 |
| 1996 | 112567 | 227241 | 55762 | 253226 | 459908 | 46543 | 156079 | 0.29 | 0.60 | 0.141 |
| 1997 | 22077 | 44725 | 10898 | 252265 | 442098 | 62431 | 156937 | 0.28 | 0.59 | 0.133 |
| 1998 | 40137 | 79307 | 20313 | 228154 | 420652 | 35655 | 75034 | 0.26 | 0.55 | 0.125 |
| 1999 | 94317 | 188086 | 47296 | 136447 | 244922 | 27973 | 92302 | 0.28 | 0.60 | 0.133 |
| 2000 | 26141 | 52328 | 13059 | 226848 | 394064 | 59633 | 184970 | 0.26 | 0.57 | 0.120 |
| 2001 | 25858 | 51880 | 12888 | 216868 | 397547 | 36189 | 64373 | 0.22 | 0.50 | 0.100 |
| 2002 | 21213 | 43924 | 10245 | 105483 | 193291 | 17675 | 77108 | 0.28 | 0.66 | 0.120 |
| 2003 | 8320 | 17050 | 4060 | 63902 | 115195 | 12609 | 24647 | 0.22 | 0.54 | 0.092 |
| 2004 | 7844 | 16007 | 3843 | 43596 | 79388 | 7804 | 13487 | 0.20 | 0.51 | 0.078 |
| 2005 | 31338 | 63978 | 15350 | 32258 | 57568 | 6948 | 42 | 0.00 | 0.00100 | 0.00 |
| 2006 | 22260 | 45775 | 10825 | 60198 | 103185 | 17212 | 46553 | 0.25 | 0.67 | 0.091 |
| 2007 | 32648 | 66953 | 15920 | 84763 | 152407 | 17120 | 5796 | 0.033 | 0.081 | 0.0140 |
| 2008 | 48357 | 100144 | 23350 | 106768 | 188899 | 24637 | 34844 | 0.053 | 0.123 | 0.023 |
| 2009 | 71697 | 147086 | 34949 | 155441 | 273276 | 37606 | 45813 | 0.079 | 0.190 | 0.033 |
| 2010 | 6395 | 13330 | 3068 | 265161 | 477874 | 52449 | 131078 | 0.088 | 0.21 | 0.038 |
| 2011 | 11016 | 22505 | 5392 | 192471 | 354421 | 30521 | 6843 | 0.068 | 0.167 | 0.028 |
| 2012 | 56619 | 115404 | 27778 | 82516 | 153679 | 11353 | 26947 | 0.137 | 0.35 | 0.054 |
| 2013 | 16508 | 33525 | 8128 | 101326 | 174425 | 28227 | 82109 | 0.22 | 0.58 | 0.083 |
| 2014 | 95420 | 201607 | 45162 | 95007 | 171388 | 18626 | 44164 | 0.21 | 0.54 | 0.083 |
| 2015 | 35685 | 75823 | 16795 | 118327 | 204551 | 32103 | 57417 | 0.23 | 0.60 | 0.086 |
| 2016 | 61908 | 131998 | 29035 | 122692 | 223167 | 22217 | 60241 | 0.25 | 0.65 | 0.092 |
| 2017 | 20576 | 42444 | 9975 | 99637 | 175735 | 23539 | 33940 | 0.23 | 0.61 | 0.089 |
| 2018 | 74574 | 151069 | 36813 | 78643 | 141789 | 15497 | 36130 | 0.25 | 0.64 | 0.098 |
| 2019 | 97178 | 196875 | 47968 | 111028 | 191148 | 30909 | 97668 | 0.26 | 0.64 | 0.109 |
| 2020 | 61834 | 130192 | 29368 | 200033 | 347856 | 52211 | 129333 | 0.26 | 0.66 | 0.104 |
| 2021 | 25853 | 55056 | 12140 | 186978 | 336235 | 37720 | 71979 | 0.24 | 0.68 | 0.088 |
| 2022 | 76654 | 203083 | 28934 | 122199 | 227598 | 16800 | 12934** | | | |

* The catches presented are the sum of product values from catch numbers- and weights-at-age used in the assessment model and do not match exactly ICES estimates presented in previous tables.

** Provisional (first three quarters of 2022 only).

Sources and references

- ICES. 2016. Report of the Benchmark Workshop on Norway Pout (*Trisopterus esmarkii*) in Subarea 4 and Division 3.a (North Sea, Skagerrak, and Kattegat), 23–25 August 2016, Copenhagen, Denmark. ICES CM 2016/ACOM:35. 396 pp. <https://doi.org/10.17895/ices.pub.5599>
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[Download the stock assessment data and figures.](#)

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Plaice (*Pleuronectes platessa*) in Division 7.a (Irish Sea)

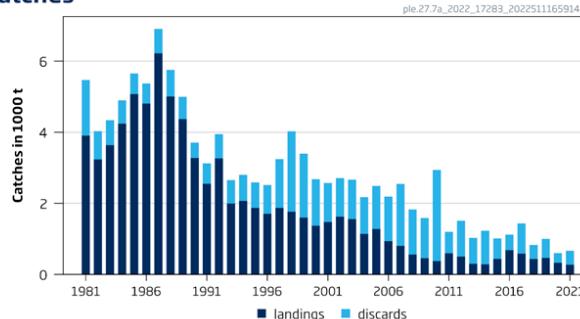
ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, and assuming that discard rates and fishery selection patterns do not change from the average of the years 2019–2021, total catches in 2023 should be no more than 2039 tonnes.

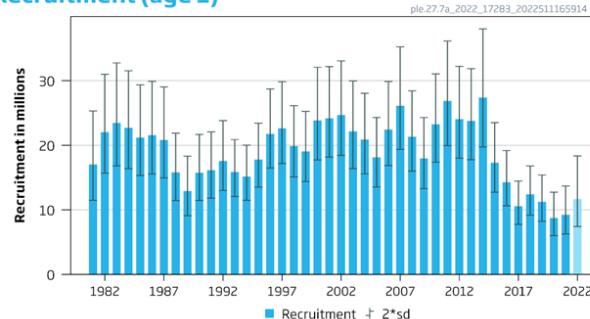
Stock development over time

Fishing pressure on the stock is below F_{MSY} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

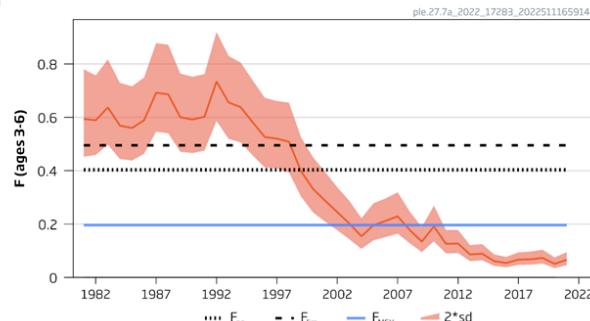
Catches



Recruitment (age 1)



F



SSB

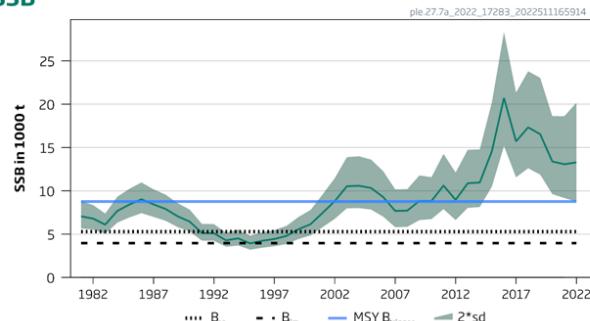


Figure 1 Plaice in Division 7.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Plaice in Division 7.a. Assumptions made for the interim year and the forecast.

| Variable | Value | Notes |
|---|--------|--|
| F_{2022} | 0.064 | $F_{sq} = F_{\text{average}(2019-2021)}$. |
| SSB_{2023} | 13 514 | Short-term forecast; in tonnes |
| $R_{\text{age } 1}(2022 \text{ and } 2023)$ | 11 245 | Median resampled recruitment (2015–2021) as estimated by a stochastic projection; in thousands |
| Total catch (2022) | 680 | Short term forecast; in tonnes |
| Projected landings (2022) | 322 | Assuming average landings pattern (2019–2021); in tonnes |
| Projected discards (2022) | 357 | Assuming average discard pattern (2019–2021); in tonnes |
| Discard survival rate | 40% | Catchpole <i>et al.</i> (2015) |
| Projected surviving discards (2022) | 143 | Assuming an average discard pattern (2019–2021) where 40% of the discards survive; in tonnes |
| Projected dead discards (2022) | 214 | Assuming an average discard pattern (2019–2021) where 60% of the discards die; in tonnes |

Table 2 Plaice in Division 7.a. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | Projected landings (2023) | Projected surviving discards (2023) | Projected dead discards (2023) | Total projected discards* (2023) | F _{total} (2023) | F _{projected landings} (2023) | F _{projected discards} ** (2023) | SSB (2024) | % SSB change *** | % advice change^ |
|--|--------------------|---------------------------|-------------------------------------|--------------------------------|----------------------------------|---------------------------|--|---|------------|------------------|------------------|
| ICES advice basis | | | | | | | | | | | |
| MSY approach: F = F _{MSY} | 2039 | 967 | 429 | 643 | 1072 | 0.196 | 0.061 | 0.135 | 12629 | -6.5 | -30 |
| Other scenarios | | | | | | | | | | | |
| F = F _{MSY} lower | 1418 | 672 | 298 | 447 | 745 | 0.133 | 0.042 | 0.091 | 13169 | -2.5 | -52 |
| F = F _{MSY} upper | 2945 | 1397 | 620 | 929 | 1549 | 0.29 | 0.091 | 0.20 | 11901 | -11.9 | 0.70 |
| F = F _{pa} | 3903 | 1851 | 821 | 1231 | 2052 | 0.40 | 0.126 | 0.28 | 11089 | -17.9 | 33 |
| F = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14305 | 5.9 | -100 |
| F = F _{lim} | 4649 | 2205 | 978 | 1467 | 2445 | 0.50 | 0.155 | 0.34 | 10468 | -23 | 59 |
| SSB ₂₀₂₄ = B _{lim} | 13047 | 6187 | 2744 | 4116 | 6860 | 2.33 | 0.73 | 1.60 | 3958 | -71 | 350 |
| SSB ₂₀₂₄ = B _{pa} | 11370 | 5391 | 2391 | 3587 | 5978 | 1.75 | 0.55 | 1.21 | 5294 | -61 | 290 |
| SSB ₂₀₂₄ = MSY B _{trigger} | 6895 | 3269 | 1450 | 2175 | 3625 | 0.81 | 0.25 | 0.56 | 8757 | -35 | 140 |
| Rollover advice | 2925 | 1387 | 615 | 923 | 1538 | 0.29 | 0.091 | 0.20 | 11913 | -11.8 | 0.0 |
| F = F ₂₀₂₂ | 696 | 330 | 146 | 220 | 366 | 0.064 | 0.020 | 0.044 | 13745 | 1.70 | -76 |
| SSB ₂₀₂₄ = SSB ₂₀₂₃ | 990 | 469 | 208 | 312 | 520 | 0.091 | 0.029 | 0.063 | 13514 | 0 | -65 |

* Dead + surviving projected discards.

** F_{projected discards} concerns dead projected discards only.

*** SSB 2024 relative to SSB 2023.

^Advice value for 2023 relative to the revised advice value for 2022 (2925 tonnes).

The advice for 2023 is lower than 2022 because of a downward revision in the stock biomass.

Basis of the advice

Table 3 Plaice in Division 7.a. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach |
| Management plan | The EU multiannual plan (MAP) for stocks in Western Waters and adjacent waters (EU, 2019) takes into account bycatch of this species. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. |

Quality of the assessment

The assessment indicates that recruitment and fishing pressure have both been decreasing and that the average age of catches has been increasing. An increasing amount of the stock is contained within the modelled plusgroup (47% in the last five years is age 8+). Consequently, the assessment and forecast have increased uncertainty, and a pattern of retrospective downscaling of SSB is seen in the recent history of the assessment

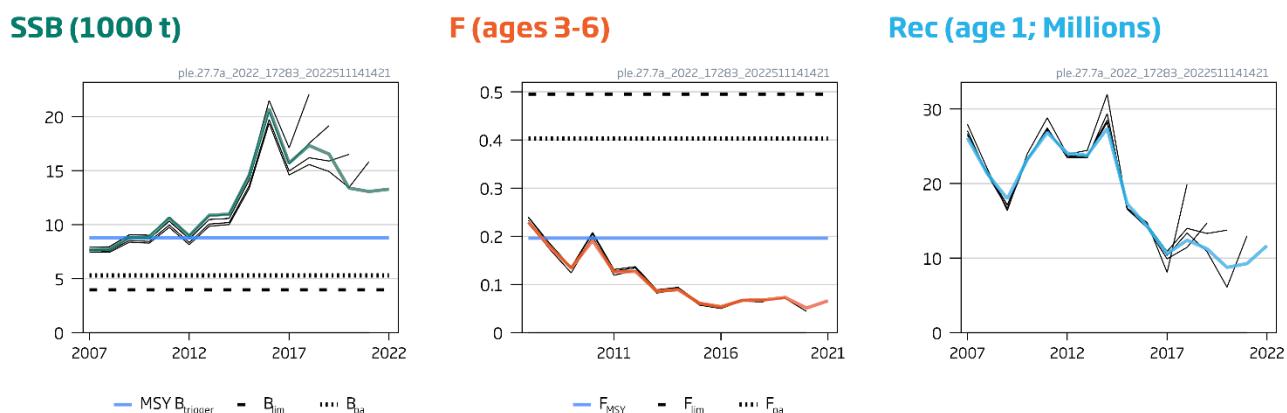


Figure 2 Plaice in Division 7.a. Historical assessment results (final-year SSB estimate and recruitment assumption included).

Issues relevant for the advice

Since 2004, the majority of the catch has been discarded (62% average discard by weight). The assessment only uses the dead portion of the discards (60%; based on Catchpole *et al.* [2015]).

Reference points

Table 4 Plaice in Division 7.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|--------------------------|----------------|---|------------------|
| MSY approach | MSY B_{trigger} | 8757 | Lower 5th percentile of B_{MSY} ; in tonnes | ICES(2018) |
| | F_{MSY} | 0.196 | Stochastic simulations with segmented regression (1981–2017) | ICES(2018) |
| | $F_{\text{MSY lower}}$ | 0.133 | F at 95% MSY (below F_{MSY}), based on simulation using a segmented regression stock–recruitment relationship (EqSim) | ICES(2018) |
| | $F_{\text{MSY upper}}$ | 0.293 | F at 95% MSY (above F_{MSY}), based on simulation using a segmented regression stock–recruitment relationship (EqSim) | ICES(2018) |
| Precautionary approach | B_{lim} | 3958 | $B_{\text{loss}} = \text{minimum SSB observed}; \text{in tonnes}$ | ICES(2018) |
| | B_{pa} | 5294 | $B_{\text{lim}} \times \exp(1.645 \times \sigma); \sigma = 0.177; \text{in tonnes}$ | ICES(2018) |
| | F_{lim} | 0.50 | F with 50% probability of $\text{SSB} < B_{\text{lim}}$. | ICES(2018) |
| | F_{pa} | 0.403 | F_{PO5} ; the F that leads to $\text{SSB} \geq B_{\text{lim}}$ with 95% probability | ICES(2018, 2021) |
| Management plan | SSB_{mgt} | Not applicable | | |
| | F_{mgt} | Not applicable | | |

Basis of the assessment

Table 5 Plaice in Division 7.a. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical assessment (SAM; Nielsen and Berg, 2014; ICES, 2022b) that uses landings and discards in the model and in the forecast. |
| Input data | Commercial catch-at-age data; three survey indices UK (E&W)-BTS-Q3 (B6596), NIGFS-WIBTS-Q1 (G7144), and NIGFS-WIBTS-Q4 (G7655); fixed maturity ogive; natural mortality constant over the years and different across the ages |
| Discards and bycatch | Discard values available from 2004. Estimates of modelled discards for 1981–2003 (WKIRISH3; ICES, 2017). Only the dead fraction of discards (estimated to be 0.6) is accounted for in the model. |
| Indicators | None |
| Other information | Last benchmark in 2017 (WKIRISH3; ICES, 2017). Reference points updated in 2018 (ICES, 2018). |
| Working group | Working Group for the Celtic Seas Ecoregion (WGCSE) |

History of the advice, catch, and management

Table 6 Plaice in Division 7.a. History of ICES advice, the agreed TAC, and ICES estimates of landings and discards. Weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards* |
|------|---|-------------------------------|----------------------------------|------------|-------------------|---------------|----------------|
| 1987 | F high; no long-term gains in increasing F | - | 5000 | 5000 | 5600 | 6220 | - |
| 1988 | No increase in F | - | 4800 | 5000 | 4400 | 5005 | - |
| 1989 | 80% of F (87); TAC | - | 5800 | 5800 | 4200 | 4372 | - |
| 1990 | Halt decline in SSB; TAC | - | 5100 | 5100 | 4000 | 3275 | - |
| 1991 | Rebuild SSB to SSB (90); TAC | - | 3300 | 4500 | 2800 | 2554 | - |
| 1992 | 70% of F (90) | - | 3000 | 3800 | 3200 | 3267 | - |
| 1993 | F = 0.55 ~ 2800 tonnes | - | 2800 | 2800 | 2000 | 1996 | - |
| 1994 | Long-term gains in decreasing F | - | < 3700 | 3100 | 2100 | 2066 | 735 |
| 1995 | Long-term gains in decreasing F | - | 2400 | 2800 | 2000 | 1874 | 717 |
| 1996 | No long-term gain in increasing F | - | 2500 | 2450 | 1900 | 1707 | 812 |
| 1997 | No advice | - | - | 2100 | 2000 | 1871 | 1373 |
| 1998 | No increase in F | - | 2400 | 2400 | 1800 | 1765 | 2263 |
| 1999 | Keep F below F_{pa} | - | 2400 | 2400 | 1600 | 1600 | 1796 |
| 2000 | Keep F below F_{pa} | - | < 2300 | 2400 | 1400 | 1371 | 1306 |
| 2001 | Keep F below F_{pa} | - | < 2400 | 2000 | 1500 | 1473 | 1100 |
| 2002 | Keep F below F_{pa} | - | < 2800 | 2400 | 1500 | 1623 | 1085 |
| 2003 | No increase in F | - | 1900 | 1675 | 1600 | 1559 | 1109 |
| 2004 | $F < F_{pa}$ | - | 1600 | 1340 | 1100 | 1143 | 1031 |
| 2005 | $F < F_{pa}$ | - | 2970 | 1608 | 1300 | 1281 | 1210 |
| 2006 | $F < F_{pa}$ | - | 5900 | 1608 | 937 | 934 | 1254 |
| 2007 | $F < F_{pa}$ | - | 6500 | 1849 | 802 | 805 | 1744 |
| 2008 | $F < F_{pa}$ | - | 5200 | 1849 | 563 | 563 | 1268 |
| 2009 | No long-term gains in increasing F above $F_{0.1}$ | - | 1430 | 1430 | 458 | 457 | 1132 |
| 2010 | No long-term gains in increasing F above $F_{0.1}$ | - | 1630 | 1630 | 377 | 378 | 2561 |
| 2011 | Effort should be consistent with no increase in catches | - | - | 1627 | 596 | 595 | 603 |
| 2012 | Catches should not increase | - | - | 1627 | 508 | 503 | 1010 |
| 2013 | Landings should be no more than 2% more than recent landings (last three years) | - | < 490 | 1627 | 339 | 303 | 725 |
| 2014 | Catches should be no more than 1% more than recent catches (last three years) | < 1827 | < 497 | 1220 | 282 | 287 | 943 |
| 2015 | Catches should be no more than recent catches (last three years) | < 1244 | < 394 | 1098 | 439 | 440 | 572 |
| 2016 | Precautionary approach (same advised catch value as given for 2015) | ≤ 1244 | ≤ 343 | 1098 | 742 | 682 | 414 |
| 2017 | Precautionary approach | ≤ 1493 | ≤ 436 | 1098 | 585 | 586 | 852 |
| 2018 | MSY approach | ≤ 3336 | ≤ 1793 | 1793 | 435 | 435 | 395 |
| 2019 | MSY approach | ≤ 3503 | | 3075 | 225† | 465 | 537 |
| 2020 | Precautionary approach | ≤ 5640 | | 2790 | 333** | 330 | 271 |
| 2021 | MSY approach | ≤ 2846 | | 2846 | 281** | 276 | 392 |
| 2022 | MSY approach | $\leq 2925***$ | | 2747 | | | |
| 2023 | MSY approach | ≤ 2039 | | | | | |

* Total discards (dead and surviving components).

** Preliminary.

*** updated in 2022 from 2747 tonnes.

† Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

History of the catch and landings

Table 7 Plaice in Division 7.a. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch | | Landings | | | Discards | | |
|-------------|------------------|------------|-------------|-------------|------------|-------------|---------------|
| Dead 77% | Surviving 23% | Beam trawl | Otter trawl | Other gears | Beam trawl | Otter trawl | Other gears |
| | | 68% | 31% | < 1% | 20% | 80% | < 1% |
| 668 tonnes | | | | 276 tonnes | | 392 tonnes | |
| | | | | | 60% dead | | 40% surviving |

Table 8 Plaice in Division 7.a. History of commercial catch and landings for each country participating in the fishery; both the official and ICES estimated values are presented. Weights in tonnes.

| Year | Belgium | France | Ireland | Netherlands | UK (NI, E, & W) | UK (Isle of Man) | UK (Scotland) | Total official landings | ICES discards | ICES estimates of catches |
|-------|---------|--------|---------|-------------|--------------------|---------------------|------------------|-------------------------------|------------------|---------------------------------|
| 1994 | 332 | 13 | 547 | - | 1082 | 14 | 63 | 2051 | 863 | 2801 |
| 1995 | 327 | 10 | 557 | - | 1050 | 20 | 60 | 2024 | 747 | 2592 |
| 1996 | 344 | 11 | 538 | 69 | 878 | 16 | 18 | 1874 | 832 | 2518 |
| 1997 | 459 | 8 | 543 | 110 | 798 | 11 | 25 | 1954 | 1285 | 3246 |
| 1998 | 327 | 8 | 730 | 27 | 679 | 14 | 18 | 1803 | 1952 | 4028 |
| 1999 | 275 | 5 | 541 | 30 | 687 | 5 | 23 | 1566 | 1657 | 3397 |
| 2000 | 325 | 14 | 420 | 47 | 610 | 6 | 21 | 1443 | 1223 | 2678 |
| 2001 | 482 | 9 | 378 | - | 607 | 1 | 11 | 1488 | 1070 | 2573 |
| 2002 | 636 | 8 | 370 | - | 569 | 1 | 7 | 1591 | 1135 | 2708 |
| 2003 | 628 | 7 | 490 | - | 409 | 1 | 9 | 1544 | 1077 | 2668 |
| 2004 | 431 | 2 | 328 | - | 369 | 0 | 4 | 1134 | 1031 | 2173 |
| 2005 | 566 | 9 | 272 | - | 422 | 0 | 1 | 1270 | 1210 | 2492 |
| 2006 | 343 | 2 | 179 | 0 | 413 | 0 | 0 | 937 | 1254 | 2188 |
| 2007 | 194 | 2 | 194 | 0 | 412 | 0 | 0 | 802 | 1744 | 2549 |
| 2008 | 157 | 2 | 102 | 0 | 300 | 1 | 1 | 563 | 1268 | 1830 |
| 2009 | 197 | 0 | 73 | 0 | 184 | 1 | 2 | 457 | 1132 | 1588 |
| 2010 | 138 | 0 | 89 | 0 | 147 | 0 | 3 | 377 | 2561 | 2939 |
| 2011 | 332 | 0 | 118 | 0 | 146 | 0 | 0 | 596 | 603 | 1198 |
| 2012 | 236 | 0 | 107 | 0 | 164 | 0 | 0 | 507 | 1010 | 1511 |
| 2013 | 144 | 0 | 103 | 0 | 92 | 0 | 0 | 339 | 725 | 1028 |
| 2014 | 100 | 0 | 123 | 0 | 59 | 0 | 0 | 282 | 943 | 1230 |
| 2015 | 115 | 0 | 244 | 0 | 80 | 0 | 0 | 439 | 572 | 1012 |
| 2016 | 82 | 0 | 541 | - | 56 | - | - | 679 | 414 | 1096 |
| 2017 | 77 | 0 | 446 | - | 62 | 1 | - | 585 | 852 | 1438 |
| 2018 | 53 | 0 | 316 | - | 66 | 0 | - | 435 | 395 | 830 |
| 2019 | 168 | 0 | † | - | 57 | - | - | 225† | 537 | 1002 |
| 2020* | 84 | - | 177 | - | 70 | 2 | - | 333 | 271 | 601 |
| 2021* | 103 | 0 | 107 | - | 70 | 1 | - | 281 | 392 | 668 |

* Preliminary official landings.

† Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

Summary of the assessment

Table 9 Plaice in Division 7.a. Assessment summary. Recruitment is in thousands and weights in tonnes. ‘High’ and ‘Low’ refer to 2 × standard deviation.

| Year | Recruitment at age 1 | | | SSB | | | Landings * 3906 | Dead discards * 940 | Surviving discards* 627 | Fishing mortality ages 3–6 | | |
|------|----------------------|---------|-------|-------|-------|-------|--------------------|------------------------|----------------------------|----------------------------|-------|-------|
| | Low | Value | High | Low | Value | High | | | | Low | Value | High |
| | | | | | | | | | | | | |
| 1981 | 11478 | 17044 | 25310 | 5650 | 7057 | 8814 | 3906 | 940 | 627 | 0.452 | 0.594 | 0.78 |
| 1982 | 15679 | 22045 | 30995 | 5521 | 6792 | 8356 | 3237 | 476 | 317 | 0.459 | 0.589 | 0.757 |
| 1983 | 16814 | 23466 | 32751 | 5030 | 6092 | 7378 | 3639 | 422 | 281 | 0.497 | 0.637 | 0.817 |
| 1984 | 16365 | 22715 | 31529 | 6322 | 7676 | 9319 | 4241 | 394 | 263 | 0.444 | 0.569 | 0.729 |
| 1985 | 15322 | 21205 | 29348 | 6924 | 8417 | 10232 | 5075 | 349 | 232 | 0.438 | 0.56 | 0.716 |
| 1986 | 15547 | 21558 | 29892 | 7419 | 9019 | 10964 | 4806 | 340 | 227 | 0.463 | 0.589 | 0.749 |
| 1987 | 14943 | 20833 | 29044 | 6984 | 8431 | 10176 | 6220 | 413 | 275 | 0.546 | 0.692 | 0.878 |
| 1988 | 11429 | 15812 | 21876 | 6533 | 7901 | 9556 | 5005 | 451 | 301 | 0.54 | 0.686 | 0.872 |
| 1989 | 9099 | 12910 | 18316 | 5806 | 7055 | 8573 | 4372 | 377 | 251 | 0.471 | 0.6 | 0.764 |
| 1990 | 11449 | 15754 | 21678 | 5293 | 6436 | 7826 | 3275 | 262 | 174 | 0.466 | 0.592 | 0.752 |
| 1991 | 11815 | 16149 | 22074 | 4247 | 5125 | 6185 | 2554 | 344 | 229 | 0.475 | 0.602 | 0.762 |
| 1992 | 12996 | 17592 | 23814 | 4226 | 5099 | 6153 | 3267 | 409 | 272 | 0.586 | 0.734 | 0.92 |
| 1993 | 12063 | 15873 | 20886 | 3538 | 4278 | 5174 | 1996 | 395 | 264 | 0.519 | 0.656 | 0.83 |
| 1994 | 11477 | 15159 | 20024 | 3682 | 4508 | 5519 | 2066 | 441 | 294 | 0.506 | 0.638 | 0.805 |
| 1995 | 13516 | 17792 | 23419 | 3200 | 3927 | 4820 | 1874 | 430 | 287 | 0.457 | 0.581 | 0.738 |
| 1996 | 16486 | 21761 | 28724 | 3430 | 4237 | 5234 | 1707 | 487 | 325 | 0.412 | 0.526 | 0.673 |
| 1997 | 17177 | 22635 | 29828 | 3597 | 4435 | 5469 | 1871 | 824 | 549 | 0.409 | 0.52 | 0.661 |
| 1998 | 15099 | 19868 | 26142 | 3859 | 4790 | 5946 | 1765 | 1358 | 905 | 0.393 | 0.508 | 0.655 |
| 1999 | 14368 | 19050 | 25258 | 4435 | 5565 | 6982 | 1600 | 1078 | 719 | 0.303 | 0.398 | 0.525 |
| 2000 | 17726 | 23845 | 32076 | 4852 | 6151 | 7796 | 1371 | 784 | 523 | 0.243 | 0.331 | 0.45 |
| 2001 | 18163 | 24174 | 32175 | 5808 | 7467 | 9602 | 1473 | 660 | 440 | 0.209 | 0.287 | 0.395 |
| 2002 | 18432 | 24688 | 33067 | 6766 | 8806 | 11461 | 1623 | 651 | 434 | 0.177 | 0.245 | 0.338 |
| 2003 | 16386 | 22155 | 29955 | 7980 | 10527 | 13886 | 1559 | 665 | 443 | 0.143 | 0.202 | 0.287 |
| 2004 | 15564 | 20893 | 28048 | 7999 | 10579 | 13990 | 1143 | 618 | 412 | 0.107 | 0.154 | 0.222 |
| 2005 | 13532 | 18137 | 24308 | 7837 | 10324 | 13602 | 1281 | 726 | 484 | 0.139 | 0.196 | 0.278 |
| 2006 | 16854 | 22440 | 29878 | 7019 | 9283 | 12276 | 934 | 752 | 502 | 0.151 | 0.212 | 0.296 |
| 2007 | 19368 | 26127 | 35246 | 5793 | 7676 | 10171 | 805 | 1046 | 698 | 0.164 | 0.229 | 0.319 |
| 2008 | 16000 | 21325 | 28422 | 5839 | 7714 | 10192 | 563 | 761 | 507 | 0.128 | 0.178 | 0.247 |
| 2009 | 13288 | 17967 | 24293 | 6619 | 8830 | 11778 | 457 | 679 | 453 | 0.095 | 0.134 | 0.189 |
| 2010 | 17379 | 23232 | 31057 | 6732 | 8828 | 11577 | 378 | 1536 | 1024 | 0.135 | 0.191 | 0.269 |
| 2011 | 19947 | 26850 | 36143 | 7887 | 10606 | 14262 | 595 | 362 | 241 | 0.09 | 0.126 | 0.178 |
| 2012 | 17988 | 24072 | 32215 | 6617 | 8952 | 12112 | 503 | 606 | 404 | 0.091 | 0.127 | 0.178 |
| 2013 | 17763 | 23785 | 31849 | 8021 | 10870 | 14730 | 303 | 435 | 290 | 0.061 | 0.086 | 0.121 |
| 2014 | 19734 | 27392 | 38021 | 8126 | 10961 | 14785 | 287 | 566 | 377 | 0.064 | 0.089 | 0.125 |
| 2015 | 12734 | 17302 | 23508 | 10482 | 14562 | 20230 | 440 | 343 | 229 | 0.043 | 0.061 | 0.086 |
| 2016 | 10637 | 14284 | 19183 | 15157 | 20726 | 28342 | 682 | 249 | 166 | 0.038 | 0.054 | 0.077 |
| 2017 | 7741 | 10582 | 14464 | 11551 | 15705 | 21352 | 586 | 511 | 341 | 0.047 | 0.067 | 0.094 |
| 2018 | 9162 | 12406 | 16799 | 12609 | 17324 | 23801 | 435 | 237 | 158 | 0.048 | 0.068 | 0.097 |
| 2019 | 8214 | 11245 | 15395 | 11862 | 16532 | 23040 | 465 | 322 | 215 | 0.052 | 0.073 | 0.104 |
| 2020 | 6011 | 8749 | 12733 | 9617 | 13383 | 18625 | 330 | 162 | 108 | 0.035 | 0.051 | 0.075 |
| 2021 | 6256 | 9261 | 13709 | 9167 | 13064 | 18618 | 276 | 235 | 157 | 0.046 | 0.066 | 0.095 |
| 2022 | 7416 | 11663** | 18344 | 8744 | 13282 | 20173 | | | | | | |

*Landings and discards are ICES estimates, which are used as assessment inputs. Discard estimates are available from 2004 prior to 2004, discard values were reconstructed.

** Median resampled recruitment (2015–2021) as estimated by a stochastic projection.

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Plaice (*Pleuronectes platessa*) in Division 7.a (Irish Sea). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, ple.27.7a. <https://doi.org/10.17895/ices.advice.19453592>.

Plaice (*Pleuronectes platessa*) in Division 7.d (eastern English Channel)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 4738 tonnes.

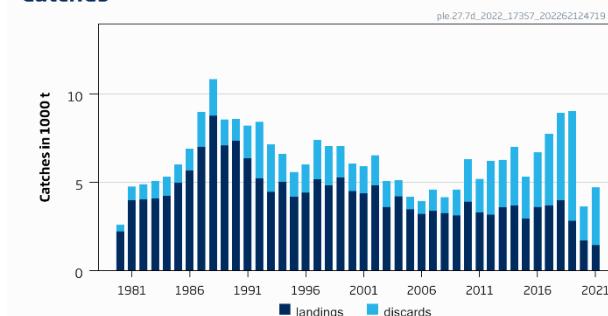
Management of plaice in Divisions 7.d and 7.e under a combined area TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species. ICES advises that management should be implemented at the stock area level.

ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

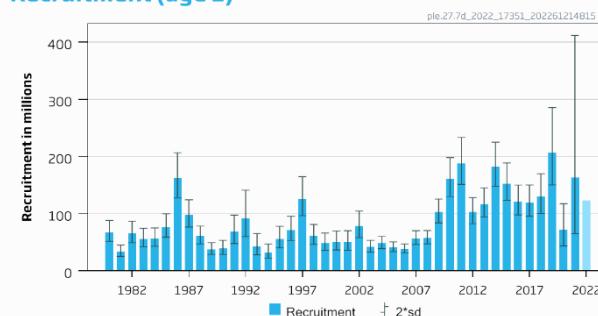
Stock development over time

Fishing pressure on the stock is above F_{MSY} but below F_{pa} and F_{lim} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

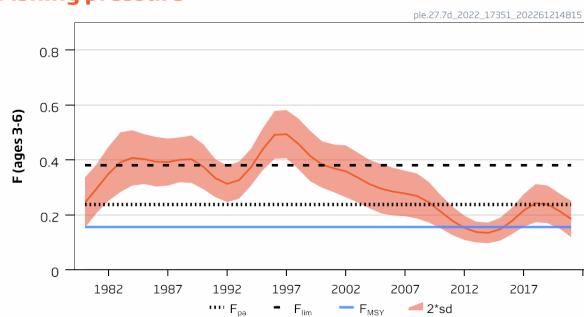
Catches



Recruitment (age 1)



Fishing pressure



SSB

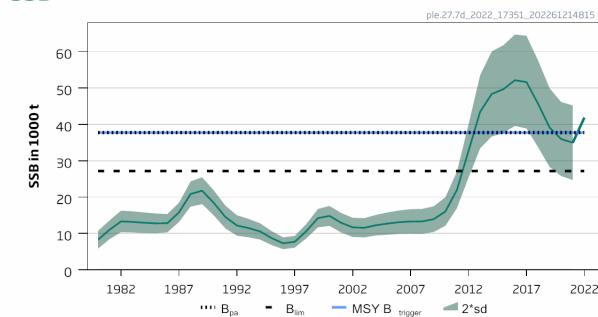


Figure 1 Plaice in Division 7.d. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. Discard data are only available since 2006; values prior to that are model estimates.

Catch scenarios

Table 1 Plaice in Division 7.d. Values in the forecast and for the interim year for Division 7.d plaice stock only.

| Variable | Value | Notes |
|---------------------------|--------------------|---|
| $F_{ages\ 3-6}\ (2022)$ | 0.185 [†] | Average exploitation pattern (2019–2021), scaled to $F_{ages\ 3-6}\ 2021$ |
| SSB (2023) | 41 642 | Short-term forecast (STF); in tonnes |
| $R_{age\ 1}\ (2022–2023)$ | 122 963 | Geometric mean 2016–2020; in thousands |
| Total catch (2022) | 5392 | STF; in tonnes |

[†] Version 2: Value corrected and Notes updated

| Variable | Value | Notes |
|---------------------------|-------|---|
| Projected landings (2022) | 2385 | STF; assuming average landings ratio (2019–2021); in tonnes |
| Projected discards (2022) | 3007 | STF; assuming average discards ratio (2019–2021); in tonnes |

Table 2 Plaice in Division 7.d. Annual catch scenarios. All weights are in tonnes.

| Basis | Division 7.d plaice stock | | | | | | | | All plaice in Division 7.d [#] | | | | | |
|---------------------------------------|---------------------------------|---------------------------|-----------------------------|--------------------------------------|---|---|------------|-----------------|---|--------------------|---------------------------|----------------------------|---|-------------------------------|
| | Total catch (2023) [^] | Projected landings (2023) | Projected discards * (2023) | F _{total} (ages 3–6) (2023) | F _{projected} landings (ages 3–6) (2023) | F _{projected} discards (ages 3–6) (2023) | SSB (2024) | % SSB change ** | % advice change ^{\$} | Total catch (2023) | Projected landings (2023) | Projected discards* (2023) | % change in projected catches ^{^^} | % advice change ^{##} |
| ICES advice basis | | | | | | | | | | | | | | |
| MSY approach: F _{MSY} | 4738 | 2204 | 2534 | 0.156 | 0.046 | 0.110 | 44 175 | 6.08 | -25 | 5671 | 2638 | 3033 | 4.20 | -25 |
| Other scenarios | | | | | | | | | | | | | | |
| F = F _{MSY} lower | 3493 | 1627 | 1866 | 0.113 | 0.034 | 0.079 | 45 820 | 10 | -45 | 4181 | 1948 | 2233 | -23 | -45 |
| F = F _{MSY} | 4738 | 2204 | 2534 | 0.156 | 0.046 | 0.110 | 44 175 | 6.08 | -25 | 5671 | 2638 | 3033 | 4.20 | -25 |
| F = F _{MSY} upper | 6618 | 3070 | 3548 | 0.22 | 0.067 | 0.157 | 41 706 | 0.15 | 4.00 | 7922 | 3674 | 4247 | 46 | 4.70 |
| F = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 473 | 23 | -100 | 0 | 0 | 0 | -100 | -100 |
| F _{pa} | 6992 | 3506 | 3750 | 0.23 | 0.07 | 0.17 | 41 217 | -1.02 | 9.80 | 8370 | 3880 | 4990 | 54 | 10 |
| F _{lim} | 10 578 | 4876 | 5702 | 0.38 | 0.27 | 0.11 | 36 573 | -12 | 66 | 12 661 | 5836 | 6826 | 133 | 67 |
| SSB (2024) = B _{lim} | 18 080 | 8210 | 9870 | 0.75 | 0.22 | 0.53 | 27 147 | -35 | 184 | 21 642 | 9827 | 11 814 | 298 | 186 |
| SSB (2024) = B _{pa} | 9655 | 4457 | 5198 | 0.34 | 0.10 | 0.24 | 37 761 | -9.32 | 52 | 11 555 | 5335 | 6222 | 112 | 53 |
| SSB (2024) = MSY B _{trigger} | 9655 | 4457 | 5198 | 0.34 | 0.10 | 0.24 | 37 761 | -9.32 | 52 | 11 555 | 5335 | 6222 | 112 | 53 |
| F = F ₂₀₂₂ | 5556 | 2581 | 2975 | 0.185 | 0.06 | 0.130 | 43 098 | 3.50 | -13 | 6651 | 3090 | 3561 | 22 | -12 |

* Including BMS landings, assuming recent discard rate.

** SSB 2024 relative to SSB 2023.

\$ Total catch of plaice stock in 2023 relative to the advice value 2022 (6365 tonnes)

^ Differences between total catch and the sum of projected landings and discards result from rounding.

^^ Total catch of plaice in division 7d in 2023 relative to the ICES estimates of catches in 2021 (5442 tonnes)

All plaice in Division 7.d, including plaice originating from the North Sea and the western English Channel, according to a ratio calculated over the years 2003–2021: 16.46 % of the plaice landed in Division 7.d is assumed to originate from the North Sea and the western English Channel which is equivalent to an additional 19.70% on top of the landings from the Division 7.d plaice stock. This ratio is therefore added to the predicted values for the Division 7.d plaice stock and applies to total catch, projected landings, and projected discards.

Total catch of plaice in division 7d in 2023 relative to the advice value 2022 (7566 tonnes)

The advice change (-25% for the Division 7.d plaice stock) is the result of a revision of reference points.

Basis of the advice

Table 3 Plaice in Division 7.d. The basis of the advice.

| Advice basis | MSY approach |
|-----------------|---|
| Management plan | ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2018) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F_{MSY} ranges are provided. |

Quality of the assessment

There is uncertainty about catches of the Division 7.d plaice stock because of migrations between 7.d and the North Sea and the western English Channel during the spawning period. The current assessment results are dependent on the proportion of quarter 1 removals estimated from an historical tagging survey (ICES, 2010).

A new FR CGFS index is used in 2022 assessment to fix the reported issues in 2021 assessment (ICES, 2021). The update of reference points, based on the latest selectivity and biological patterns, resulted in a substantial decrease of F_{MSY} due to decreasing trends in the stock weight at age in the recent years.

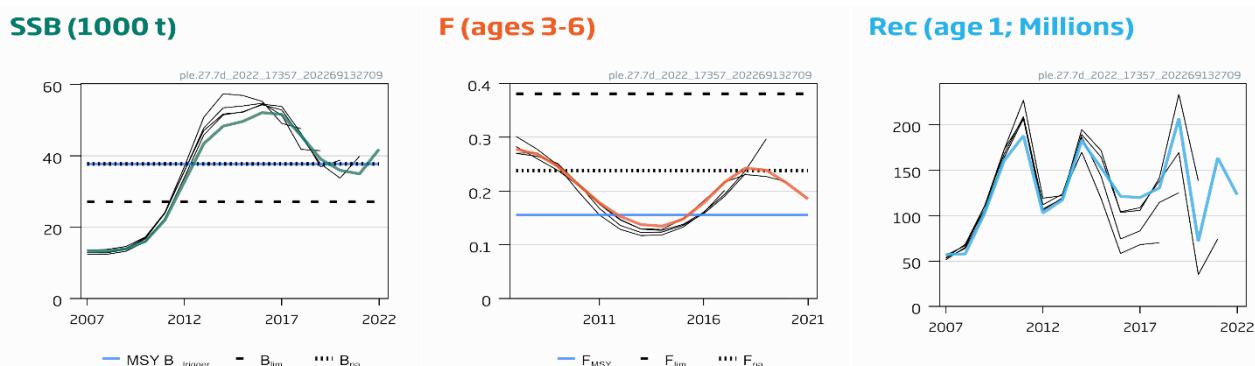


Figure 2 Plaice in Division 7.d. Historical assessment results (final-year recruitment included for each line, corresponding to the forecast recruitment in the interim year). The reference points were revised in 2022, and only assessment results from the final year should be compared to the reference points indicated.

Issues relevant for the advice

A single TAC covers both divisions 7.d and 7.e; management should ensure that fishing opportunities are in line with the stock status for each of the stocks in the combined management area to ensure that both stocks are exploited sustainably.

A catch advice of 4738 tonnes corresponds to catches of plaice in Division 7.d of no more than 5671 tonnes in 2023, assuming the same proportion of the Division 7.e and Subarea 4 plaice stocks is taken in Division 7.d as was estimated during 2003–2021. Management should be implemented at the stock level.

Plaice is caught in a mixed fishery targeting sole, with 80 mm mesh size. This leads to a large number of plaice being discarded because this mesh size is not matched to the minimum conservation reference size (MCRS).

Decreasing trends in observed mean weight at age could be explained by a change in the catchability and need to be investigated.

Reference points

Table 4 Plaice in Division 7.d. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|---------------------------|-----------------------|--------|---|--------------|
| MSY approach | MSY $B_{trigger}$ | 37 761 | B_{pa} ; in tonnes | ICES (2022a) |
| | F_{MSY} | 0.156 | EQsim analysis based on recruitment period 1980–2020 | ICES (2022a) |
| Precautionary approach | B_{lim} | 27 174 | Break-point of hockey stick stock-recruit relationship, based on recruitment period 1980–2020; in tonnes | ICES (2022a) |
| | B_{pa} | 37 761 | $B_{lim} \times \exp(1.645 \times \sigma) \approx 1.4 \times B_{lim}$, $\sigma = 0.20$; in tonnes | ICES (2022a) |
| | F_{lim} | 0.381 | EQsim analysis based on recruitment period 1980–2020 | ICES (2022a) |
| | F_{pa} | 0.238 | The F that provides a 95% probability for SSB to be above B_{lim} ($F_{p,0.05}$ with advice rule [AR]) | ICES (2022a) |
| EU Management plan (MAP)* | MAP MSY $B_{trigger}$ | 37 761 | MSY $B_{trigger}$; in tonnes | ICES (2022a) |
| | MAP B_{lim} | 27 174 | B_{lim} ; in tonnes | ICES (2022a) |
| | MAP F_{MSY} | 0.156 | F_{MSY} | ICES (2022a) |
| | MAP range F_{lower} | 0.113 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY | ICES (2022a) |
| | MAP range F_{upper} | 0.224 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY | ICES (2022a) |

* EU multiannual plan (MAP) for the Western Waters (EU, 2019).

Basis of the assessment

Table 5 Plaice in Division 7.d. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022b) |
| Assessment type | Age-based analytical assessment (Aarts and Poos, 2009) that uses catches in the model and in the forecast (ICES, 2022a) |
| Input data | Commercial catch (international landings, with age frequencies from catch sampling covering 75% of the landings), two survey indices UK-BTS [B2453]. A delta-GAM is used to calculate FR-GFS index [G3425]. Time invariant natural mortality by age is calculated from Peterson and Wroblewski (1984). Fixed maturity ogive is based on biological sampling. |
| Discards and bycatch | Discards are included in the assessment and all major fleets are covered. In 2021, 60% of the landings had associated discard information, with age frequencies from catch sampling covering 57% of the discards. Fifty eight percent of the discard estimates are based on observations. The model reconstructs discards for years where data are not available (before 2006). |
| Indicators | None |
| Other information | Last benchmarked in 2015 (WKPLE; ICES, 2015), Reference points updated in 2022 (WGNSSK; ICES, 2022a) |
| Working group | Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) |

History of the advice, catch, and management

Table 6 Plaice in Division 7.d. History of ICES advice, official landings for plaice in Division 7.d, agreed TAC for divisions 7.d and 7.e, and ICES estimates for landings and discards of Division 7.d plaice and for plaice in Division 7.d. All weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice | | | Catch corresponding to advice | | Agreed TAC 7.d, e | Official landings of plaice in 7.d * | ICES landings of plaice in 7.d* | ICES landings 7.d plaice | ICES discards of 7.d plaice | ICES discards of plaice in 7.d ^^ |
|------|---|----------------------------------|---------------|------------------|-------------------------------|---------------|-------------------|--------------------------------------|---------------------------------|--------------------------|-----------------------------|-----------------------------------|
| | | 7.d plaice | Plaice in 7.d | Plaice in 7.d, e | 7.d plaice stock | Plaice in 7.d | | | | | | |
| 1987 | Precautionary TAC for 7.d, e | | | 6800 | | | 8300 | 7867 | 8366 | 7006 | | |
| 1988 | Precautionary TAC for 7.d, e | | | 6900 | | | 9960 | 9103 | 10 420 | 8785 | | |
| 1989 | No increase in effort for 7.d, e | | | 11 700 | | | 11 700 | 7115 | 8758 | 7093 | | |
| 1990 | No increase in F; TAC for 7.d, e | | | 10 700 | | | 10 700 | 8367 | 9047 | 7349 | | |
| 1991 | TAC for 7.d, e | | | 8800 | | | 10 700 | 7913 | 7813 | 6362 | | |
| 1992 | <i>Status quo</i> F gives mean SSB | | 7600 | | | | 9600 | 6232 | 6337 | 5219 | | |
| 1993 | <i>Status quo</i> F within safe biological limits | | 6400 | | | | 8500 | 4771 | 5331 | 4479 | | |
| 1994 | No long-term gains in increased F | | - | | | | 9100 | 5633 | 6121 | 5047 | | |
| 1995 | No increase in F | | 5600 | | | | 8000 | 4569 | 5130 | 4196 | | |
| 1996 | No long-term gains in increasing F | | 6500 | | | | 7530 | 4598 | 5393 | 4430 | | |
| 1997 | No advice | | - | | | | 7090 | 5316 | 6307 | 5180 | | |
| 1998 | Reduce F in 1998 by 30% from 1996 value | | 4300 | | | | 5700 | 4830 | 5762 | 4831 | | |
| 1999 | Fishing at F_{pa} | | 6300 | | | | 7400 | 5437 | 6326 | 5268 | | |
| 2000 | Fishing at F_{pa} | | 4900 | | | | 6500 | 5235 | 6014 | 4521 | | |
| 2001 | Fishing at $< F_{pa}$ | | < 4400 | | | | 6000 | 4968 | 5266 | 4380 | | |
| 2002 | Fishing at $< F_{pa}$ | | < 5800 | | | | 6700 | 5496 | 5777 | 4846 | | |
| 2003 | Fishing at $< F_{pa}$ | | < 5300 | | | | 5970 | 4650 | 4086 | 3610 | | |
| 2004 | Fishing at $< F_{pa}$ ** | | < 5400 | | | | 6060 | 4312 | 4750 | 4206 | | |
| 2005 | Fishing at $< F_{pa}$ ** | | < 4400 | | | | 5150 | 3706 | 3991 | 3485 | | |
| 2006 | No effort increase ** | | | | | | 5151 | 3525 | 3646 | 3225 | 727 | 749 |
| 2007 | Average landings ** | | < 4000 | | | | 5050 | 3845 | 4001 | 3381 | 1220 | 1252 |
| 2008 | Average landings ** | | < 3500 | | | | 5050 | 3609 | 3864 | 3278 | 888 | 936 |
| 2009 | Average landings (2006–2008) ** | | < 3500 | | | | 4646 | 3522 | 3560 | 3124 | 1473 | 1528 |

| Year | ICES advice | Landings corresponding to advice | | | Catch corresponding to advice | | Agreed TAC 7.d, e | Official landings of plaice in 7.d * | ICES landings of plaice in 7.d* | ICES landings 7.d plaice | ICES discards of 7.d plaice | ICES discards of plaice in 7.d ^^ |
|------|---|----------------------------------|---------------|------------------|-------------------------------|-------------------------------|----------------------|--------------------------------------|---------------------------------|--------------------------|-----------------------------|-----------------------------------|
| | | 7.d plaice | Plaice in 7.d | Plaice in 7.d, e | 7.d plaice stock | Plaice in 7.d | | | | | | |
| 2010 | Average landings (2007–2009) | | < 3500 | | | | 4274 | 3892 | 4411 | 3910 | 2412 | 2511 |
| 2011 | Average landings (2008–2010) | | < 3500 | | | | 4665 | 3593 | 3649 | 3291 | 1926 | 2024 |
| 2012 | No increase in catches and reduce discards | | - | | | | 5062 | 3611 | 3723 | 3178 | 3043 | 3336 |
| 2013 | Transition to F_{MSY} proxy for data-limited stocks by 2015 and reduce discards | | < 4300 | | | | 6400 | 4182 | 4127 | 3604 | 2696 | 2955 |
| 2014 | Transition to F_{MSY} proxy for data-limited stocks by 2015 and reduce discards | < 3016 | < 3925 | | | | 5322 | 4326 | 4320 | 3675 | 3325 | 3886 |
| 2015 | ICES DLS approach (F_{MSY} proxy) | < 2811 | < 3469 | | | | 6223 | 3749 | 3727 | 2957 | 2368 | 2821 |
| 2016 | MSY approach | ≤ 10 855 | ≤ 12 512 | ≤ 16 249 | ≤ 16 923 | ≤ 19 506 | 12 446 | 4658 | 4638 | 3617 | 3090 | 3603 |
| 2017 | MSY approach | ≤ 7550 | ≤ 8764 | ≤ 11 381 | ≤ 12 805 | ≤ 14 864 | 10 022 | 4581 | 4613 | 3689 | 4075 | 5065 |
| 2018 | MSY approach | ≤ 7132 | ≤ 8335 | ≤ 10 909 | ≤ 10 592 | ≤ 12 378 | 10 360 | 4977 | 4999 | 3975 | 4959 | 6215 |
| 2019 | MSY approach | | | | ≤ 7864 | ≤ 9225 | 10 354 | 3681 | 3721 | 2836 | 6211 | 7064 |
| 2020 | Management Plan^ | | | | 9073 (range 6545–12 029) | 10 687 (range 7710–14 170) | 9154 | 2120 | 2152 | 1727 | 1902 | 2191 |
| 2021 | Management Plan^ | | | | 8402 (range 6066–11 130) | 9959 (range 7190–13 192) | 11 920 | 1774 | 1770 | 1456 | 3261 | 3672 |
| 2022 | MSY approach | | | | ≤ 6365 | ≤ 7566 | 9138 | | | | | |
| 2023 | MSY approach | | | | ≤ 4738 | ≤ 5671 | | | | | | |

* Plaice in Division 7.d, taking into account fish caught in the first quarter in Division 7.d that come to spawn from Division 7.e and Subarea 4.

** Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries.

^ EU multiannual plan (MAP) for the Western Waters (EU, 2019).

^^ Including BMS landings.

History of the catch and landings

Table 7 Plaice in Division 7.d. Catch distribution of plaice in 7.d by fleet in 2021 as estimated by ICES.

| Catch 5442 tonnes | Landings | | | | Discards 3672 tonnes |
|----------------------|--------------------|---------------------|----------------------|---------------------|-------------------------|
| | Beam trawl 39 % | Otter trawl 39 % | Trammel nets 10 % | Other gears 11 % | |
| | 1770 tonnes | | | | |

Table 8 Plaice in Division 7.d. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

| Year | Belgium | France | UK(E+W) | Others | Official landings in 7.d | BMS landings | Unallocated in 7.d | ICES estimated landings of plaice in 7.d | Quarter 1 removals ^a | ICES estimated landings for 7.d plaice ^a | ICES estimated landings for 7.e | Agreed TAC for 7.d, e* |
|------|---------|--------|---------|--------|--------------------------|--------------|--------------------|--|---------------------------------|---|---------------------------------|------------------------|
| 1976 | 147 | 1 439 | 376 | | 1 962 | | 1 | 1 963 | | 1 963 | 640 | |
| 1977 | 149 | 1 714 | 302 | | 2 165 | | 81 | 2 246 | | 2 246 | 702 | |
| 1978 | 161 | 1 810 | 349 | | 2 320 | | 156 | 2 476 | | 2 476 | 784 | |
| 1979 | 217 | 2 094 | 278 | | 2 589 | | 28 | 2 617 | | 2 617 | 977 | |
| 1980 | 435 | 2 905 | 304 | | 3 644 | | -994 | 2 650 | 427 | 2 223 | 1 178 | |
| 1981 | 815 | 3 431 | 489 | | 4 735 | | 34 | 4 769 | 760 | 4 009 | 1 676 | |
| 1982 | 738 | 3 504 | 541 | 22 | 4 805 | | 60 | 4 865 | 825 | 4 040 | 1 878 | |
| 1983 | 1 013 | 3 119 | 548 | | 4 680 | | 363 | 5 043 | 950 | 4 093 | 1 714 | |
| 1984 | 947 | 2 844 | 640 | | 4 431 | | 730 | 5 161 | 912 | 4 249 | 1 758 | |
| 1985 | 1 148 | 3 943 | 866 | | 5 957 | | 65 | 6 022 | 1 022 | 5 000 | 1 677 | |
| 1986 | 1 158 | 3 288 | 828 | | 5 274 | | 1 560 | 6 834 | 1 161 | 5 673 | 2 078 | |
| 1987 | 1 807 | 4 768 | 1 292 | | 7 867 | | 499 | 8 366 | 1 360 | 7 006 | 2 272 | 8 300 |
| 1988 | 2 165 | 5 688 | 1 250 | | 9 103 | | 1 317 | 10 420 | 1 635 | 8 785 | 2 835 | 9 960 |
| 1989 | 2 019 | 3 713 | 1 383 | | 7 115 | | 1 643 | 8 758 | 1 665 | 7 093 | 2 742 | 11 700 |
| 1990 | 2 149 | 4 739 | 1 479 | | 8 367 | | 680 | 9 047 | 1 698 | 7 349 | 2 985 | 10 700 |
| 1991 | 2 265 | 4 082 | 1 566 | | 7 913 | | -100 | 7 813 | 1 451 | 6 362 | 2 183 | 10 700 |
| 1992 | 1 560 | 3 099 | 1 572 | 1 | 6 232 | | 105 | 6 337 | 1 118 | 5 219 | 1 882 | 9 600 |
| 1993 | 877 | 2 792 | 1 102 | | 4 771 | | 560 | 5 331 | 852 | 4 479 | 1 614 | 8 500 |
| 1994 | 1 418 | 3 199 | 1 007 | 9 | 5 633 | | 488 | 6 121 | 1 074 | 5 047 | 1 404 | 9 100 |
| 1995 | 1 157 | 2 598 | 814 | | 4 569 | | 561 | 5 130 | 934 | 4 196 | 1 247 | 8 000 |
| 1996 | 1 112 | 2 630 | 856 | | 4 598 | | 795 | 5 393 | 963 | 4 430 | 1 266 | 7 530 |
| 1997 | 1 161 | 3 077 | 1 078 | | 5 316 | | 991 | 6 307 | 1 127 | 5 180 | 1 583 | 7 090 |
| 1998 | 854 | 3 276 | 700 | | 4 830 | | 932 | 5 762 | 931 | 4 831 | 1 346 | 5 700 |
| 1999 | 1 306 | 3 388 | 743 | | 5 437 | | 889 | 6 326 | 1 058 | 5 268 | 1 543 | 7 400 |
| 2000 | 1 298 | 3 183 | 754 | | 5 235 | | 779 | 6 014 | 1 494 | 4 521 | 1 625 | 6 500 |
| 2001 | 1 346 | 2 962 | 660 | | 4 968 | | 298 | 5 266 | 886 | 4 380 | 1 310 | 6 000 |

| Year | Belgium | France | UK(E+W) | Others | Official landings in 7.d | BMS landings | Unallocated in 7.d | ICES estimated landings of plaice in 7.d | Quarter 1 removals^ | ICES estimated landings for 7.d plaice^ | ICES estimated landings for 7.e plaice in 7.e | Agreed TAC for 7.d, e* |
|------|---------|--------|---------|--------|--------------------------|--------------|--------------------|--|---------------------|---|---|------------------------|
| 2002 | 1 204 | 3 450 | 841 | 1 | 5 496 | | 281 | 5 777 | 931 | 4 846 | 1 472 | 6 700 |
| 2003 | 998 | 2 893 | 756 | 3 | 4 650 | | -564 | 4 086 | 476 | 3 610 | 1 387 | 5 970 |
| 2004 | 954 | 2 766 | 582 | 10 | 4 312 | | 438 | 4 750 | 544 | 4 206 | 1 337 | 6 060 |
| 2005 | 832 | 2 432 | 421 | 21 | 3 706 | | 285 | 3 991 | 506 | 3 485 | 1 319 | 5 150 |
| 2006 | 1 024 | 1 935 | 550 | 16 | 3 525 | | 121 | 3 646 | 421 | 3 225 | 1 411 | 5 151 |
| 2007 | 1 355 | 2 017 | 463 | 10 | 3 845 | | 156 | 4 001 | 620 | 3 381 | 1 146 | 5 050 |
| 2008 | 1 386 | 1 740 | 471 | 12 | 3 609 | | 255 | 3 864 | 586 | 3 278 | 1 112 | 5 050 |
| 2009 | 1 002 | 1 892 | 612 | 16 | 3 522 | | 38 | 3 560 | 436 | 3 124 | 1 024 | 4 646 |
| 2010 | 1 123 | 2 190 | 517 | 62 | 3 892 | | 519 | 4 411 | 501 | 3 910 | 1 208 | 4 274 |
| 2011 | 1 067 | 1 994 | 472 | 60 | 3 593 | | 56 | 3 649 | 358 | 3 291 | 1 417 | 4 665 |
| 2012 | 1 045 | 1 962 | 542 | 63 | 3 612 | | 111 | 3 723 | 544 | 3 178 | 1 492 | 5 062 |
| 2013 | 1 295 | 2 159 | 641 | 87 | 4 182 | | -55 | 4 127 | 523 | 3 604 | 1 472 | 6 400 |
| 2014 | 1 389 | 2 229 | 633 | 76 | 4 327 | | -7 | 4 320 | 645 | 3 675 | 1 490 | 5 322 |
| 2015 | 1 600 | 1 702 | 392 | 54 | 3 748 | | -21 | 3 727 | 770 | 2 957 | 1 424 | 6 223 |
| 2016 | 2 247 | 1 557 | 795 | 60 | 4 659 | | -21 | 4 638 | 1 020 | 3 617 | 2 013 | 12 446 |
| 2017 | 2 189 | 1 487 | 814 | 86 | 4 576 | | 37 | 4 613 | 924 | 3 689 | 2 128 | 10 022 |
| 2018 | 1 876 | 2 171 | 832 | 98 | 4 977 | | 27 | 4 999 | 1 024 | 3 975 | 1 880 | 10 360 |
| 2019 | 1 277 | 1 688 | 628 | 87 | 3 681 | <1 | 40 | 3 721 | 885 | 2 836 | 1 725 | 10 354 |
| 2020 | 745 | 984 | 342 | 50 | 2 120 | <1 | 32 | 2 152 | 424 | 1 727 | 1 373 | 9 154 |
| 2021 | 663 | 769 | 284 | 53 | 1 774 | <1 | - 4 | 1 770 | 313 | 1 456 | | 11 920 |

* TACs for divisions 7.d and 7.e.

^ Takes into account the 'quarter 1 removal' of 65% of the quarter 1 Division 7.d landings of plaice that originate from Division 7.e and Subarea 4.

Summary of the assessment

Table 9 Plaice in Division 7.d. Assessment summary. Recruitment in thousands. Weights are in tonnes. High and low correspond to 2 standard deviation.

| Year | Recruitment (Age 1) | | | Spawning-stock biomass | | | Landings | Discards* | Catch* | Fishing pressure (Ages 3–6) | | |
|------|---------------------|---------|---------|------------------------|--------|--------|----------|-----------|--------|-----------------------------|-------|-------|
| | R | High | Low | SSB | High | Low | | | | F | High | Low |
| 1980 | 67 465 | 88 163 | 51 589 | 8 247 | 10 694 | 5 800 | 2 223 | 410 | 2 223 | 0.24 | 0.34 | 0.153 |
| 1981 | 33 795 | 45 124 | 25 307 | 11 002 | 13 604 | 8 400 | 4 009 | 758 | 4 009 | 0.30 | 0.39 | 0.21 |
| 1982 | 65 393 | 86 913 | 49 185 | 13 330 | 16 292 | 10 368 | 4 040 | 865 | 4 040 | 0.35 | 0.45 | 0.25 |
| 1983 | 55 990 | 74 407 | 42 138 | 13 197 | 16 111 | 10 283 | 4 093 | 995 | 4 093 | 0.39 | 0.50 | 0.28 |
| 1984 | 56 818 | 75 097 | 43 022 | 12 962 | 15 795 | 10 129 | 4 249 | 1 083 | 4 249 | 0.41 | 0.51 | 0.31 |
| 1985 | 76 696 | 99 900 | 58 928 | 12 794 | 15 521 | 10 067 | 5 000 | 1 033 | 5 000 | 0.40 | 0.49 | 0.31 |
| 1986 | 162 331 | 206 612 | 127 440 | 12 832 | 15 350 | 10 314 | 5 673 | 1 245 | 5 673 | 0.39 | 0.48 | 0.30 |
| 1987 | 97 494 | 124 179 | 76 613 | 15 793 | 18 456 | 13 130 | 7 006 | 2 006 | 7 006 | 0.39 | 0.48 | 0.31 |
| 1988 | 60 683 | 78 355 | 46 958 | 20 853 | 24 330 | 17 376 | 8 785 | 2 063 | 8 785 | 0.40 | 0.48 | 0.32 |
| 1989 | 37 703 | 49 395 | 28 750 | 21 777 | 25 484 | 18 070 | 7 093 | 1 490 | 7 093 | 0.40 | 0.49 | 0.32 |
| 1990 | 39 243 | 53 429 | 28 851 | 18 447 | 21 903 | 14 991 | 7 349 | 1 245 | 7 349 | 0.37 | 0.46 | 0.29 |
| 1991 | 68 216 | 97 591 | 47 642 | 14 568 | 17 722 | 11 414 | 6 362 | 1 873 | 6 362 | 0.33 | 0.40 | 0.26 |
| 1992 | 91 906 | 141 071 | 59 933 | 12 222 | 15 048 | 9 396 | 5 219 | 3 212 | 5 219 | 0.31 | 0.38 | 0.25 |
| 1993 | 42 871 | 65 353 | 28 126 | 11 489 | 14 034 | 8 944 | 4 479 | 2 678 | 4 479 | 0.33 | 0.39 | 0.26 |
| 1994 | 32 365 | 47 006 | 22 292 | 10 583 | 12 844 | 8 322 | 5 047 | 1 574 | 5 047 | 0.37 | 0.44 | 0.31 |
| 1995 | 55 921 | 78 056 | 40 088 | 8 733 | 10 665 | 6 802 | 4 196 | 1 394 | 4 196 | 0.44 | 0.52 | 0.36 |
| 1996 | 71 171 | 95 532 | 53 039 | 7 307 | 8 943 | 5 671 | 4 430 | 1 590 | 4 430 | 0.49 | 0.58 | 0.40 |
| 1997 | 126 137 | 164 743 | 96 554 | 7 732 | 9 357 | 6 106 | 5 180 | 2 240 | 5 180 | 0.49 | 0.58 | 0.41 |
| 1998 | 61 351 | 81 144 | 46 352 | 10 662 | 12 655 | 8 669 | 4 831 | 2 241 | 4 831 | 0.46 | 0.55 | 0.37 |
| 1999 | 48 647 | 66 087 | 35 785 | 14 242 | 16 784 | 11 700 | 5 268 | 1 801 | 5 268 | 0.41 | 0.51 | 0.32 |
| 2000 | 50 401 | 69 691 | 36 468 | 14 835 | 17 591 | 12 079 | 4 521 | 1 556 | 4 521 | 0.38 | 0.47 | 0.30 |
| 2001 | 50 251 | 70 214 | 35 979 | 12 957 | 15 661 | 10 253 | 4 380 | 1 550 | 4 380 | 0.37 | 0.46 | 0.28 |
| 2002 | 78 014 | 104 608 | 58 222 | 11 691 | 14 338 | 9 044 | 4 846 | 1 687 | 4 846 | 0.36 | 0.45 | 0.26 |
| 2003 | 41 723 | 53 410 | 32 606 | 11 571 | 14 227 | 8 915 | 3 610 | 1 472 | 3 610 | 0.34 | 0.43 | 0.25 |
| 2004 | 48 453 | 60 341 | 38 880 | 12 280 | 15 114 | 9 446 | 4 206 | 940 | 4 206 | 0.31 | 0.40 | 0.22 |
| 2005 | 41 310 | 50 755 | 33 632 | 12 731 | 15 810 | 9 652 | 3 485 | 714 | 3 485 | 0.30 | 0.39 | 0.21 |
| 2006 | 38 133 | 46 967 | 30 971 | 13 109 | 16 343 | 9 875 | 3 225 | 727 | 3 952 | 0.28 | 0.37 | 0.20 |
| 2007 | 56 959 | 70 298 | 46 143 | 13 303 | 16 692 | 9 914 | 3 381 | 1 220 | 4 601 | 0.28 | 0.36 | 0.195 |
| 2008 | 57 758 | 70 542 | 47 289 | 13 327 | 16 779 | 9 875 | 3 278 | 888 | 4 167 | 0.27 | 0.35 | 0.187 |
| 2009 | 102 694 | 125 676 | 83 997 | 13 958 | 17 499 | 10 417 | 3 124 | 1 473 | 4 596 | 0.25 | 0.32 | 0.172 |
| 2010 | 160 341 | 197 996 | 129 832 | 16 048 | 19 990 | 12 106 | 3 910 | 2 412 | 6 323 | 0.21 | 0.27 | 0.151 |
| 2011 | 187 961 | 233 482 | 151 318 | 22 000 | 27 057 | 16 943 | 3 291 | 1 926 | 5 217 | 0.18 | 0.23 | 0.126 |
| 2012 | 102 738 | 128 068 | 82 428 | 32 719 | 40 072 | 25 366 | 3 178 | 3 043 | 6 222 | 0.15 | 0.20 | 0.109 |
| 2013 | 117 014 | 145 199 | 94 291 | 43 469 | 53 554 | 33 384 | 3 604 | 2 696 | 6 299 | 0.14 | 0.175 | 0.100 |
| 2014 | 182 490 | 225 258 | 147 709 | 48 380 | 60 097 | 36 663 | 3 675 | 3 325 | 7 001 | 0.13 | 0.172 | 0.097 |
| 2015 | 152 566 | 188 633 | 123 308 | 49 684 | 61 790 | 37 578 | 2 957 | 2 368 | 5 324 | 0.15 | 0.189 | 0.106 |
| 2016 | 121 187 | 150 091 | 97 831 | 52 165 | 64 749 | 39 581 | 3 617 | 3 090 | 6 707 | 0.18 | 0.23 | 0.130 |
| 2017 | 119 821 | 150 260 | 95 595 | 51 636 | 64 411 | 38 861 | 3 689 | 4 075 | 7 764 | 0.22 | 0.28 | 0.157 |
| 2018 | 130 540 | 169 763 | 100 292 | 45 709 | 57 667 | 33 751 | 3 975 | 4 959 | 8 934 | 0.24 | 0.31 | 0.173 |
| 2019 | 207 083 | 285 467 | 150 260 | 39 131 | 49 987 | 28 275 | 2 836 | 6 211 | 9 047 | 0.24 | 0.31 | 0.170 |
| 2020 | 71 614 | 117 494 | 43 646 | 35 967 | 46 161 | 25 773 | 1 728 | 1 901 | 3 629 | 0.21 | 0.28 | 0.150 |
| 2021 | 163 630 | 411 778 | 64 975 | 34 987 | 45 246 | 24 728 | 1 456 | 3 261 | 4 717 | 0.185 | 0.25 | 0.119 |
| 2022 | 122963** | | | 41 883 | | | | | | | | |

* Since 2006, discard estimates are raised from observer programmes. Prior to 2006, discards are reconstructed by the model and are not included in the total catch column.

** Geometric mean 2016–2020.

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Plaice (*Pleuronectes platessa*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)

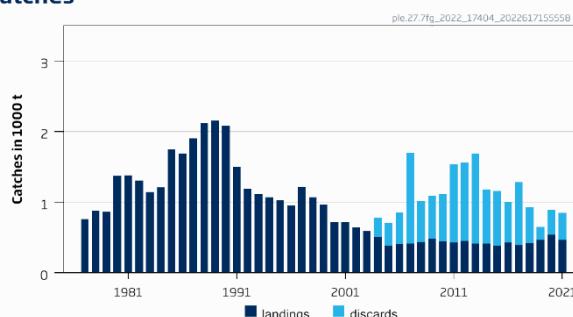
ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches should be no more than 402 tonnes in each of the years 2023 and 2024.

Stock development over time

The fishing pressure proxy on the stock is above $F_{MSY\ proxy}$ (Figure 2), and the stock-size index is below MSY $B_{trigger\ proxy}$ ($I_{trigger}$).

Catches



Biomass index

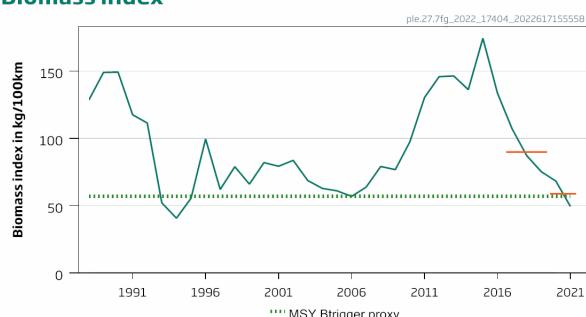


Figure 1 Plaice in divisions 7.f and 7.g. Catches (thousand tonnes) and biomass index. The short orange lines in the biomass index indicate the average values of the respective years (2017 to 2019 and 2020 to 2021).

Catch scenarios

ICES framework for category 3 stocks was applied (rfb rule, method 2.1; ICES, 2022a). A survey biomass index was used as an indicator of stock development. The advice is based on the recent advised catches, multiplied by the ratio of the mean of the last two index values (index A) and the mean of the three preceding values (index B), a ratio of observed mean length in the catch relative to the target mean length, a biomass safeguard, and a precautionary multiplier. Recent catch was used rather than recent advice because catches have been considerably lower than the advice and the advice rule is intended to adjust the realized catches. The stability clause was not applied because the recent biomass index value was below MSY $B_{trigger}$. The discard rate (average 2019–2021) was 38%.

Table 1 Plaice in divisions 7.f and 7.g. The basis for the catch scenarios*.

| | |
|---|------------------|
| Mean catch 2019–2021 (C_y) | 793 tonnes |
| Biomass index trend | |
| Index A (2020–2021) | 58.9 kg / 100 km |
| Index B (2017–2019) | 89.9 kg / 100 km |
| r: Stock biomass trend (index ratio A/B) | 0.655 |
| Fishing pressure proxy | |
| Mean catch length ($L_{mean} = L_{2021}$) | 28.3 cm |
| MSY proxy length ($L_{F= M}$) | 30.2 cm |
| f: Fishing pressure proxy relative to MSY proxy ($L_{2021}/L_{F= M}$) | 0.937 |
| Biomass safeguard | |
| Last index value (I_{2021}) | 49.3 kg / 100 km |
| Index trigger value ($I_{trigger} = I_{loss} \times 1.4$) | 57.0 kg / 100 km |
| b: index relative to trigger value, min{ $I_{2021}/I_{trigger}, 1$ } | 0.87 |
| Precautionary multiplier to maintain biomass above B_{lim} with 95% probability | |
| m: multiplier (generic multiplier based on life history) | 0.95 |
| RFB calculation** | 402 tonnes |
| Stability clause (+20%/-30% compared to A_y , only applied if $b \geq 1$) | Not applied |
| Discard rate | 38% |
| Catch advice for 2023 and 2024 [$C_y \times r \times f \times b \times m$] | 402 tonnes |
| % advice change*** | -77% |

* The figures in the table are rounded. Calculations were done with unrounded inputs, and computed values may not match exactly when calculated using the rounded figures in the table.

** $A_{y+1} = C_y \times r \times f \times b \times m$, limited by stability clause if applicable.

***Advice value for 2023 relative to the advice value for 2022 (1735 tonnes).

The current advice has decreased by 77% compared to last year's advice because of a change in the advice method and a declining trend in the recent stock biomass.

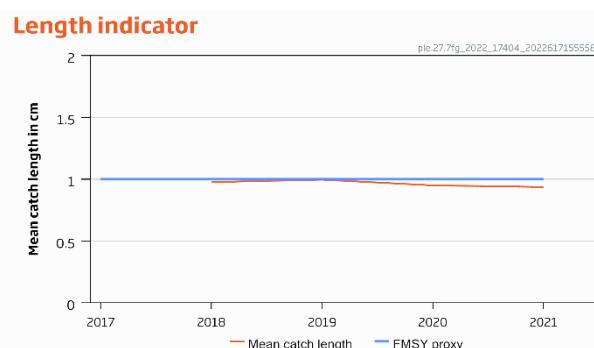


Figure 2 Plaice in divisions 7.f and 7.g. Length indicator (mean length of fish in the catch and MSY proxy reference length $L_{F= M}$). The exploitation status is below the F_{MSY} proxy when the indicator ratio value is higher than 1 (shown by the blue line).

Basis of the advice

Table 2 Plaice in divisions 7.f and 7.g. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach |
| Management plan | The EU multiannual plan (MAP) for stocks in Western Waters and adjacent waters (EU, 2019) takes into account bycatch of this species. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. |

Quality of the assessment

The method for providing advice has changed in 2022 following new ICES guidelines (ICES, 2022a), and advice is now based on the empirical rfb rule (Fischer *et al.*, 2021). The UKBTS survey (1988–2021) alone was used as the index of abundance. This survey covers the main habitat of the stock and has similar trends as the Irish groundfish survey.

Issues relevant for the advice

Sole and plaice are caught in mixed fisheries, which generates high discards of plaice owing to a combination of the selectivity properties of the gear and the plaice minimum landing size. In addition, the relatively low market value of plaice may contribute to the high and variable discard rates. Catchpole *et al.* (2015) estimate discard survival of plaice at around 40%. Plaice in divisions 7.f and 7.g is primarily a bycatch of the targeted sole fishery, so changes in effort in this fishery will impact fishing mortality on plaice.

There is no quantitative mixed-fishery analysis that includes plaice in this area.

Reference points

Table 3 Plaice in divisions 7.f and 7.g. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|--------------------------------|----------------|---|---------------------|
| MSY approach | MSY $B_{\text{trigger proxy}}$ | 57 | Biomass index trigger value, defined as $I_{\text{trigger}} = I_{\text{loss}} \times 1.4$, where I_{loss} is the lowest observed historical biomass index value, kg/100 km. | ICES (2022a; 2022c) |
| | $F_{\text{MSY proxy}}$ | 1 | $L_{\text{mean}} / L_F = M$; mean catch length divided by MSY proxy reference length ($L_F = M = 30.2$ cm) | ICES (2022a; 2022c) |
| Precautionary approach | B_{lim} | Not defined | | |
| | B_{pa} | Not defined | | |
| | F_{lim} | Not defined | | |
| | F_{pa} | Not defined | | |
| Management plan | SSB_{MGT} | Not applicable | | |
| | F_{MGT} | Not applicable | | |

Basis of the assessment

Table 4 Plaice in divisions 7.f and 7.g. The basis of the assessment.

| | |
|--------------------------|---|
| ICES stock data category | 3 (ICES, 2022b) |
| Assessment type | Survey biomass trend applying the <i>rbf</i> rule for advice (ICES, 2022c) |
| Input data | Commercial landings and discards, one survey index (UK [E&W]-BTS-Q3 [B6596]), length frequencies of the entire catch (landings + discards) |
| Discards and bycatch | Discards were raised to get the total international commercial catches. Discard information is available since 2004. Prior 2004 discards were reconstructed from the mean ratio in 2004-2010. |
| Indicators | IGFS-WIBTS-Q4 [G7212] |
| Other information | Benchmarked in 2022 (ICES, 2022d) |
| Working group | Working Group for the Celtic Seas Ecoregion (WGCSE) |

History of the advice, catch, and management

Table 5 Plaice in divisions 7.f and 7.g. History of ICES advice, the agreed TAC, and the official and ICES estimates of landings and discards. Weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards * |
|------|--|-------------------------------|----------------------------------|------------|-------------------|---------------|-----------------|
| 1987 | TAC not to be restrictive on other species | - | - | 2000 | 1912 | 1901 | 1027 |
| 1988 | TAC not to be restrictive on other species | - | - | 2500 | 2194 | 2116 | 1143 |
| 1989 | TAC not to be restrictive on other species | - | - | 2500 | 2583 | 2151 | 1162 |
| 1990 | F likely to be F (88) | - | ~ 1900 | 1900 | 2219 | 2082 | 1124 |
| 1991 | F likely to be F (89) | - | ~ 1700 | 1900 | 1827 | 1501 | 811 |
| 1992 | No long-term gains in increasing F | - | - | 1500 | 1362 | 1188 | 642 |
| 1993 | No long-term gains in increasing F | - | - | 1400 | 1303 | 1114 | 602 |
| 1994 | No long-term gains in increasing F | - | - | 1400 | 982 | 1070 | 578 |
| 1995 | No increase in F | - | 1290 | 1400 | 956 | 1028 | 555 |

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards * |
|------|---|-------------------------------|----------------------------------|------------|-------------------|---------------|-----------------|
| 1996 | 20% reduction in F | - | 930 | 1100 | 978 | 952 | 514 |
| 1997 | 20% reduction in F | - | 1100 | 1100 | 1259 | 1217 | 657 |
| 1998 | 20% reduction in F | - | 1000 | 1100 | 1149 | 1067 | 576 |
| 1999 | 35% reduction in F | - | 670 | 905 | 656 | 968 | 523 |
| 2000 | 30% reduction in F | - | 700 | 800 | 721 | 718 | 388 |
| 2001 | 40% reduction in F | - | 600 | 760 | 684 | 714 | 386 |
| 2002 | At least 35% reduction in F | - | 680 | 680 | 618 | 642 | 347 |
| 2003 | At least 40% reduction in F | - | 660 | 660 | 564 | 594 | 321 |
| 2004 | F < 0.10 or recovery plan | - | < 210 | 560 | 489 | 510 | 274 |
| 2005 | 70% reduction in F or recovery plan | - | < 250 | 476 | 399 | 386 | 321 |
| 2006 | 50% reduction in F or recovery plan | - | < 400 | 476 | 414 | 404 | 453 |
| 2007 | 50% reduction in F or recovery plan | - | < 380 | 417 | 417 | 410 | 1288 |
| 2008 | 60% reduction in F | - | < 240 | 491 | 375 | 437 | 583 |
| 2009 | 75% reduction in F | - | < 170 | 422 | 481 | 481 | 608 |
| 2010 | 50% reduction in F | - | < 330 | 451 | 442 | 442 | 670 |
| 2011 | See scenarios | - | - | 410 | 420 | 427 | 1107 |
| 2012 | Reduce catches | - | - | 369 | 450 | 450 | 1123 |
| 2013 | Decrease landings by 19% (1.5% increase followed by 20% PA reduction) | - | < 360 | 369 | 412 | 414 | 1274 |
| 2014 | Increase catches by 20% | < 1608 | < 519 | 461 | 410 | 410 | 772 |
| 2015 | Catches should be no more than recent catches (last three years) | < 1500 | < 420 | 461 | 381 | 381 | 778 |
| 2016 | Precautionary approach (same catch value as advised for 2015) | ≤ 1500 | ≤ 420 | 420 | 443 | 430 | 571 |
| 2017 | Precautionary approach (same catch value as advised for 2016) | ≤ 1500 | ≤ 405 | 405 | 389 | 390 | 895 |
| 2018 | Precautionary approach | ≤ 1800 | ≤ 511 | 511 | 422 | 422 | 508 |
| 2019 | Precautionary approach | ≤ 2160 | | 1662 | 394 † | 463 | 189 |
| 2020 | Precautionary approach | ≤ 2295 | | 2003 | 536** | 535 | 357 |
| 2021 | Precautionary approach | ≤ 1911 | | 1911 | 470** | 468 | 378 |
| 2022 | Precautionary approach | ≤ 1735 | | 1611 | | | |
| 2023 | MSY approach | ≤ 402 | | | | | |
| 2024 | MSY approach | ≤ 402 | | | | | |

* Discard estimates are available from 2004; discard values prior to 2004 are assumed, based on limited sampling information.

† Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

** Preliminary.

History of the catch and landings

Table 6 Plaice in divisions 7.f and 7.g. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch | Landings | | | | | Discards | | | | |
|------------|-----------------|----------------|--------------|----------|------------|----------------|----------------|--------------|------------|------------|
| | Otter trawl 28% | Beam trawl 69% | Gillnet < 1% | Seine 3% | Other < 1% | Otter trawl 5% | Beam trawl 94% | Gillnet < 1% | Seine < 1% | Other < 1% |
| 846 tonnes | 468 tonnes | | | | | 378 tonnes | | | | |

Table 7 Plaice in divisions 7.f and 7.g. History of official landings by country, ICES estimated landings, and discards. Weights are in tonnes.

| Year | Belgium | UK | France | Ireland | Spain | Netherlands | Total reported | ICES discards | ICES landings | ICES catch |
|-------|---------|-----|--------|---------|-------|-------------|----------------|---------------|---------------|------------|
| 1977 | 214 | 150 | 365 | 28 | | | 757 | n/a | 757 | n/a |
| 1978 | 196 | 152 | 527 | 0 | | | 875 | n/a | 875 | n/a |
| 1979 | 171 | 176 | 467 | 49 | | | 863 | n/a | 863 | n/a |
| 1980 | 372 | 234 | 706 | 61 | | | 1373 | n/a | 1373 | n/a |
| 1981 | 365 | 251 | 697 | 64 | | | 1377 | n/a | 1377 | n/a |
| 1982 | 341 | 196 | 568 | 198 | | | 1303 | n/a | 1303 | n/a |
| 1983 | 314 | 279 | 532 | 48 | | | 1173 | n/a | 1146 | n/a |
| 1984 | 283 | 366 | 558 | 72 | | | 1279 | n/a | 1210 | n/a |
| 1985 | 357 | 466 | 493 | 91 | | | 1407 | n/a | 1752 | n/a |
| 1986 | 665 | 539 | 878 | 302 | | 9 | 2384 | n/a | 1691 | n/a |
| 1987 | 581 | 496 | 708 | 127 | | | 1912 | n/a | 1901 | n/a |
| 1988 | 617 | 630 | 721 | 226 | | | 2194 | n/a | 2116 | n/a |
| 1989 | 843 | 471 | 1089 | 180 | | | 2583 | n/a | 2151 | n/a |
| 1990 | 794 | 498 | 767 | 160 | | | 2219 | n/a | 2082 | n/a |
| 1991 | 836 | 392 | 444 | 155 | | | 1827 | n/a | 1501 | n/a |
| 1992 | 371 | 307 | 504 | 180 | | | 1362 | n/a | 1188 | n/a |
| 1993 | 542 | 299 | 373 | 89 | | | 1303 | n/a | 1114 | n/a |
| 1994 | 350 | 252 | 298 | 82 | | | 982 | n/a | 1070 | n/a |
| 1995 | 346 | 286 | 254 | 70 | | | 956 | n/a | 1028 | n/a |
| 1996 | 410 | 239 | 246 | 83 | | | 978 | n/a | 952 | n/a |
| 1997 | 594 | 258 | 329 | 78 | | | 1259 | n/a | 1217 | n/a |
| 1998 | 540 | 176 | 298 | 135 | | | 1149 | n/a | 1067 | n/a |
| 1999 | 371 | 170 | n/a | 115 | | | n/a | n/a | 968 | n/a |
| 2000 | 224 | 134 | 287 | 76 | | | 721 | n/a | 718 | n/a |
| 2001 | 241 | 136 | 262 | 45 | | | 684 | n/a | 714 | n/a |
| 2002 | 248 | 105 | 186 | 79 | | | 618 | n/a | 642 | n/a |
| 2003 | 221 | 127 | 165 | 51 | | | 564 | n/a | 594 | n/a |
| 2004 | 212 | 87 | 145 | 45 | | | 489 | 274 | 510 | 784 |
| 2005 | 168 | 55 | 132 | 44 | | | 399 | 321 | 386 | 707 |
| 2006 | 172 | 88 | 106 | 48 | | | 414 | 453 | 404 | 857 |
| 2007 | 194 | 61 | 104 | 58 | | | 417 | 1288 | 410 | 1698 |
| 2008 | 188 | 63 | 70 | 64 | | | 385 | 583 | 437 | 1020 |
| 2009 | 216 | 56 | 148 | 61 | | | 481 | 608 | 481 | 1089 |
| 2010 | 188 | 54 | 136 | 63 | | | 442 | 670 | 442 | 1112 |
| 2011 | 210 | 45 | 98 | 67 | | | 420 | 1107 | 427 | 1534 |
| 2012 | 203 | 44 | 126 | 76 | | | 450 | 1123 | 450 | 1573 |
| 2013 | 186 | 40 | 106 | 80 | | | 412 | 1274 | 414 | 1688 |
| 2014 | 181 | 24 | 155 | 50 | | | 410 | 772 | 410 | 1182 |
| 2015 | 185 | 25 | 111 | 59 | | | 380 | 778 | 381 | 1159 |
| 2016 | 244 | 27 | 108 | 64 | | | 443 | 571 | 430 | 1001 |
| 2017 | 180 | 38 | 108 | 63 | | | 389 | 895 | 388 | 1283 |
| 2018 | 204 | 40 | 127 | 51 | | | 422 | 508 | 422 | 930 |
| 2019 | 263 | 45 | 84 | † | 1 | < 1 | 394† | 189 | 463 | 652 |
| 2020* | 332 | 47 | 47 | 110 | < 1 | < 1 | 536 | 357 | 536 | 893 |
| 2021* | 263 | 48 | 51 | 105 | 0.5 | < 1 | 468 | 378 | 468 | 846 |

† Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

*Preliminary.

Summary of the assessment

Table 8 Plaice in divisions 7.f and 7.g. Assessment summary. Weights are in tonnes, length is in centimeters.

| Year | Biomass index (kg / 100 km towed) | Length indicator (cm) | ICES landings (tonnes) | ICES discards (tonnes) |
|------|--------------------------------------|--------------------------|---------------------------|---------------------------|
| 1988 | 129 | | 2116 | |
| 1989 | 149 | | 2151 | |
| 1990 | 149 | | 2082 | |
| 1991 | 118 | | 1501 | |
| 1992 | 111 | | 1188 | |
| 1993 | 52 | | 1114 | |
| 1994 | 41 | | 1070 | |
| 1995 | 56 | | 1028 | |
| 1996 | 100 | | 952 | |
| 1997 | 62 | | 1217 | |
| 1998 | 79 | | 1067 | |
| 1999 | 66 | | 968 | |
| 2000 | 82 | | 718 | |
| 2001 | 79 | | 714 | |
| 2002 | 84 | | 642 | |
| 2003 | 69 | | 594 | |
| 2004 | 63 | | 510 | 274 |
| 2005 | 61 | | 386 | 321 |
| 2006 | 57 | | 404 | 453 |
| 2007 | 64 | | 410 | 1288 |
| 2008 | 79 | | 437 | 583 |
| 2009 | 77 | | 481 | 608 |
| 2010 | 98 | | 442 | 670 |
| 2011 | 130 | | 427 | 1107 |
| 2012 | 146 | | 450 | 1123 |
| 2013 | 146 | | 414 | 1274 |
| 2014 | 136 | | 410 | 772 |
| 2015 | 174 | | 381 | 778 |
| 2016 | 134 | | 430 | 571 |
| 2017 | 107 | | 388 | 895 |
| 2018 | 87 | 0.976 | 422 | 508 |
| 2019 | 75 | 0.996 | 463 | 189 |
| 2020 | 68 | 0.950 | 536 | 357 |
| 2021 | 49 | 0.937 | 468 | 378 |

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Plaice (*Pleuronectes platessa*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, ple.27.7fg, <https://doi.org/10.17895/ices.advice.19453634>.

Plaice (*Pleuronectes platessa*) in subdivisions 21–23 (Kattegat, Belt Seas, and the Sound)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 11 914 tonnes.

Management of plaice in the Baltic Sea (SDs 22–32) with a combined TAC for Plaice in subdivisions 21–23 and Plaice in subdivisions 24–32 prevents effective control of the single-stock exploitation rates and could lead to the overexploitation of either stock

Stock development over time

Fishing pressure on the stock is below F_{MSY} and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

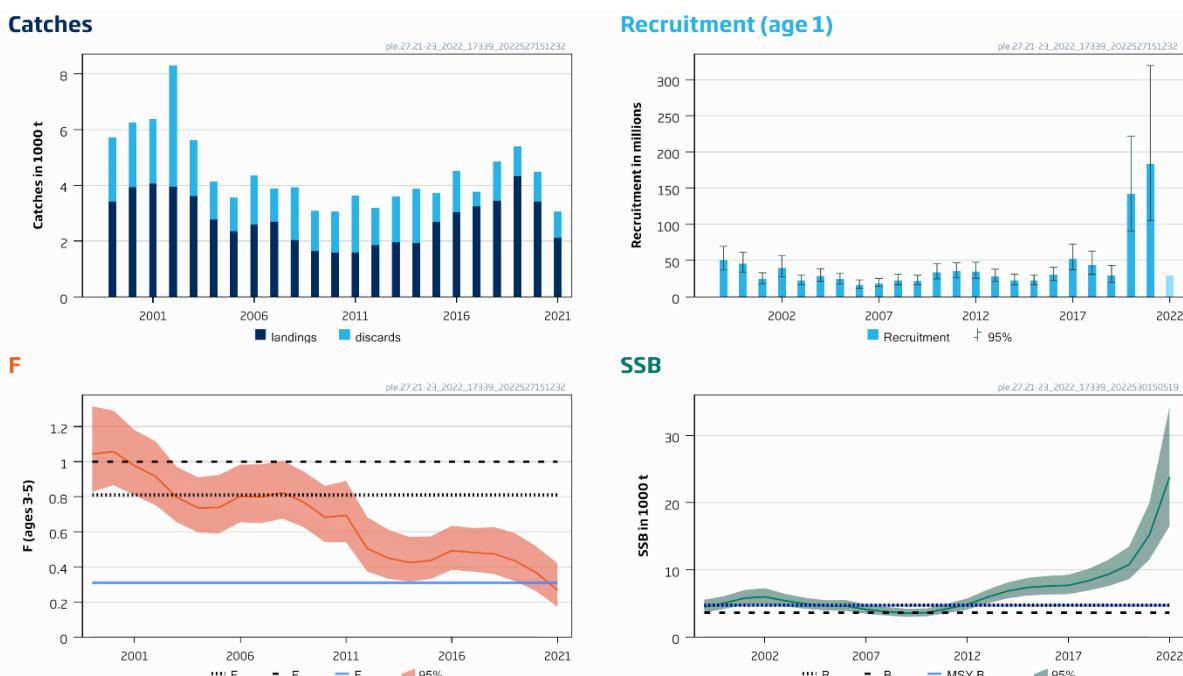


Figure 1 Plaice in subdivisions 21–23. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Plaice in subdivisions 21–23. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|---------------------------|--------|--|
| $F_{ages\ 3-5}\ (2022)$ | 0.268 | $F_{status\ quo} = F_{2021}$ |
| SSB (2023) | 31 756 | Short-term forecast; tonnes |
| $R_{age\ 1}\ (2022-2024)$ | 29 240 | Median resampled from the entire time-series of recruitment; thousands |
| Total catch (2022) | 7 178 | Short-term forecast using F_{2022} ; tonnes |
| Projected landings (2022) | 4 855 | Short-term forecast, assuming average landings ratio by age in 2019–2021; tonnes |
| Projected discards (2022) | 2 323 | Short-term forecast, assuming average discard ratio by age 2019–2021; tonnes |

Table 2 Plaice in subdivisions 21–23. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | F (2023) | SSB (2024) | % SSB change* | % advice change** |
|--|--------------------|----------|------------|---------------|-------------------|
| ICES advice basis | | | | | |
| MSY approach: ($F = F_{MSY}$) | 11 914 | 0.31 | 34 276 | 7.9% | 35% |
| Other scenarios | | | | | |
| $F = 0$ | 0 | 0.00 | 44 594 | 40% | -100% |
| $F = F_{2022}$ | 10 441 | 0.27 | 35 287 | 11% | 18% |
| $F = F_{pa}$ | 24 912 | 0.81 | 22 717 | -28% | 182% |
| $F = F_{lim}$ | 28 574 | 1.00 | 19 602 | -38% | 224% |
| SSB (2024) = MSY $B_{trigger}$ | 46 788 | 3.31 | 4 730 | -85% | 430% |
| SSB (2024) = B_{pa} | 46 788 | 3.31 | 4 730 | -85% | 430% |
| SSB (2024) = B_{lim} | 48 307 | 3.91 | 3 635 | -89% | 448% |
| MSY approach: ($F = F_{MSY}$) lower | 7 306 | 0.180 | 38 069 | 20% | -17% |
| SSB (2024) = SSB (2023) | 14 506 | 0.393 | 31 756 | 0% | 64% |
| MSY approach: ($F = F_{MSY}$) upper | 19 906 | 0.59 | 27 038 | -15% | 126% |
| 20% increase on advised catch for 2022 | 10 585 | 0.272 | 35 165 | 11% | 20% |

* SSB 2024 relative to SSB 2023.

** Catches in 2023 relative to ICES advised catch for 2022 (8 821 tonnes).

The advised catch has increased for 2023, as the SSB continues to increase due to incoming large year classes.

Basis of the advice

Table 3 Plaice in subdivisions 21–23. The basis of the advice.

| Advice basis | MSY approach |
|-----------------|---|
| Management plan | The EU multiannual plan for the Baltic Sea (EU, 2016, 2019) applies to bycatches of this stock taken when fishing for the target stocks described in the plan. Catches taken in the Kattegat (Subdivision 21) are covered by the North Sea multiannual plan (EU, 2018). |

Quality of the assessment

Revisions in SSB and F are likely due to recent changes in fishing patterns and extraordinarily high recruitment pulses.

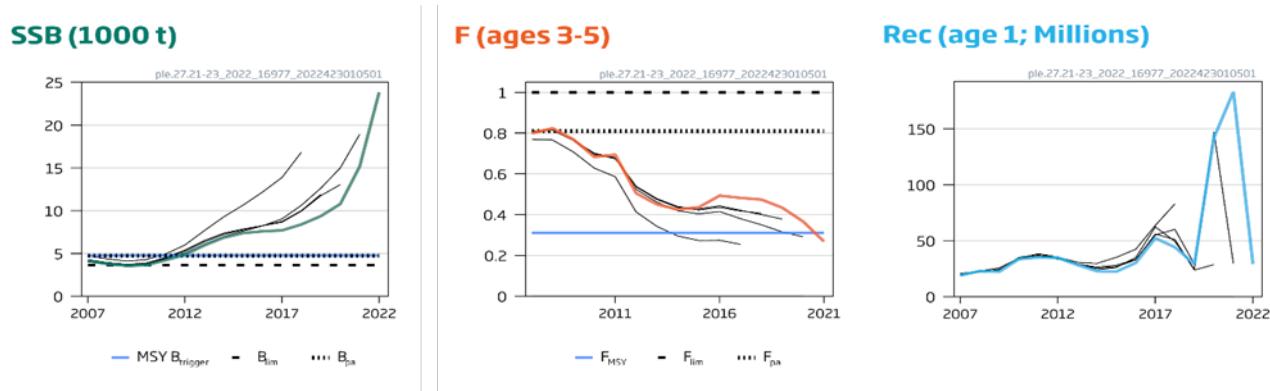


Figure 2 Plaice in subdivisions 21–23. Historical assessment results. (Final-year recruitment assumptions included for each line). The reference points were revised in 2019, and only the last four assessment results should be compared to the reference points indicated.

Issues relevant for the advice

The fishery in Subdivision (SD) 22 has changed from being a directed cod fishery to becoming a targeted flatfish fishery.

Plaice in the Baltic Sea (ple.27.21–23 and ple.27.24–32) are both experiencing extraordinarily high recruitment pulses from the 2019 and 2020 year classes. High catches of below minimum size (BMS) plaice are to be expected in a *status quo* demersal fishery (e.g. *Nephrops* fishery in SD 21 and targeted flatfish fisheries in SD 22).

The management areas for plaice in the Baltic Sea (i.e. SDs 21 and 22–32) are different from the stock areas (i.e. SDs 21–23 and 24–32). As for the plaice stock in SDs 24–32 (ICES, 2022a), this section provides an option for calculating TACs by management area, based on the catch distribution observed in 2021. The catch ratio between SDs 21 and 22–23 in 2021 was used to calculate a split of the advised catches for the stock in SDs 21–23 for 2023. The advised catch for the stock in SDs 24–32 was added to the calculated catch for SDs 22–23 in order to obtain plaice catches by management area that would be consistent with ICES advice for the two stocks assuming that the distribution of catches would be the same observed in 2021. If the distribution changes in 2023 the combined TAC may not be consistent with ICES advice. The details of this calculation are presented in Table 4. This results in catches of no more than 3232 tonnes in SD 21, and 13 315 tonnes in SDs 22–32.

Table 4 Plaice in subdivisions (SDs) 21–23. Calculation of TACs by management area based on the catch distribution observed in 2021. Weights are in tonnes.

| Basis | | Catch 2021 | Landings 2021 | ICES stock advice 2023 (catch) |
|--|------------|--|---------------|--------------------------------|
| Stock area-based | SDs 21–23 | 3 053 | 2 126 | 11 914 |
| | SDs 24–32 | 1 317 | 767 | 4 633 |
| Total advised catch, 2023 (SDs 21–32) | | | | 16 547 |
| Management area-based | SD 21 | 828 | 215 | |
| | SDs 22–23 | 2 225 | 1 912 | |
| | SDs 22–32* | 3 542 | 2 679 | |
| | | | Calculation | Result |
| Share of SD 21 of the total catch in SDs 21–23 in 2021 | | = 828/3 053 (catch in 2021 SD 21/catch in 2021 SDs 21–23) | | 0.271 |
| Catch in 2023 for SD 21 | | = 11 914*0.271 (ICES stock advice in 2023 (catch) for SDs 21–23 × share) | | 3 232 |
| Catch in 2023 for SD 22–32 | | = 16 547–3 232 (total advised catch in 2023 SDs 21–32 minus catch SD 21) (landings in 2021 SD 21/landings in 2021 SDs 21–23) | | 13 315 |

Reference points

Table 5 Plaice in subdivisions 21–23. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-------------------|-------------|--|-------------|
| MSY approach | MSY $B_{trigger}$ | 4 730 | B_{pa} ; in tonnes | ICES (2019) |
| | F_{MSY} | 0.31 | Stochastic simulations (EqSim) with segmented regression | ICES (2019) |
| Precautionary approach | B_{lim} | 3 635 | B_{loss} in 2009, from the 2019 assessment; in tonnes | ICES (2019) |
| | B_{pa} | 4 730 | $B_{lim} \times e^{1.645 \times \sigma}$, $\sigma = 0.16$; in tonnes | ICES (2019) |
| | F_{lim} | 1.00 | The F that on average leads to B_{lim} | ICES (2019) |
| | F_{pa} | 0.81 | F_{95} , the F that provides a 95% probability for SSB to be above B_{lim} | ICES (2021) |
| Management plan | SSB_{mgt} | Not defined | | |
| | F_{mgt} | Not defined | | |

* Version 2: label of SDs corrected.

Basis of the assessment

Table 6 Plaice in subdivisions 21–23. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022b) |
| Assessment type | Age-based analytical assessment SAM (ICES, 2022c) that uses catches in the model and in the forecast |
| Input data | Commercial catches; two combined survey indices (NS-IBTSQ1 [G1022] and BITS-Q1 [G2916], NS-IBTS-Q3 [G2829] and BITS-Q4 [G8863]); mean maturity data for the modelled period (Q1 surveys); natural mortalities are fixed and assumed to be 0.1 except for age 1, which has 0.2 |
| Discards and bycatch | Discard information is available from 2002 (back-calculated to 1999) from the main fleets and is included |
| Indicators | None |
| Other information | The stock was last benchmarked in 2015 (ICES, 2015) and revised in 2019 (ICES, 2019) |
| Working group | Baltic Fisheries Assessment Working Group (WGBFAS) |

History of the advice, catch, and management

Table 7 Plaice in subdivisions (SDs) 21–23. ICES advice, TACs, and ICES catches. All weights are in tonnes.

| Year | ICES advice | Catch corresp. to advice for SDs 21–23 | Catch corresp. to advice for Skagerrak and Kattegat combined | TAC Kattegat (SD 21) | TAC Baltic Sea (SDs 22–32) | ICES landings (SDs 21–23) ^{^^} | Discards (SDs 21–23) ^{^^} |
|------|--|--|--|-------------------------|-------------------------------|--|---------------------------------------|
| 1992 | TAC | | 14 000 | 2 800 | | 2 700 | |
| 1993 | Precautionary TAC | | - | 2 800 | | 1 700 | |
| 1994 | If required, precautionary TAC | | - | 2 800 | | 2 100 | |
| 1995 | If required, precautionary TAC | | - | 2 800 | | 2 100 | |
| 1996 | If required, precautionary TAC | | - | 2 800 | | 3 500 | |
| 1997 | No advice | | - | 2 800 | | 3 400 | |
| 1998 | No increase in F from the present level | | 11 900 | 2 800 | | 2 900 | |
| 1999 | No increase in F from the present level | | 11 000 | 2 800 | | 3 400 | 2 313 |
| 2000 | $F < F_{pa}$ | | 11 800 | 2 800 | | 3 900 | 2 313 |
| 2001 | $F < F_{pa}$ | | 9 400 | 2 350 | | 4 100 | 2 313 |
| 2002 | $F < F_{pa}$ | | 8 500* | 1 600** | | 3 900 | 4 357 |
| 2003 | $F < F_{pa}$ | | 18 400 | 3 000 | | 3 400 | 2 004 |
| 2004 | $F < F_{pa}$ | | *** | 1 800 | | 2 600 | 1 368 |
| 2005 | $F < F_{pa}$ | | < 9 500 | 1 900 | | 2 400 | 1 197 |
| 2006 | No increase in F | | < 9 600 | 1 900 | | 2 400 | 1 769 |
| 2007 | Maintain current TAC | | < 9 600 | 2 100 | | 2 600 | 1 190 |
| 2008 | No increase in catch | | < 9 400 | 2 300 | | 2 000 | 1 901 |
| 2009 | Same advice as last year | | < 9 400 | 2 300 | | 1 700 | 1 447 |
| 2010 | Same advice as last year | | < 9 400 | 2 300 | | 1 500 | 1 488 |
| 2011 | Last three years' (2007– 2009) average landings | | < 8 000 | 1 988 | 3 041 | 1 600 | 2 045 |
| 2012 | Reduce catch | | - | 1 988 | 2 889 | 1 800 | 1 350 |

| Year | ICES advice | Catch corresp. to advice for SDs 21–23 | Catch corresp. to advice for Skagerrak and Kattegat combined | TAC Kattegat (SD 21) | TAC Baltic Sea (SDs 22–32) | ICES landings (SDs 21–23) ^{^^} | Discards (SDs 21–23) ^{^^} |
|------|--|--|--|-------------------------|-------------------------------|--|---------------------------------------|
| 2013 | Increase catch by 16%, transition to F _{MSY} | < 1 800 [^] | | 1 800 | 3 409 | 2 000 | 1 637 |
| 2014 | Increase landings by 20% | 2 224 [^] | | 2 160 | 3 409 | 1 931 | 1 946 |
| 2015 | Increase catch by 20% | 4 031 | | 2 626 | 3 409 | 2 687 | 1 021 |
| 2016 | MSY approach | ≤ 8 639 | | 2 347 | 4 034 | 3 020 | 1 501 |
| 2017 | MSY approach | ≤ 8 333 | | 2 343 | 7 862 | 3 253 | 988 |
| 2018 | MSY approach | ≤ 5 405 | | 1 483 | 7 076 | 3 459 | 1 387 |
| 2019 | Precautionary approach | ≤ 15 237 | | 1 705 | 10 122 | 4 334 | 1 054 |
| 2020 | Precautionary approach | ≤ 10 636 | | 1 141 | 6 894 | 3 409 | 1 061 |
| 2021 | MSY approach | ≤ 5 176 | | 719 | 7 240 | 2126 | 927 |
| 2022 | MSY approach | ≤ 8 821 | | 1038 [†] | 9 050 | | |
| 2023 | MSY approach | ≤ 11 914 | | | | | |

* In March 2002, ICES revised its advice to 11 600 tonnes for both areas combined.

** The TAC for the two areas combined was adjusted to 11 200 tonnes in mid-2002.

*** The exploitation of this stock should be conducted in the context of mixed fisheries.

[^] Landings.

^{^^} On 1/1/2017 the EU landing obligation was introduced for plaice in SDs 22–32. In 2017, landings include those below minimum size (BMS), while for 2019 onward Denmark and Sweden BMS catches are included in discards.

History of the catch and landings

Table 8 Plaice in subdivisions 21–23. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch (2021) | Landings | | Discards* |
|--------------|-------------------|--------------------|------------|
| | Active gears 64 % | Passive gears 36 % | |
| 3 053 tonnes | 2 126 tonnes | | 927 tonnes |

* BMS landings are included in discards.

Table 9 Plaice in subdivisions (SDs) 21–23. History of commercial catch and landings. ICES estimated landings by area and country, estimated discards, and officially reported BMS. All weights are in tonnes. Missing values indicate no reported catch; zeros represent either zero reported catch or the rounding down of catch of below one tonne.

| Year and SD | Denmark | | Germany | | Sweden | | Aggregate BMS | Total catches |
|-------------|----------|----------|----------|----------|----------|----------|------------------|------------------|
| | Discards | Landings | Discards | Landings | Discards | Landings | | |
| 2002 | 3 877 | 3 654 | 22 | 39 | 458 | 246 | | 8 296 |
| SD 21 | 3 314 | 1 880 | 0 | | 446 | 204 | | 5 844 |
| SD 23 | 178 | 75 | 0 | | 13 | 42 | | 308 |
| SD 22 | 385 | 1 699 | 22 | 39 | | 0 | | 2 145 |
| 2003 | 1 635 | 3 308 | 17 | 31 | 353 | 279 | | 5 623 |
| SD 21 | 1 235 | 2 132 | 0 | | 351 | 253 | | 3 971 |
| SD 23 | 23 | 105 | 0 | | 1 | 26 | | 155 |
| SD 22 | 377 | 1 071 | 17 | 31 | 0 | 0 | | 1 496 |
| 2004 | 1 195 | 2 540 | 48 | 54 | 126 | 173 | | 4 136 |
| SD 21 | 711 | 1 454 | 0 | | 119 | 137 | | 2 421 |
| SD 23 | 48 | 137 | 0 | | 7 | 35 | | 227 |
| SD 22 | 435 | 949 | 48 | 54 | | 0 | | 1 486 |
| 2005 | 1 048 | 2 171 | 37 | 48 | 113 | 135 | | 3 552 |
| SD 21 | 617 | 1 145 | 0 | | 108 | 100 | | 1 970 |
| SD 23 | 37 | 152 | 0 | | 4 | 34 | | 227 |

[†] Version 3: TAC corrected

| Year and SD | Denmark | | Germany | | Sweden | | Aggregate BMS | Total catches |
|-------------|----------|----------|----------|----------|----------|----------|---------------|---------------|
| | Discards | Landings | Discards | Landings | Discards | Landings | | |
| SD 22 | 394 | 874 | 37 | 48 | | 0 | | 1 353 |
| 2006 | 1 593 | 2 321 | 25 | 45 | 152 | 214 | | 4 350 |
| SD 21 | 1 165 | 1 400 | 0 | | 149 | 175 | | 2 889 |
| SD 23 | 17 | 180 | 0 | | 3 | 39 | | 239 |
| SD 22 | 410 | 742 | 25 | 45 | | 0 | | 1 222 |
| 2007 | 962 | 2 376 | 56 | 75 | 173 | 241 | | 3 883 |
| SD 21 | 641 | 1 244 | 0 | | 170 | 172 | | 2 227 |
| SD 23 | 42 | 199 | 0 | | 2 | 69 | | 312 |
| SD 22 | 279 | 933 | 56 | 75 | | 0 | | 1 343 |
| 2008 | 1 807 | 1 754 | 16 | 92 | 79 | 182 | | 3 930 |
| SD 21 | 1 471 | 899 | 0 | | 76 | 137 | | 2 583 |
| SD 23 | 39 | 120 | 0 | | 3 | 45 | | 207 |
| SD 22 | 297 | 735 | 16 | 92 | | 0 | | 1 140 |
| 2009 | 1 332 | 1 317 | 16 | 191 | 99 | 127 | | 3 082 |
| SD 21 | 1 033 | 589 | 0 | | 99 | 84 | | 1 805 |
| SD 23 | 10 | 144 | 0 | | 0 | 42 | | 196 |
| SD 22 | 289 | 585 | 16 | 191 | | 0 | | 1 081 |
| 2010 | 1 212 | 1 262 | 149 | 226 | 127 | 83 | | 3 059 |
| SD 21 | 388 | 428 | 5 | 5 | 127 | 66 | | 1 019 |
| SD 23 | 5 | 59 | 0 | | 1 | 17 | | 82 |
| SD 22 | 819 | 775 | 144 | 221 | | 0 | | 1 959 |
| 2011 | 1 823 | 1 224 | 127 | 310 | 95 | 51 | | 3 630 |
| SD 21 | 1 042 | 327 | 0 | | 94 | 40 | | 1 503 |
| SD 23 | 27 | 46 | 0 | | 1 | 11 | | 85 |
| SD 22 | 754 | 851 | 127 | 310 | | 0 | | 2 042 |
| 2012 | 1 192 | 1 439 | 119 | 365 | 39 | 41 | | 3 195 |
| SD 21 | 277 | 196 | 0 | | 39 | 30 | | 542 |
| SD 23 | 1 | 54 | 0 | | 1 | 12 | | 68 |
| SD 22 | 914 | 1 189 | 119 | 365 | | 0 | | 2 587 |
| 2013 | 1 423 | 1 561 | 111 | 320 | 104 | 74 | | 3 593 |
| SD 21 | 756 | 232 | 3 | 1 | 103 | 60 | | 1 155 |
| SD 23 | 1 | 76 | 0 | | 1 | 14 | | 92 |
| SD 22 | 666 | 1 252 | 109 | 319 | | 0 | | 2 346 |
| 2014 | 1 750 | 1 497 | 100 | 321 | 96 | 113 | | 3 877 |
| SD 21 | 525 | 343 | 1 | 1 | 94 | 68 | | 1 032 |
| SD 23 | 5 | 57 | 0 | | 2 | 45 | | 109 |
| SD 22 | 1 220 | 1 097 | 99 | 320 | | 0 | | 2 736 |
| 2015 | 784 | 2 014 | 115 | 560 | 122 | 113 | | 3 708 |
| SD 21 | 345 | 807 | 0 | 0 | 122 | 87 | | 1 361 |
| SD 23 | 6 | 103 | 0 | | 0 | 26 | | 135 |
| SD 22 | 434 | 1 103 | 115 | 560 | | 0 | | 2 212 |
| 2016 | 1 223 | 2 199 | 145 | 681 | 133 | 141 | | 4 522 |
| SD 21 | 633 | 984 | 1 | 1 | 131 | 121 | | 1 871 |
| SD 23 | 17 | 107 | 0 | | 2 | 20 | | 146 |
| SD 22 | 573 | 1 108 | 144 | 680 | | 0 | | 2 505 |
| 2017 | 583 | 2 198 | 126 | 936 | 54 | 110 | 4 | 4 011 |
| SD 21 | 396 | 703 | 0 | 1 | 52 | 97 | | 1 249 |
| SD 23 | | 70 | 0 | | 3 | 13 | | 86 |
| SD 22 | 187 | 1 424 | 126 | 936 | | 0 | | 2 673 |
| 2018 | 969 | 2 300 | 365 | 1073 | 65 | 65 | 8 | 4 845 |
| SD 21 | 777 | 482 | 1 | 1 | 61 | 51 | 0 | 1 373 |
| SD 23 | 42 | 111 | 0 | | 5 | 13 | | 171 |
| SD 22 | 151 | 1 708 | 364 | 1072 | 0 | 0 | 8 | 3 303 |
| 2019 | 839 | 2 775 | 166 | 1498 | 33 | 52 | 25 | 5 388 |
| SD 21 | 345 | 332 | 4 | 4 | 29 | 28 | 6 | 748 |
| SD 23 | 24 | 102 | 0 | | 4 | 24 | 0 | 154 |
| SD 22 | 470 | 2 342 | 162 | 1494 | 0 | 0 | 19 | 4 487 |
| 2020 | 846 | 2 551 | 154 | 820 | 53 | 31 | 14 | 4 469 |

| Year and SD | Denmark | | Germany | | Sweden | | Aggregate BMS | Total catches |
|-------------|----------|----------|----------|----------|----------|----------|---------------|---------------|
| | Discards | Landings | Discards | Landings | Discards | Landings | | |
| SD 21 | 522 | 264 | 8 | 2 | 46 | 17 | 1 | 860 |
| SD 23 | 29 | 87 | 0 | | 7 | 14 | 1 | 138 |
| SD 22 | 296 | 2 201 | 146 | 818 | | 0 | 12 | 3 473 |
| 2021 | 561 | 1 341 | 257 | 758 | 95 | 27 | 14 | 3 053 |
| SD 21 | 507 | 197 | 12 | 5 | 93 | 13 | 2 | 828 |
| SD 23 | 20 | 63 | | | 2 | 15 | 0 | 101 |
| SD 22 | 34 | 1 081 | 245 | 753 | 0 | 0 | 12 | 2 124 |

Summary of the assessment

Table 10 Plaice in subdivisions 21–23. Assessment summary. Weights are in tonnes; recruitment is in thousands. High and low refers to 95% confidence intervals.

| Year | Recruitment | | | SSB | | | Landings | Discards | Fishing mortality | | |
|------|-------------|---------|---------|--------|--------|--------|----------|----------|-------------------|------|------|
| | Age 1 | High | Low | SSB | High | Low | | | Ages 3–5 | High | Low |
| 1999 | 50 709 | 69 717 | 36 883 | 4 473 | 5 559 | 3 600 | 3 406 | 2 313 | 1.04 | 1.32 | 0.83 |
| 2000 | 45 753 | 61 550 | 34 011 | 5 054 | 6 101 | 4 186 | 3 935 | 2 313 | 1.06 | 1.29 | 0.87 |
| 2001 | 24 316 | 33 042 | 17 895 | 5 796 | 7 016 | 4 788 | 4 054 | 2 313 | 0.98 | 1.18 | 0.81 |
| 2002 | 39 797 | 57 035 | 27 769 | 5 983 | 7 278 | 4 919 | 3 939 | 4 357 | 0.92 | 1.12 | 0.75 |
| 2003 | 22 443 | 30 312 | 16 616 | 5 403 | 6 433 | 4 538 | 3 618 | 2 004 | 0.80 | 0.97 | 0.65 |
| 2004 | 28 863 | 38 759 | 21 494 | 4 952 | 5 843 | 4 197 | 2 766 | 1 369 | 0.74 | 0.91 | 0.60 |
| 2005 | 24 380 | 32 747 | 18 151 | 4 642 | 5 471 | 3 939 | 2 354 | 1 197 | 0.74 | 0.93 | 0.59 |
| 2006 | 16 494 | 23 350 | 11 652 | 4 617 | 5 503 | 3 873 | 2 580 | 1 770 | 0.80 | 0.98 | 0.66 |
| 2007 | 18 919 | 25 530 | 14 020 | 4 097 | 4 864 | 3 450 | 2 691 | 1 191 | 0.80 | 0.99 | 0.65 |
| 2008 | 22 768 | 31 458 | 16 479 | 3 778 | 4 479 | 3 187 | 2 028 | 1 902 | 0.82 | 1.01 | 0.68 |
| 2009 | 22 158 | 29 745 | 16 507 | 3 548 | 4 210 | 2 990 | 1 635 | 1 448 | 0.77 | 0.94 | 0.63 |
| 2010 | 33 536 | 45 588 | 24 671 | 3 618 | 4 267 | 3 068 | 1 570 | 1 489 | 0.68 | 0.86 | 0.54 |
| 2011 | 35 028 | 47 063 | 26 071 | 4 197 | 4 959 | 3 552 | 1 584 | 2 045 | 0.69 | 0.89 | 0.54 |
| 2012 | 34 859 | 47 679 | 25 487 | 4 837 | 5 751 | 4 068 | 1 845 | 1 351 | 0.51 | 0.68 | 0.37 |
| 2013 | 28 306 | 38 071 | 21 045 | 5 939 | 7 052 | 5 002 | 1 956 | 1 638 | 0.45 | 0.61 | 0.33 |
| 2014 | 22 779 | 31 600 | 16 420 | 6 846 | 8 150 | 5 751 | 1 931 | 1 946 | 0.43 | 0.57 | 0.32 |
| 2015 | 22 356 | 30 324 | 16 482 | 7 383 | 8 825 | 6 176 | 2 687 | 1 021 | 0.44 | 0.57 | 0.33 |
| 2016 | 30 226 | 40 799 | 22 393 | 7 587 | 9 111 | 6 318 | 3 020 | 1 501 | 0.49 | 0.64 | 0.38 |
| 2017 | 52 233 | 72 998 | 37 374 | 7 694 | 9 274 | 6 384 | 3 243 | 530 | 0.48 | 0.62 | 0.37 |
| 2018 | 44 137 | 63 148 | 30 849 | 8 392 | 10 174 | 6 922 | 3 446 | 1 400 | 0.47 | 0.63 | 0.36 |
| 2019 | 29 240 | 43 174 | 19 803 | 9 367 | 11 539 | 7 604 | 4 334 | 1 054 | 0.43 | 0.59 | 0.32 |
| 2020 | 142 019 | 221 541 | 91 041 | 10 786 | 13 498 | 8 618 | 3 409 | 1 061 | 0.37 | 0.52 | 0.26 |
| 2021 | 183 127 | 319 481 | 104 968 | 15 186 | 20 012 | 11 523 | 2 126 | 927 | 0.27 | 0.42 | 0.17 |
| 2022 | 29 240* | | | 23 849 | 34 374 | 16 518 | | | | | |

* Median and confidence intervals of resampled recruitment from the entire time-series.

Sources and references

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Recommended citation: ICES. 2022. Plaice (*Pleuronectes platessa*) in subdivisions 21–23 (Kattegat, Belt Seas, and the Sound). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, ple.27.21–23, <https://doi.org/10.17895/ices.advice.19453550>

Plaice (*Pleuronectes platessa*) in Subarea 4 (North Sea) and Subdivision 20 (Skagerrak)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 150 705 tonnes.

ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

Stock development over time

Fishing pressure on the stock is below F_{MSY} and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and, B_{lim} .

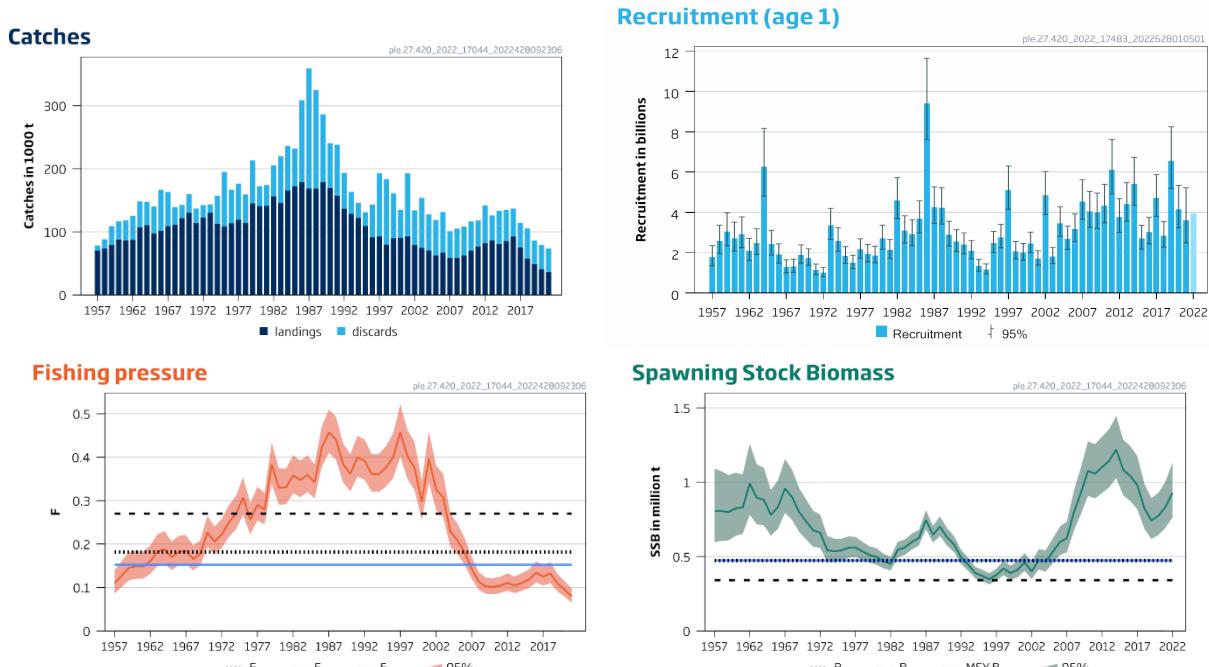


Figure 1 Plaice in Subarea 4 and Subdivision 20. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Plaice in Subarea 4 and Subdivision 20. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|---------------------------|-----------|---|
| $F_{ages\ 2-6}\ (2022)$ | 0.080 | $F_{sq} = F_{ages\ 2-6}\ (2021)$. |
| SSB (2023) | 977 491 | Short-term forecast (STF); tonnes |
| $R_{age1}\ (2022-2023)$ | 3 952 706 | Resampled recruitments from the years 2012–2021 (geometric mean shown); thousands |
| Total catch (2022) | 79 774 | STF, using exploitation pattern and $F_{ages\ 2-6}$ in 2021; tonnes |
| Projected landings (2022) | 45 821 | STF, assuming average landings ratio by age 2019–2021; tonnes |
| Projected discards (2022) | 33 953 | STF, assuming average landings ratio by age 2019–2021; tonnes |

Table 2 Plaice in Subarea 4 and Subdivision 20. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch* (2023) | Projected landings * (2023) | Projected discards ** (2023) | F _{total} ages 2–6 ^^ (2023) | F _{projected} landings ages 2–6 (2023) | F _{projected} discards ages 2–3 (2023) | SSB (2024) | % SSB change *** | % TAC change ^ | % advice change ^ |
|--|------------------------|--------------------------------|---------------------------------|---|--|--|---------------|---------------------|-------------------|----------------------|
| ICES advice basis | | | | | | | | | | |
| MSY approach: F _{MSY} | 150 705 | 89 647 | 61 058 | 0.15 | 0.06 | 0.09 | 939 221 | -3.90 | 5.80 | 5.80 |
| Other scenarios | | | | | | | | | | |
| F = F _{MSY} upper | 178 156 | 105 971 | 72 185 | 0.18 | 0.08 | 0.11 | 916 347 | -6.30 | 25 | 25 |
| F = F _{MSY} lower | 117 767 | 70 047 | 47 720 | 0.12 | 0.05 | 0.07 | 966 970 | -1.08 | -17.40 | -17.40 |
| F = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 065 304 | 8.90 | -100 | -100 |
| F _{pa} | 178 156 | 105 971 | 72 185 | 0.18 | 0.08 | 0.11 | 916 347 | -6.30 | 25 | 25 |
| SSB (2024) = B _{lim} | 910 260 | 538 461 | 371 799 | 1.53 | 0.64 | 0.88 | 341 003 | -65 | 540 | 540 |
| SSB (2024) = B _{pa} | 730 460 | 432 732 | 297 728 | 1.04 | 0.44 | 0.60 | 473 850 | -52 | 410 | 410 |
| SSB (2024) = MSY B _{trigger} | 730 460 | 432 732 | 297 728 | 1.04 | 0.44 | 0.60 | 473 850 | -52 | 410 | 410 |
| Rollover advice | 142 508 | 85 173 | 57 335 | 0.14 | 0.06 | 0.08 | 945 389 | -3.30 | 0 | 0 |
| F ₂₀₂₃ = F ₂₀₂₂ | 81 350 | 48 410 | 32 940 | 0.08 | 0.03 | 0.05 | 997 551 | 2.10 | -43 | -43 |

* “Projected” (marketable) landings and discards are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on average discard rate estimates for 2019–2021. Total catch is equal to the sum of “Projected landings” and “Projected discards”. Both projected landing and projected discards refer to Subarea 4 and Subdivision 20, calculated as the projected total stock catch (i.e. total stock catches which includes catches of the subarea 4 and subdivision 20 plaice stock that are taken in Division 7.d) and deducting the catches of the subarea 4 and subdivision 20 plaice stock forecast to be taken in Division 7.d in 2023. The subtracted value (278 t of projected landings and 326 t of projected discards) is estimated based on the plaice catch advice for Division 7.d for 2023.

** Including BMS landings (EU stocks), assuming recent discard rates.

*** SSB 2024 relative to SSB 2023.

^ Total catch in 2023 relative to the advice value 2022 and TAC (142 508 tonnes).

^^ F_{projected} landings and F_{projected} discards do not add up to the F_{total} as they are calculated using different ages.

Basis of the advice

Table 3 Plaice in Subarea 4 and Subdivision 20. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach |
| Management plan | An EU multiannual management plan (MAP) has been agreed by the EU for this stock (EU, 2018). There is no agreement with Norway and UK regarding this plan, and it is not used as the basis of the advice for this shared stock. ICES was requested by the EC and UK to provide advice based on the MSY approach and to include F _{MSY} ranges in the catch scenarios. |

Quality of the assessment

The assessment was updated during a benchmark in early 2022 (ICES, 2022a). A combined BTS and IBTS-Q3 index was applied to replace the two individual survey indices. Age-specific natural mortalities were applied to replace the fixed 0.1 value across all ages. The stock assessment model was changed (Table 5). Reference points were updated (Table 4).

The benchmark updates led to changes in the trajectory of SSB and recruitment of the stock while fishing pressure was scaled down (Figure 2). Changes also included a reduction in the estimated proportion of older fish in the stock (the plus group accounts for 48% of 2020 SSB in 2021 assessment to 17% in the current assessment).

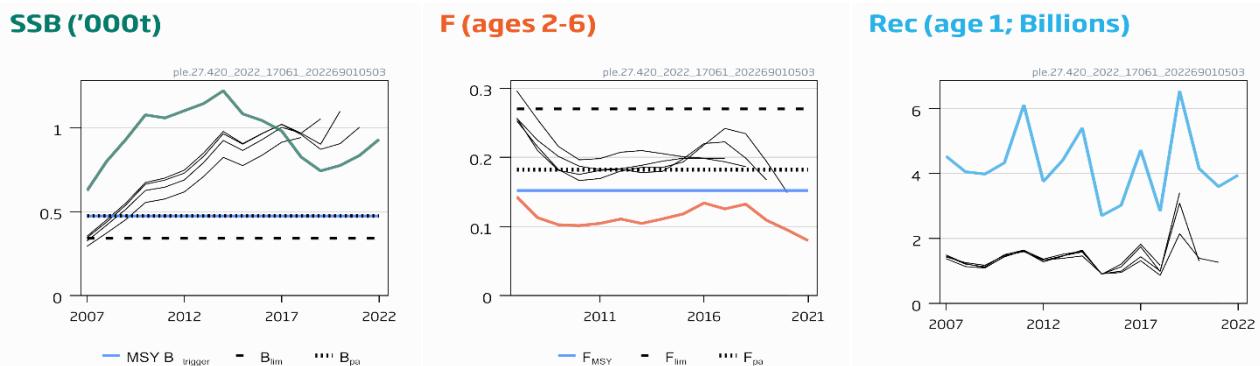


Figure 2 Plaice in Subarea 4 and Subdivision 20. Historical assessment results (final-year recruitment included for each line, corresponding to the forecast recruitment in the interim year). The reference points were revised in 2022 following a benchmark, and only assessment results from the final year should be compared to the reference points indicated.

Issues relevant for the advice

Between 2014 and 2018, the majority of the Dutch beam trawlers have switched to pulse trawls, resulting in reallocation of fishing effort to fishing grounds in the southern part of Division 4.c targeting sole. The discards ratio for plaice has been increasing in the same period (Figure 3), from 40% in 2014 to 51% in 2021. Following the EU decision in February 2019 to revise the technical measures regulations, pulse trawling is prohibited since 30 June 2021.

ICES advice for ple.27.420 is for catches from subarea 4 and subdivision 20. Fish from this stock which migrate out of the stock area and are caught in subdivision 7d have been accounted for in the advice.

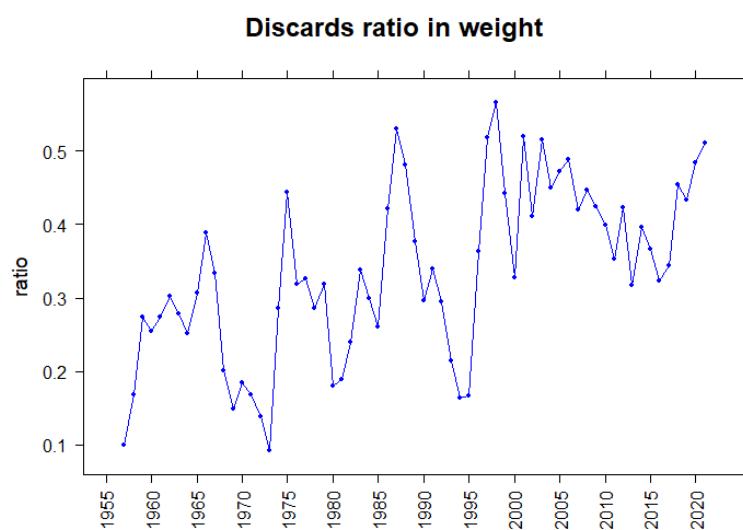


Figure 3 Discards–catch ratio of plaice in weight.

Reference points

Table 4 Plaice in Subarea 4 and Subdivision 20. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|---------------------------|------------------------------|-------------|---|--------------|
| MSY approach | MSY $B_{trigger}$ | 473 850 | B_{pa} ; in tonnes | ICES (2022a) |
| | F_{MSY} | 0.152 | Stochastic simulations (EqSim) based on the recruitment period 1957–2020 | ICES (2022a) |
| Precautionary approach | B_{lim} | 341 003 | B_{loss} , lowest estimated SSB from benchmark assessment, which equals the SSB of year 1996; in tonnes | ICES (2022a) |
| | B_{pa} | 473 850 | $B_{lim} \times \exp(1.645 \times \sigma)$, $\sigma = 0.20$; in tonnes | ICES (2022a) |
| | F_{lim} | 0.270 | The F that on average leads to B_{lim} from EqSim | ICES (2022a) |
| | F_{pa} | 0.182 | $F_{P,05}$ with advice rule (AR): The F that provides a 95% probability for SSB to be above B_{lim} | ICES (2022a) |
| EU Management plan (MAP)* | MAP MSY $B_{trigger}$ | 473 850 | MSY $B_{trigger}$; in tonnes | ICES (2022a) |
| | MAP B_{lim} | 341 003 | B_{lim} ; in tonnes | ICES (2022a) |
| | MAP F_{MSY} | 0.152 | F_{MSY} | ICES (2022a) |
| | MAP target range F_{lower} | 0.117–0.152 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY | ICES (2022a) |
| | MAP target range F_{upper} | 0.152–0.182 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY | ICES (2022a) |

* EU multiannual plan (MAP) for the North Sea (EU, 2018).

Basis of the assessment

Table 5 Plaice in Subarea 4 and Subdivision 20. Basis of the assessment and advice.

| | |
|-------------------------------------|---|
| ICES stock data category | 1 (ICES, 2022c) |
| Assessment type | Age-based analytical assessment (SAM, Nielsen and Berg, 2014; ICES, 2022b) that uses catches in the model and in the forecast |
| Input data | Commercial catch, ages, and length frequencies from port and observer and self-sampling. Five survey indices: combined BTS and IBTS Q3 (1996–2021, [B2453], [G2829]), BTS-Isis (1985–1995, [B2453]), SNS (split into two series, SNS1 1970–1999 and SNS2 2000–2021, [B3499]), and IBTS Q1 (2007–2021, [G1022]). Both the BTS+IBTS Q3 and IBTS Q1 survey indices are updated yearly using a Delta-GAM model (Berg <i>et al.</i> , 2014). Natural mortality is age dependent and was estimated using Peterson-Wroblewski method during benchmark and it is time invariant. Maturity-at-age is assumed constant over time. |
| Discards, BMS landings, and bycatch | Data from the majority of fleets were included in the assessment. In 2021, 75% of the total discards in Subarea 4 were obtained from sampling programmes. For Subdivision 20, 47% of the total discards were obtained from sampling programmes. BMS landings, where reported, are included with discards in the assessment from 2016 onwards. |
| Indicators | None |
| Other information | Catch information, landings since 1984, and discards since 2002 for plaice from Subdivision 20 (Skagerrak) are now added to plaice for Subarea 4 (North Sea). Plaice migrate into Division 7.d during quarter 1; 50% of the mature catches in Division 7.d were assigned, therefore, to the North Sea plaice stock during the stock assessment. This stock was last benchmarked in 2022 (ICES, 2022a). |
| Working groups | Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) |

History of the advice, catch, and management

Table 6a Plaice in Subarea 4 and Subdivision 20. **North Sea (Subarea 4)**. ICES advice, TAC, and official and ICES estimates of landings and discards. All weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice^ | Agreed TAC | Official landings | ICES landings | ICES discards^^ |
|------|---|----------------------------------|--------------------------------|------------|-------------------|---------------|-----------------|
| 1987 | F < F (84); TAC | 120 000 | | 150 000 | 130 794 | 153 670 | 190 524 |
| 1988 | 70% of F (85); TAC | 150 000 | | 175 000 | 138 412 | 154 475 | 156 423 |
| 1989 | Reduce F; buffer SSB | < 175 000 | | 185 000 | 152 408 | 169 818 | 107 793 |
| 1990 | <i>Status quo</i> F; TAC | 171 000 | | 180 000 | 156 261 | 156 240 | 71 225 |
| 1991 | No increase in F; TAC | 169 000 | | 175 000 | 143 565 | 148 003 | 80 935 |
| 1992 | No long-term gains in increasing F | -* | | 175 000 | 123 482 | 125 190 | 57 049 |
| 1993 | No long-term gains in increasing F | 170 000 * | | 175 000 | 115 278 | 117 113 | 35 016 |
| 1994 | No long-term gains in increasing F | -* | | 165 000 | 109 679 | 110 392 | 23 785 |
| 1995 | Significant reduction in F | 87 000** | | 115 000 | 96 410 | 98 356 | 21 828 |
| 1996 | Reduction in F of 40% | 61 000 | | 81 000 | 80 033 | 81 673 | 52 049 |
| 1997 | Reduction in F of 20% | 80 000 | | 91 000*** | 81 483 | 83 048 | 100 145 |
| 1998 | Fish at F = 0.3 | 82 000 | | 87 000 | 70 365 | 71 534 | 103 751 |
| 1999 | Fish at F = 0.3 | 106 000 | | 102 000 | 78 617 | 80 662 | 70 976 |
| 2000 | Fish at F = 0.3 | 95 000 | | 97 000 | 82 151 | 81 150 | 44 311 |
| 2001 | Fish at F = 0.26 | 78 000 | | 78 000 | 79 700 | 81 847 | 100 309 |
| 2002 | F < F _{pa} | < 77 000 | | 77 000 | 69 705 | 70 217 | 54 525 |
| 2003 | Fish at F = 0.23 | 60 000 | | 73 000 | 65 669 | 66 489 | 77 838 |
| 2004 | Recovery plan | - | | 61 000 | 61 008 | 61 436 | 54 605 |
| 2005 | Rebuild the SSB above B _{pa} in 2006 | 35 000 | | 59 000 | 54 908 | 55 700 | 54 169 |
| 2006 | Rebuild the SSB above B _{pa} in 2007 | 48 000 | | 57 000 | 55 933 | 57 943 | 61 917 |
| 2007 | Rebuild the SSB above B _{pa} in 2008 | < 32 000 | | 50 000 | 49 031 | 49 744 | 39 511 |
| 2008 | Rebuild the SSB above B _{pa} in 2009 | < 35 000 | | 49 000 | 47 682 | 48 875 | 45 950 |
| 2009 | Limit total landings to 55 500 t | < 55 500 | | 55 500 | n/a | 54 973 | 45 292 |
| 2010 | Limit total landings to 63 825 t | < 63 800 | | 63 800 | 50 666 | 60 674 | 45 728 |
| 2011 | See scenarios | < 64 200 | | 73 400 | 65 923 | 67 386 | 40 553 |
| 2012 | Apply first stage of the management plan | < 84 410 | | 84 400 | 71 246 | 73 830 | 59 068 |
| 2013 | Apply first stage of the management plan | < 97 070 | | 97 100 | 78 982 | 78 905 | 38 864 |
| 2014 | Apply first stage of the management plan | < 111 631 | | 111 600 | 69 179 | 70 847 | 51 915 |
| 2015 | (November update) apply second stage of the management plan | < 128 376 | 179 301 | 128 376 | 74 807 | 74 963 | 49 432 |
| 2016 | Apply second stage of the management plan | - | ≤ 216 345 | 131 714 | 78 659 | 81 059 | 42 063 |
| 2017 | MSY approach | - | ≤ 158 201 | 129 917 | 64 352 | 65 442 | 37 613 |
| 2018 | MSY approach | - | ≤ 142 481 | 112 643 | 49 513 | 50 783 | 46 305 |
| 2019 | MSY approach | - | ≤ 142 217 | 125 435 | 39 374 | 39 972 | 33 397 |
| 2020 | MSY approach | - | ≤ 166 499 | 146 852 | 32 110 | 32 736 | 35 747 |
| 2021 | MSY approach (value revised in May 2021) | - | ≤ 167 785 | 143 419 | 28 708 | 28 915 | 34 585 |
| 2022 | MSY approach | - | ≤ 142 508 | 125 692 | | | |
| 2023 | MSY approach | - | ≤ 150 705 | | | | |

* Catch at *status quo* F.

** Catch at 20% reduction in F.

*** After revision from 77 000 t.

^ From 2016 onwards, the advice is for the combined North Sea and Skagerrak stock.

^^ Since 2016, discards include BMS landings.

n/a = not available.

Table 6b Plaice in Subarea 4 and Subdivision 20. **Skagerrak (Subdivision 20)**. ICES advice, TAC, official and ICES estimates of landings and discards. All weights are in tonnes. Advice until 2012 was provided for Skagerrak and Kattegat separately. Since 2016, the Skagerrak component has been merged with plaice in Subarea 4.

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice [^] | Agreed TAC | Official landings | ICES landings | ICES discards** |
|------|---|----------------------------------|--|------------|-------------------|---------------|-----------------|
| 1992 | TAC | 14 000 | | 11 200 | 11 823 | 9554 | |
| 1993 | Precautionary TAC | - | | 11 200 | 11 407 | 9854 | |
| 1994 | If required, precautionary TAC | - | | 11 200 | 11 334 | 9551 | |
| 1995 | If required, precautionary TAC | - | | 11 200 | 10 766 | 9380 | |
| 1996 | If required, precautionary TAC | - | | 11 200 | 10 517 | 8003 | |
| 1997 | No advice | - | | 11 200 | 10 292 | 7814 | |
| 1998 | No increase in F from the present level | 11 900 | | 11 200 | 8431 | 6449 | |
| 1999 | No increase in F from the present level | 11 000 | | 11 200 | 8719 | 7049 | |
| 2000 | $F < F_{pa}$ | 11 800 | | 11 200 | 8826 | 6989 | |
| 2001 | $F < F_{pa}$ | 9400 | | 9400 | 11 653 | 9231 | |
| 2002 | $F < F_{pa}$ | 8510 | | 6420 | 8789 | 7102 | 574 |
| 2003 | $F < F_{pa}$ | 18 400 | | 10 400 | 9110 | 7143 | 1437 |
| 2004 | $F < F_{pa}$ | * | | 9500 | 9090 | 8033 | 2873 |
| 2005 | $F < F_{pa}$ | < 9500 | | 7600 | 6764 | 6099 | 2081 |
| 2006 | No increase in F | < 9600 | | 7600 | 9565 | 8345 | 2243 |
| 2007 | Maintain current TAC | < 9600 | | 8500 | 8747 | 7621 | 2862 |
| 2008 | No increase in catch | < 9400 | | 9300 | 8657 | 8356 | 1043 |
| 2009 | Same advice as last year | < 9400 | | 9300 | 6748 | 6514 | 610 |
| 2010 | Same advice as last year | < 9400 | | 9300 | 9057 | 8700 | 842 |
| 2011 | Average landings from last three years (2007–2009) | < 8000 | | 7900 | 8251 | 8218 | 1040 |
| 2012 | Reduce catch | - | | 7900 | 7611 | 7680 | 846 |
| 2013 | Increase catch by 7% – protect eastern component | | < 8 400 | 9142 | 6911 | 6812 | 1161 |
| 2014 | Increase catch by 7% – protect eastern component | < 8972 | < 10 196 | 10 056 | 9004 | 9213 | 1022 |
| 2015 | Decrease catch (2012–2013) by 13% – protect eastern component | ≤ 6287 | ≤ 7 232 | 10 056 | 10 171 | 9804 | 676 |
| 2016 | Apply second stage of the management plan | - | ≤ 216 345 | 11 766 | 10 883 | 10 900 | 1908 |
| 2017 | MSY approach | - | ≤ 158 201 | 17 639 | 8467 | 8775 | 1353 |
| 2018 | MSY approach | - | ≤ 142 481 | 15 343 | 5958 | 6229 | 1487 |
| 2019 | MSY approach | - | ≤ 142 217 | 16 782 | 4614 | 8091 | 316 |
| 2020 | MSY approach | - | ≤ 166 499 | 19 647 | 5179 | 7826 | 2 363 |
| 2021 | MSY approach (value revised in May 2021) | - | ≤ 167 785 | 19 188 | 4286 | 6775 | 2628 |
| 2022 | MSY approach | - | ≤ 142 508 | 16 816 | | | |
| 2023 | MSY approach | | ≤ 150 705 | | | | |

* The exploitation of this stock should be conducted in the context of mixed fisheries.

** Since 2016, discards include BMS landings.

[^] From 2016 onwards, the advice is for the combined North Sea and Skagerrak stock.

History of the catch and landings

Table 7 Plaice in Subarea 4 and Subdivision 20. Catch distribution by fleet in Subarea 4 and Subdivision 20 in 2021 as estimated by ICES. Weights are in tonnes.

| Catch | Landings | | | Discards |
|--------|-------------------|--------------------|--------------|----------|
| | Beam trawl 52% | Otter trawl 33% | Other 15% | |
| 72 903 | | | 35 690 | 37 213 |

Table 8 Plaice in Subarea 4 and Subdivision 20. History of official commercial catch and landings of plaice in Subarea 4, along with ICES estimates. All weights are in tonnes.

| Year | Belgium | Denmark | France | Germany | Netherlands | Norway | Sweden | UK | Others | Landings (official) | Landings (ICES estimates) | BMS landings (official) |
|------|---------|---------|--------|---------|-------------|--------|--------|--------|--------|---------------------|---------------------------|-------------------------|
| 1980 | 7 005 | 27 057 | 711 | 4 319 | 39 782 | 15 | 7 | 23 032 | 0 | 101 928 | 139 951 | |
| 1981 | 6 346 | 22 026 | 586 | 3 449 | 40 049 | 18 | 3 | 21 519 | 0 | 93 996 | 139 697 | |
| 1982 | 6 755 | 24 532 | 1 046 | 3 626 | 41 208 | 17 | 6 | 20 740 | 0 | 97 930 | 154 546 | |
| 1983 | 9 716 | 18 749 | 1 185 | 2 397 | 51 328 | 15 | 22 | 17 400 | 0 | 100 812 | 144 030 | |
| 1984 | 11 393 | 22 154 | 604 | 2 485 | 61 478 | 16 | 13 | 16 853 | 0 | 114 996 | 156 149 | |
| 1985 | 9 965 | 28 236 | 1 010 | 2 197 | 90 950 | 23 | 18 | 15 912 | 0 | 148 311 | 159 838 | |
| 1986 | 7 232 | 26 332 | 751 | 1 809 | 74 447 | 21 | 16 | 17 294 | 0 | 127 902 | 165 347 | |
| 1987 | 8 554 | 21 597 | 1 580 | 1 794 | 76 612 | 12 | 7 | 20 638 | 0 | 130 794 | 153 670 | |
| 1988 | 11 527 | 20 259 | 1 773 | 2 566 | 77 724 | 21 | 2 | 24 497 | 43 | 138 412 | 154 475 | |
| 1989 | 10 939 | 23 481 | 2 037 | 5 341 | 84 173 | 321 | 12 | 26 104 | 0 | 152 408 | 169 818 | |
| 1990 | 13 940 | 26 474 | 1 339 | 8 747 | 78 204 | 1 756 | 169 | 25 632 | 0 | 156 261 | 156 240 | |
| 1991 | 14 328 | 24 356 | 508 | 7 926 | 67 945 | 560 | 103 | 27 839 | 0 | 143 565 | 148 003 | |
| 1992 | 12 006 | 20 891 | 537 | 6 818 | 51 064 | 836 | 53 | 31 277 | 0 | 123 482 | 125 190 | |
| 1993 | 10 814 | 16 452 | 603 | 6 895 | 48 552 | 827 | 7 | 31 128 | 0 | 115 278 | 117 113 | |
| 1994 | 7 951 | 17 056 | 407 | 5 697 | 50 289 | 524 | 6 | 27 749 | 0 | 109 679 | 110 392 | |
| 1995 | 7 093 | 13 358 | 442 | 6 329 | 44 263 | 527 | 3 | 24 395 | 0 | 96 410 | 98 356 | |
| 1996 | 5 765 | 11 776 | 379 | 4 780 | 35 419 | 917 | 5 | 20 992 | 0 | 80 033 | 81 673 | |
| 1997 | 5 223 | 13 940 | 254 | 4 159 | 34 143 | 1 620 | 10 | 22 134 | 0 | 81 483 | 83 048 | |
| 1998 | 5 592 | 10 087 | 489 | 2 773 | 30 541 | 965 | 2 | 19 915 | 1 | 70 365 | 71 534 | |
| 1999 | 6 160 | 13 468 | 624 | 3 144 | 37 513 | 643 | 4 | 17 061 | 0 | 78 617 | 80 662 | |
| 2000 | 7 260 | 13 408 | 547 | 4 310 | 35 030 | 883 | 3 | 20 710 | 0 | 82 151 | 81 150 | |
| 2001 | 6 369 | 13 797 | 429 | 4 739 | 33 290 | 1 926 | 3 | 19 147 | 0 | 79 700 | 81 847 | |
| 2002 | 4 859 | 12 552 | 548 | 3 927 | 29 081 | 1 996 | 2 | 16 740 | 0 | 69 705 | 70 217 | |
| 2003 | 4 570 | 13 742 | 343 | 3 800 | 27 353 | 1 967 | 2 | 13 892 | 0 | 65 669 | 66 489 | |
| 2004 | 4 314 | 12 123 | 231 | 3 649 | 23 662 | 1 744 | 1 | 15 284 | 0 | 61 008 | 61 436 | |
| 2005 | 3 396 | 11 385 | 112 | 3 379 | 22 271 | 1 660 | 0 | 12 705 | 0 | 54 908 | 55 700 | |
| 2006 | 3 487 | 11 907 | 132 | 3 599 | 22 764 | 1 614 | 0 | 12 429 | 0 | 55 933 | 57 943 | |
| 2007 | 3 866 | 8 128 | 144 | 2 643 | 21 465 | 1 224 | 4 | 11 557 | 0 | 49 031 | 49 744 | |

| Year | Belgium | Denmark | France | Germany | Netherlands | Norway | Sweden | UK | Others | Landings (official) | Landings (ICES estimates) | BMS landings (official) |
|-------|---------|---------|--------|---------|-------------|--------|--------|--------|--------|---------------------|---------------------------|-------------------------|
| 2008 | 3 396 | 8 229 | 125 | 3 138 | 20 312 | 1 051 | 20 | 11 411 | 0 | 47 682 | 48 875 | |
| 2009 | 3 474 | n/a | n/a | 2 931 | 29 142 | 1 116 | 1 | 13 143 | 0 | n/a | 54 973 | |
| 2010 | 3 699 | 435 | 383 | 3 601 | 26 689 | 1 089 | 5 | 14 765 | 0 | 50 666 | 60 674 | |
| 2011 | 4 466 | 11 634 | 344 | 3 812 | 29 272 | 1 223 | 3 | 15 169 | 0 | 65 923 | 67 386 | |
| 2012 | 4 862 | 12 245 | 281 | 3 742 | 32 201 | 1 022 | 5 | 16 888 | 0 | 71 246 | 73 830 | |
| 2013 | 6 462 | 13 650 | 249 | 4 903 | 33 537 | 843 | 3 | 19 334 | 0 | 78 982 | 78 905 | |
| 2014 | 7 105 | 12 004 | 276 | 4 203 | 29 309 | 577 | 5 | 17 370 | 0 | 69 179 | 70 847 | |
| 2015 | 5 522 | 14 401 | 223 | 5 171 | 32 074 | 169 | 7 | 17 240 | 0 | 74 807 | 74 963 | |
| 2016 | 6 659 | 16 398 | 169 | 4 371 | 32 227 | 94 | 9 | 18 731 | 0 | 78 659 | 81 059 | |
| 2017 | 5 317 | 12 518 | 151 | 2 526 | 28 775 | 67 | 5 | 14 993 | 0 | 64 352 | 65 442 | 5 |
| 2018 | 4 894 | 9 666 | 112 | 2 580 | 22 586 | 69 | 3 | 9 603 | 0 | 49 513 | 50 783 | 90 |
| 2019 | 3 912 | 6 583 | 61 | 2 059 | 19 289 | 57 | 3 | 7 410 | 0 | 39 374 | 39 970 | 207 |
| 2020* | 2 560 | 5 636 | 25 | 1 396 | 16 870 | 37 | 5 | 5 582 | 0 | 32 110 | 32 736 | 184 |
| 2021* | 2 898 | 4 901 | 9 | 1 255 | 14 757 | 24 | 4 | 4 859 | 0 | 28 708 | 28 915 | 197 |

n/a = not available.

* preliminary

Table 9 Plaice in Subarea 4 and Subdivision (SD) 20. Historical official landings, along with ICES estimated landings for plaice in Subdivision (SD) 20 for each country participating in the fishery. All weights are in tonnes.

| Year | Denmark | Sweden | Germany | Belgium | Norway | Netherlands | Landings (ICES estimates) | Landings (official) | BMS landings (official) |
|------|---------|--------|---------|---------|--------|-------------|---------------------------|---------------------|-------------------------|
| 1972 | 5 095 | 70 | | | 3 | | 5 168 | | |
| 1973 | 3 871 | 80 | | | 6 | | 3 957 | | |
| 1974 | 3 429 | 70 | | | 5 | | 3 504 | | |
| 1975 | 4 888 | 77 | | | 6 | | 4 971 | | |
| 1976 | 9 251 | 51 | | 717 | 6 | | 10 025 | | |
| 1977 | 12 855 | 142 | | 846 | 6 | | 13 849 | | |
| 1978 | 13 383 | 94 | | 371 | 9 | | 13 857 | | |
| 1979 | 11 045 | 67 | | 763 | 9 | | 11 884 | | |
| 1980 | 9 514 | 71 | | 914 | 11 | | 10 510 | - | |
| 1981 | 8 115 | 110 | | 263 | 13 | | 8 501 | | |
| 1982 | 7 789 | 146 | | 127 | 11 | | 8 073 | | |
| 1983 | 6 828 | 155 | | 133 | 14 | | 7 130 | | |
| 1984 | 7 560 | 311 | | 27 | 22 | | 7 921 | | |
| 1985 | 9 646 | 296 | | 136 | 18 | | 10 095 | | |
| 1986 | 10 645 | 202 | | 505 | 26 | | 11 378 | | |
| 1987 | 11 327 | 241 | | 907 | 27 | | 12 503 | 15 694 | |
| 1988 | 9 782 | 281 | | 716 | 41 | | 10 820 | 12 858 | |
| 1989 | 5 414 | 320 | | 230 | 33 | | 5 997 | 7 710 | |
| 1990 | 8 729 | 779 | | 471 | 69 | | 10 048 | 12 078 | |
| 1991 | 5 809 | 472 | 15 | 315 | 68 | | 6 679 | 8 685 | |
| 1992 | 8 514 | 381 | 16 | 537 | 106 | | 9 554 | 11 823 | |
| 1993 | 9 125 | 287 | 37 | 326 | 79 | | 9 854 | 11 407 | |
| 1994 | 8 783 | 315 | 37 | 325 | 91 | | 9 551 | 11 334 | |
| 1995 | 8 468 | 337 | 48 | 302 | 224 | | 9 380 | 10 766 | |
| 1996 | 7 304 | 260 | 11 | | 428 | | 8 003 | 10 517 | |
| 1997 | 7 306 | 244 | 14 | | 249 | | 7 814 | 10 292 | |
| 1998 | 6 132 | 208 | 11 | | 98 | | 6 449 | 8 431 | |
| 1999 | 6 473 | 233 | 7 | | 336 | | 7 049 | 8 719 | |
| 2000 | 6 680 | 230 | 5 | | 67 | | 6 989 | 8 826 | |
| 2001 | 9 045 | 125 | | | 61 | | 9 231 | 11 653 | |
| 2002 | 6 773 | 141 | 3 | | 164 | 3 | 7 102 | 8 789 | |
| 2003 | 5 079 | 143 | 8 | | 385 | 1 484 | 7 143 | 9 110 | |
| 2004 | 5 999 | 545 | 67 | | 111 | 1 288 | 8 033 | 9 090 | |
| 2005 | 4 684 | 554 | 14 | | 9 | 823 | 6 099 | 6 764 | |
| 2006 | 6 563 | 366 | 21 | | 352 | 1 059 | 8 345 | 9 565 | |
| 2007 | 5 656 | 281 | 21 | | 166 | 1 503 | 7 621 | 8 747 | |
| 2008 | 7 163 | 220 | 17 | | 117 | 775 | 8 356 | 8 657 | |
| 2009 | 5 828 | 92 | 13 | | 62 | 506 | 6 514 | 6 748 | |
| 2010 | 7 101 | 127 | 13 | | 103 | 1 331 | 8 700 | 9 057 | |
| 2011 | 7 746 | 179 | 13 | | 230 | 15 | 8 218 | 8 251 | |
| 2012 | 7 338 | 155 | 12 | | 136 | 10 | 7 680 | 7 611 | |
| 2013 | 6 326 | 160 | 10 | | 138 | 181 | 6 812 | 6 911 | |
| 2014 | 7 484 | 240 | 46 | | 48 | 506 | 8 324 | 9 004 | |
| 2015 | 7 808 | 274 | 14 | | 69 | 1 639 | 9 804 | 10 171 | |
| 2016 | 8 035 | 218 | 14 | 0 | 84 | 2 550 | 10 900 | 10 883 | |
| 2017 | 6 864 | 159 | 11 | 0 | 154 | 1 588 | 8 775 | 8 467 | 2 |
| 2018 | 4 382 | 70 | 7 | 0 | 26 | 1 743 | 6 229 | 5 958 | 19 |
| 2019 | 4 605 | 40 | 15 | 0 | 9 | 3 422 | 8 091 | 4 614 | 13 |
| 2020 | 5 099 | 65 | 50 | 0 | 7 | 2 605 | 7 826 | 5 179* | 6 |
| 2021 | 4 224 | 41 | 44 | 0 | 2 | 2 464 | 6 775 | 4 286* | 7 |

* preliminary

Table 10 Plaice in Subarea 4 and Subdivision 20. History of official commercial landings, along with ICES catches estimates for the stock. All weights are in tonnes.

| Year | Total landings 4 + SD 20 (ICES estimates) | Total discards 4 + SD 20 ** (ICES estimates) | Total landings 4 + SD 20 (Official) | Landings 7d *** (ICES estimates) | Discards 7d *** (ICES estimates) |
|------|--|---|--|-------------------------------------|-------------------------------------|
| 1980 | 150 461 | 31 080 | 101 928 | 328 | |
| 1981 | 148 198 | 33 031 | 93 996 | 585 | |
| 1982 | 162 619 | 49 127 | 97 930 | 635 | |
| 1983 | 151 160 | 74 483 | 100 812 | 731 | |
| 1984 | 164 070 | 70 816 | 114 996 | 702 | |
| 1985 | 169 933 | 60 549 | 148 311 | 786 | |
| 1986 | 176 725 | 129 953 | 127 902 | 893 | |
| 1987 | 166 173 | 190 524 | 146 488 | 1046 | |
| 1988 | 165 295 | 156 423 | 151 270 | 1258 | |
| 1989 | 175 815 | 107 793 | 160 118 | 1281 | |
| 1990 | 166 288 | 71 225 | 168 339 | 1306 | |
| 1991 | 154 682 | 80 935 | 152 250 | 1116 | |
| 1992 | 134 744 | 57 049 | 135 305 | 860 | |
| 1993 | 126 967 | 35 016 | 126 685 | 655 | |
| 1994 | 119 943 | 23 785 | 121 013 | 826 | |
| 1995 | 107 736 | 21 828 | 107 176 | 718 | |
| 1996 | 89 676 | 52 049 | 90 550 | 741 | |
| 1997 | 90 862 | 100 145 | 91 775 | 867 | |
| 1998 | 77 983 | 103 751 | 78 796 | 716 | |
| 1999 | 87 711 | 70 976 | 87 336 | 814 | |
| 2000 | 88 139 | 44 311 | 90 977 | 1149 | |
| 2001 | 91 078 | 100 309 | 91 353 | 682 | |
| 2002 | 77 319 | 55 099 | 78 494 | 716 | |
| 2003 | 73 632 | 79 275 | 74 779 | 366 | |
| 2004 | 69 469 | 57 478 | 70 098 | 418 | |
| 2005 | 61 799 | 56 250 | 61 672 | 389 | |
| 2006 | 66 288 | 64 160 | 65 498 | 324 | 16 |
| 2007 | 57 365 | 42 373 | 57 778 | 477 | 25 |
| 2008 | 57 231 | 46 993 | 56 339 | 451 | 37 |
| 2009 | 61 487 | 45 902 | n/a | 335 | 43 |
| 2010 | 69 374 | 46 570 | 59 723 | 385 | 76 |
| 2011 | 75 604 | 41 593 | 74 174 | 275 | 76 |
| 2012 | 81 510 | 59 914 | 78 857 | 418 | 225 |
| 2013 | 85 717 | 40 025 | 85 893 | 402 | 200 |
| 2014 | 80 060 | 52 937 | 78 183 | 496 | 432 |
| 2015 | 84 767 | 50 108 | 84 978 | 593 | 348 |
| 2016 | 91 959 | 43 971 | 89 542 | 785 | 395 |
| 2017 | 74 217 | 38 966 | 72 819 | 711 | 762 |
| 2018 | 57 012 | 47 792 | 55 471 | 788 | 446 |
| 2019 | 48 063 | 36 713 | 43 988 | 681 | 657 |
| 2020 | 40 562 | 38 110 | 37 289* | 326 | 223 |
| 2021 | 35 690 | 37 213 | 32 994* | 241 | 316 |

n/a = not available.

* preliminary

** Since 2016, discards include BMS landings.

*** Part of the catches in Division 7.d during spawning migration in the first quarter.

Summary of the assessment

Table 11 Plaice in Subarea 4 and Subdivision 20. Assessment summary. Recruitments are in thousands, weights are in tonnes. Highs and lows refer to 95% confidence intervals.

| Year | Recruitment (Age 1) | | | Spawning-stock biomass | | | Fishing pressure (Ages 2–6) | | | Landings * | Discards *** |
|------|---------------------|------------|-----------|------------------------|-----------|---------|-----------------------------|-------|-------|------------|--------------|
| | R | High | Low | SSB | High | Low | F | High | Low | | |
| 1957 | 1 777 447 | 2 345 621 | 1 346 901 | 807 544 | 1 091 964 | 597 206 | 0.110 | 0.140 | 0.086 | 70 563 | 7 880 |
| 1958 | 2 574 779 | 3 364 861 | 1 970 212 | 805 719 | 1 073 076 | 604 974 | 0.128 | 0.161 | 0.101 | 73 354 | 14 837 |
| 1959 | 3 051 492 | 3 976 239 | 2 341 812 | 799 447 | 1 049 476 | 608 986 | 0.145 | 0.181 | 0.116 | 79 300 | 29 864 |
| 1960 | 2 704 808 | 3 512 926 | 2 082 591 | 824 896 | 1 063 685 | 639 713 | 0.149 | 0.185 | 0.120 | 87 541 | 29 793 |
| 1961 | 2 913 510 | 3 772 886 | 2 249 879 | 829 414 | 1 053 586 | 652 939 | 0.148 | 0.183 | 0.120 | 85 984 | 32 490 |
| 1962 | 2 094 935 | 2 706 940 | 1 621 297 | 991 853 | 1 259 109 | 781 324 | 0.160 | 0.197 | 0.131 | 87 472 | 37 903 |
| 1963 | 2 463 849 | 3 183 255 | 1 907 026 | 895 708 | 1 119 703 | 716 523 | 0.182 | 0.22 | 0.150 | 107 118 | 41 258 |
| 1964 | 6 266 903 | 8 163 903 | 4 810 698 | 882 605 | 1 097 211 | 709 974 | 0.188 | 0.23 | 0.155 | 110 540 | 37 031 |
| 1965 | 2 422 182 | 3 112 906 | 1 884 723 | 779 390 | 948 816 | 640 218 | 0.170 | 0.21 | 0.140 | 97 143 | 43 080 |
| 1966 | 1 901 768 | 2 439 265 | 1 482 709 | 833 998 | 1 012 695 | 686 833 | 0.182 | 0.22 | 0.151 | 101 834 | 64 718 |
| 1967 | 1 281 557 | 1 643 582 | 999 274 | 957 752 | 1 156 304 | 793 294 | 0.184 | 0.22 | 0.154 | 108 819 | 54 546 |
| 1968 | 1 314 378 | 1 677 427 | 1 029 905 | 900 101 | 1 085 134 | 746 620 | 0.166 | 0.197 | 0.139 | 111 534 | 27 987 |
| 1969 | 1 882 310 | 2 389 191 | 1 482 967 | 800 516 | 961 129 | 666 743 | 0.177 | 0.21 | 0.151 | 121 651 | 21 169 |
| 1970 | 1 739 388 | 2 196 713 | 1 377 272 | 737 568 | 884 324 | 615 166 | 0.23 | 0.27 | 0.193 | 130 342 | 29 640 |
| 1971 | 1 144 435 | 1 438 667 | 910 378 | 676 348 | 808 189 | 566 014 | 0.21 | 0.24 | 0.176 | 113 944 | 22 995 |
| 1972 | 1 010 330 | 1 268 583 | 804 651 | 660 542 | 781 577 | 558 250 | 0.22 | 0.26 | 0.191 | 122 843 | 19 632 |
| 1973 | 3 345 467 | 4 200 703 | 2 664 352 | 543 347 | 640 048 | 461 255 | 0.25 | 0.29 | 0.22 | 130 429 | 13 354 |
| 1974 | 2 586 583 | 3 236 391 | 2 067 245 | 535 511 | 619 757 | 462 716 | 0.27 | 0.31 | 0.23 | 112 540 | 44 945 |
| 1975 | 1 836 871 | 2 297 706 | 1 468 462 | 541 835 | 620 036 | 473 497 | 0.31 | 0.35 | 0.27 | 108 536 | 86 699 |
| 1976 | 1 504 720 | 1 879 404 | 1 204 733 | 559 399 | 635 526 | 492 390 | 0.26 | 0.29 | 0.22 | 113 670 | 53 247 |
| 1977 | 2 157 308 | 2 689 748 | 1 730 265 | 561 052 | 632 644 | 497 561 | 0.29 | 0.33 | 0.25 | 119 188 | 57 501 |
| 1978 | 1 930 926 | 2 404 823 | 1 550 415 | 534 593 | 599 201 | 476 952 | 0.28 | 0.32 | 0.25 | 113 984 | 45 655 |
| 1979 | 1 865 315 | 2 324 199 | 1 497 032 | 511 239 | 569 344 | 459 064 | 0.38 | 0.43 | 0.34 | 145 347 | 67 935 |
| 1980 | 2 705 160 | 3 368 465 | 2 172 471 | 497 571 | 556 427 | 444 940 | 0.33 | 0.37 | 0.29 | 140 764 | 31 080 |
| 1981 | 2 130 023 | 2 648 313 | 1 713 166 | 467 552 | 519 690 | 420 646 | 0.33 | 0.37 | 0.29 | 141 233 | 33 031 |
| 1982 | 4 597 953 | 5 721 848 | 3 694 815 | 450 554 | 499 076 | 406 749 | 0.36 | 0.40 | 0.32 | 156 153 | 49 127 |
| 1983 | 3 084 917 | 3 830 144 | 2 484 688 | 544 782 | 600 011 | 494 638 | 0.35 | 0.39 | 0.31 | 145 779 | 74 483 |
| 1984 | 2 924 046 | 3 628 736 | 2 356 205 | 561 149 | 615 154 | 511 885 | 0.36 | 0.40 | 0.32 | 165 772 | 70 816 |
| 1985 | 3 695 236 | 4 580 468 | 2 981 086 | 598 280 | 654 676 | 546 742 | 0.34 | 0.38 | 0.31 | 171 838 | 60 549 |
| 1986 | 9 413 689 | 11 646 524 | 7 608 927 | 624 663 | 679 204 | 574 502 | 0.42 | 0.47 | 0.38 | 178 878 | 129 953 |
| 1987 | 4 262 104 | 5 269 402 | 3 447 361 | 746 710 | 813 395 | 685 492 | 0.46 | 0.51 | 0.41 | 168 759 | 190 524 |
| 1988 | 4 221 792 | 5 219 402 | 3 414 860 | 647 360 | 706 025 | 593 569 | 0.44 | 0.49 | 0.39 | 168 552 | 156 423 |
| 1989 | 2 878 911 | 3 561 246 | 2 327 312 | 701 085 | 770 196 | 638 175 | 0.38 | 0.43 | 0.34 | 178 891 | 107 793 |
| 1990 | 2 543 192 | 3 143 087 | 2 057 794 | 629 992 | 691 958 | 573 574 | 0.36 | 0.41 | 0.32 | 169 453 | 71 225 |
| 1991 | 2 405 496 | 2 982 354 | 1 940 216 | 580 728 | 636 886 | 529 521 | 0.40 | 0.45 | 0.36 | 157 277 | 80 935 |
| 1992 | 2 100 116 | 2 609 017 | 1 690 479 | 495 074 | 544 604 | 450 049 | 0.39 | 0.44 | 0.35 | 136 727 | 57 049 |
| 1993 | 1 348 263 | 1 672 073 | 1 087 161 | 445 227 | 491 211 | 403 548 | 0.36 | 0.41 | 0.32 | 128 506 | 35 016 |
| 1994 | 1 164 663 | 1 443 100 | 939 948 | 389 446 | 430 553 | 352 264 | 0.36 | 0.41 | 0.32 | 121 925 | 23 785 |
| 1995 | 2 471 067 | 3 047 735 | 2 003 511 | 370 772 | 411 643 | 333 959 | 0.38 | 0.43 | 0.33 | 109 348 | 21 828 |
| 1996 | 2 764 040 | 3 406 398 | 2 242 814 | 348 525 | 387 893 | 313 152 | 0.40 | 0.46 | 0.35 | 91 386 | 52 049 |
| 1997 | 5 114 056 | 6 296 384 | 4 153 744 | 376 501 | 419 913 | 337 577 | 0.46 | 0.52 | 0.40 | 92 958 | 100 145 |
| 1998 | 2 076 286 | 2 551 908 | 1 689 310 | 420 275 | 470 817 | 375 158 | 0.40 | 0.46 | 0.35 | 79 810 | 103 751 |
| 1999 | 1 999 642 | 2 457 289 | 1 627 228 | 389 501 | 439 504 | 345 187 | 0.38 | 0.43 | 0.32 | 89 726 | 70 976 |
| 2000 | 2 459 946 | 3 015 288 | 2 006 885 | 410 554 | 468 183 | 360 019 | 0.30 | 0.35 | 0.26 | 90 754 | 44 311 |
| 2001 | 1 708 452 | 2 099 461 | 1 390 265 | 460 560 | 524 215 | 404 635 | 0.40 | 0.46 | 0.34 | 92 912 | 100 309 |
| 2002 | 4 842 997 | 6 020 186 | 3 895 996 | 401 319 | 461 293 | 349 143 | 0.33 | 0.38 | 0.28 | 79 178 | 55 099 |
| 2003 | 1 817 149 | 2 260 559 | 1 460 714 | 476 195 | 548 936 | 413 093 | 0.31 | 0.36 | 0.26 | 74 722 | 79 275 |
| 2004 | 3 461 146 | 4 274 111 | 2 802 812 | 465 976 | 543 374 | 399 602 | 0.23 | 0.27 | 0.194 | 70 511 | 57 478 |
| 2005 | 2 682 394 | 3 319 412 | 2 167 625 | 531 537 | 621 241 | 454 785 | 0.21 | 0.25 | 0.176 | 62 796 | 56 250 |
| 2006 | 3 160 040 | 3 925 347 | 2 543 942 | 597 793 | 701 370 | 509 512 | 0.180 | 0.21 | 0.152 | 67 143 | 64 160 |
| 2007 | 4 538 757 | 5 624 540 | 3 662 577 | 624 280 | 736 214 | 529 364 | 0.143 | 0.170 | 0.120 | 58 576 | 42 373 |
| 2008 | 4 055 831 | 5 041 072 | 3 263 148 | 798 230 | 943 825 | 675 094 | 0.113 | 0.135 | 0.094 | 58 336 | 46 993 |
| 2009 | 3 987 082 | 4 958 166 | 3 206 191 | 930 373 | 1 101 139 | 786 090 | 0.102 | 0.123 | 0.085 | 62 360 | 45 902 |
| 2010 | 4 333 843 | 5 387 384 | 3 486 330 | 1 076 306 | 1 275 053 | 908 538 | 0.101 | 0.121 | 0.085 | 70 340 | 46 570 |
| 2011 | 6 119 852 | 7 619 383 | 4 915 436 | 1 057 917 | 1 256 028 | 891 054 | 0.104 | 0.125 | 0.087 | 76 507 | 41 593 |
| 2012 | 3 755 868 | 4 680 589 | 3 013 840 | 1 101 077 | 1 306 817 | 927 728 | 0.111 | 0.133 | 0.092 | 82 018 | 59 914 |

| Year | Recruitment (Age 1) | | | Spawning-stock biomass | | | Fishing pressure (Ages 2–6) | | | Landings * | Discards *** |
|------|---------------------|-----------|-----------|------------------------|-----------|-----------|-----------------------------|-------|-------|------------|--------------|
| | R | High | Low | SSB | High | Low | F | High | Low | | |
| 2013 | 4 414 532 | 5 477 549 | 3 557 813 | 1 144 205 | 1 356 603 | 965 061 | 0.104 | 0.125 | 0.087 | 86 222 | 40 025 |
| 2014 | 5 410 268 | 6 728 239 | 4 350 470 | 1 219 831 | 1 446 685 | 1 028 550 | 0.111 | 0.133 | 0.093 | 80 686 | 53 011 |
| 2015 | 2 704 338 | 3 360 267 | 2 176 446 | 1 082 277 | 1 285 848 | 910 934 | 0.118 | 0.142 | 0.099 | 85 360 | 49 225 |
| 2016 | 3 026 454 | 3 758 059 | 2 437 275 | 1 042 356 | 1 243 427 | 873 800 | 0.134 | 0.161 | 0.112 | 92 744 | 44 251 |
| 2017 | 4 726 987 | 5 870 235 | 3 806 390 | 980 394 | 1 174 492 | 818 373 | 0.125 | 0.150 | 0.104 | 74 928 | 39 372 |
| 2018 | 2 840 331 | 3 546 489 | 2 274 779 | 825 079 | 990 700 | 687 146 | 0.132 | 0.159 | 0.110 | 57 800 | 48 000 |
| 2019 | 6 543 052 | 8 252 857 | 5 187 479 | 742 891 | 893 403 | 617 736 | 0.109 | 0.131 | 0.091 | 48 745 | 37 376 |
| 2020 | 4 155 293 | 5 339 116 | 3 233 955 | 774 884 | 929 416 | 646 045 | 0.095 | 0.115 | 0.079 | 40 888 | 38 270 |
| 2021 | 3 599 961 | 5 219 935 | 2 482 735 | 834 755 | 1 004 922 | 693 403 | 0.080 | 0.097 | 0.065 | 35 930 | 37 523 |
| 2022 | 3952706** | | | 930 214 | 1 133 626 | 764 258 | | | | | |

* These values include part of the catches in Division 7.d in the first quarter.

** Geometric mean of resampled recruitments from the years 2012–2021.

*** Since 2016, discards include BMS landings.

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[Download the stock assessment data and figures.](#)

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Saithe (*Pollachius virens*) in subareas 1 and 2 (Northeast Arctic)

ICES advice on fishing opportunities

ICES advises that when the Norwegian management plan is applied, catches in 2023 should be no more than 226 794 tonnes.

Bycatches of coastal cod and golden redfish (*Sebastes norvegicus*) in fisheries targeting saithe in subareas 1 and 2 should be kept as low as possible.

Stock development over time

Fishing pressure on the stock is below F_{MP} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

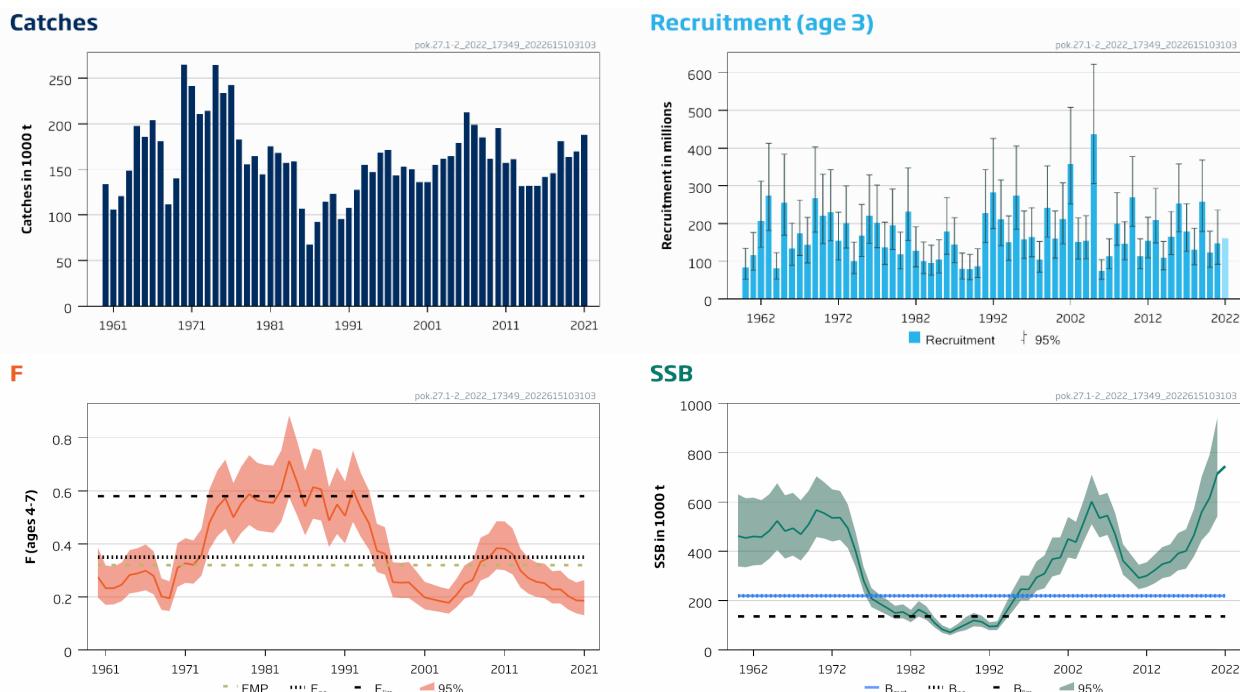


Figure 1 Saithe in subareas 1 and 2. Historical development of the stock . The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Saithe in subareas 1 and 2. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|-------------------------------|---------|--|
| $F_{ages\ 4-7}\ (2022)$ | 0.207 | Based on a catch of 197 212 tonnes for 2022. |
| SSB (2023) | 686 937 | Short-term forecast; tonnes. |
| $R_{age\ 3}\ (2022\ onwards)$ | 161 659 | Geometric mean (1960–2021); thousands. |
| Total catch (2022) | 197 212 | TAC for 2022; tonnes. |

Table 2 Saithe in subareas 1 and 2. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | F total (2023) | SSB (2024) | % SSB change* | % TAC change** | % advice change*** |
|---------------------|--------------------|----------------|------------|---------------|----------------|--------------------|
| ICES advice basis | | | | | | |
| Management plan^ | 226 794 | 0.254 | 597 899 | -13 | 15 | 15 |
| Other scenarios | | | | | | |
| F = 0 | 0 | 0 | 815 773 | 19 | -100 | -100 |
| F _{pa} | 295 900 | 0.35 | 532 739 | -22 | 50 | 50 |
| F = F _{sq} | 189 690 | 0.207 | 633 154 | -8 | -4 | -4 |

* SSB 2024 relative to SSB 2023.

** Catch advice in 2023 relative to TAC in 2022 (197 212 tonnes).

*** Catch advice in 2023 relative to the advice value for 2022 (197 212 tonnes).

^ Catch advice is based on an average of a three-year catch forecast using F_{MP}. The relevant predicted catches are 275 058 tonnes (2023), 229 797 tonnes (2024), and 199 602 tonnes (2025) which give an average of 234 819 tonnes. The advice is constrained by the stability clause of 15% which reduces this to 226 794 tonnes.

The advice for 2023 is higher than the advice for 2022 because of an increase in stock size.

Basis of the advice

Table 3 Saithe in subareas 1 and 2. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | Norwegian management plan |
| Management plan | <p>The harvest control rule (HCR), as revised in 2013 and communicated to ICES by the Norwegian Ministry of Fisheries and Coastal Affairs, contains the following elements:</p> <ul style="list-style-type: none"> – Estimate the average TAC level for the coming three years based on F_{MP} = 0.32. The TAC for the next year will be set to this level as a starting value for the three-year period. – The year after, the TAC calculation for the next three years is repeated based on updated information about the stock development. However, the TAC should not be changed by more than +/- 15% compared with the previous year's TAC. – If the spawning-stock biomass (SSB) at the beginning of the year for which the quota is set (first year of prediction) is below B_{pa}, the procedure for establishing the TAC should be based on a fishing mortality that is linearly reduced from F_{MP} at SSB = B_{pa} to zero at SSB equal to zero. At SSB levels below B_{pa} in any of the operational years (current year and three years of prediction), there should be no limitations on the year-to-year variations in TAC. <p>The HCR was last evaluated by ICES in 2011 (ICES, 2011), with F_{MP} = 0.35. The evaluation concluded that the HCR is precautionary. The F_{MP} was lowered to the current value of 0.32 by Norwegian authorities in 2013. The interbenchmark for this stock in 2014 did not result in significantly different estimates of stock dynamics, and the former HCR evaluation is still considered valid.</p> |

Quality of the assessment

The assessment is fairly consistent over recent years.

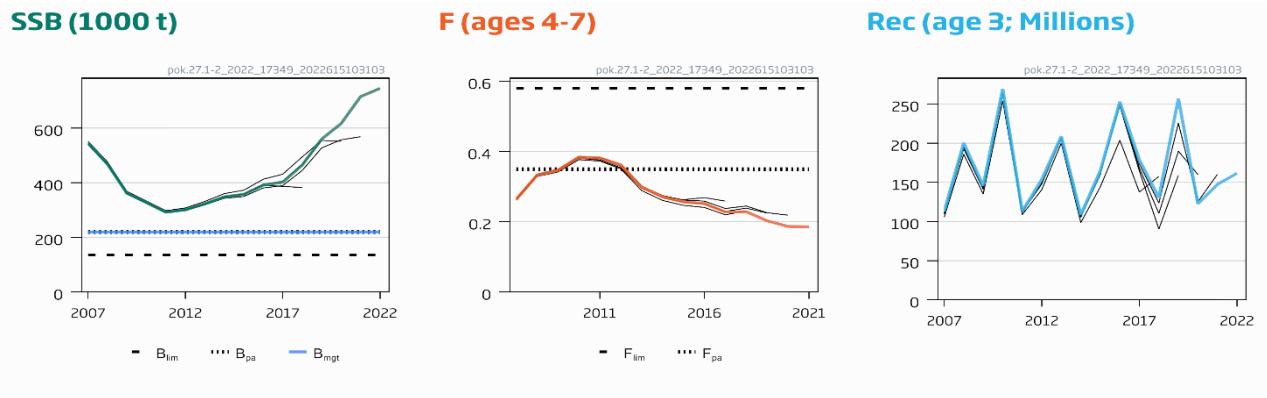


Figure 2 Saithe in subareas 1 and 2. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

The current catch of golden redfish (*Sebastodes norvegicus*) taken as bycatch in fisheries targeting Northeast Arctic (NEA) saithe constitutes a considerable part of the total *Sebastodes norvegicus* catch. Bycatch of *Sebastodes norvegicus* should be kept as low as possible because of the poor status of this stock.

Bycatch of northern coastal cod should be kept as low as possible to ensure sustainable management of coastal cod.

Predicted catches in the forecast are influenced by recent recruitment estimates; these estimates are uncertain, but they make a relatively small contribution to catches in the forecast period.

Sampling data from the Russian Federation for catches in 2021 were not available for the assessment.

Reference points

Table 4 Saithe in subareas 1 and 2. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Reference |
|------------------------|--------------------------|-------------|---|-------------------|
| MSY approach | MSY B_{trigger} | Not defined | | |
| | F_{MSY} | Not defined | | |
| Precautionary approach | B_{lim} | 136 000 t | Change point regression | ICES (2005, 2014) |
| | B_{pa} | 220 000 t | $B_{\text{lim}} \times e^{1.645 \times \sigma}$, where $\sigma = 0.3$ | ICES (2005, 2014) |
| | F_{lim} | 0.58 | F corresponding to an equilibrium stock at B_{lim} | ICES (2005, 2014) |
| | F_{pa} | 0.35 | $F_{\text{lim}} \times e^{-1.645 \times \sigma}$, where $\sigma = 0.3$. This value is considered to have a 95% probability of avoiding the F_{lim} . | ICES (2005, 2014) |
| Management plan | SSB_{MGT} | 220 000 t | B_{pa} | ICES (2011) |
| | F_{MP} | 0.32 | From the agreed MP | ICES (2014) |

Basis of the assessment

Table 5 Saithe in subareas 1 and 2. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a). |
| Assessment type | Age-based analytical assessment (SAM; ICES, 2022b) that uses landings in the model and in the forecast |
| Input data | Commercial catches (international landings, ages and length frequencies from Norwegian, German, and Russian catch sampling); one survey index from the Norwegian coastal survey Q4 (A6335, split in 2002) recalculated using StoX from 2004 onwards; three-year running average maturity based on spawning zones from otoliths from commercial catches and surveys for 1985–2006, constant (2005–2007 average) for later years. |
| Discards and bycatch | Discarding is considered negligible. Bycatch is included. |
| Indicators | None. |
| Other information | An interbenchmark was undertaken in 2014 (ICES, 2014). |
| Working group | Arctic Fisheries Working Group (AFWG). |

History of the advice, catch, and management

Table 6 Saithe in subareas 1 and 2. ICES advice, TAC, and catches. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Agreed TAC [§] | ICES catches |
|------|---|-------------------------------|-------------------------|--------------|
| 1994 | No increase in F | 158000# | 145000 | 146950 |
| 1995 | No increase in F | 221000# | 165000 | 168378 |
| 1996 | No increase in F | 158000# | 163000 | 171348 |
| 1997 | Reduction of F to F_{med} or below | 107000 | 125000 | 143629 |
| 1998 | Reduction of F to F_{med} or below | 117000 | 145000## | 153327 |
| 1999 | Reduce F below F_{pa} | 87000 | 144000### | 150375 |
| 2000 | Reduce F below F_{pa} | 89000 | 125000^ | 135928 |
| 2001 | Reduce F below F_{pa} | < 115000 | 135000 | 135853 |
| 2002 | Maintain F below F_{pa} | < 152000 | 162000^^ | 154870 |
| 2003 | Maintain F below F_{pa} | < 168000 | 164000 | 161592 |
| 2004 | Maintain F below F_{pa} | < 186000 | 169000 | 164636 |
| 2005 | Take account of <i>Sebastes marinus</i> bycatch; maintain F below F_{pa} | < 215000 | 215000 | 178568 |
| 2006 | Take account of <i>Sebastes marinus</i> bycatch; maintain F below F_{pa} | < 202000 | 193500 | 212557 |
| 2007 | Take account of <i>Sebastes marinus</i> bycatch; maintain F below F_{pa} | < 247000 | 222525 | 198967 |
| 2008 | Take account of <i>Sebastes marinus</i> bycatch; maintain F below F_{HCR} | < 247000 | < 247000 | 184840 |
| 2009 | Take account of <i>Sebastes marinus</i> bycatch; apply management plan | < 225000 | 225000 | 161865 |
| 2010 | Take account of <i>Sebastes marinus</i> bycatch; apply management plan | < 204000 | 204000 | 195554 |
| 2011 | Take account of <i>Sebastes marinus</i> bycatch; apply management plan | < 173000 | 173000 | 157048 |
| 2012 | Take account of coastal cod and <i>Sebastes marinus*</i> bycatch; apply management plan | < 164000 | 164000 | 160960 |
| 2013 | Take account of coastal cod and <i>Sebastes marinus*</i> bycatch; apply management plan | < 164000 | 140000^^^ | 131629 |
| 2014 | Take account of coastal cod and <i>Sebastes marinus*</i> bycatch; stabilize SSB | < 140000 | 119000^^^ | 132070 |
| 2015 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | < 122000 | 122000 | 132275 |
| 2016 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | < 140000 | 140000 | 141768 |
| 2017 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 150000 | 150000 | 145819 |
| 2018 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 172500 | 172500 | 181280 |

| Year | ICES advice | Catch corresponding to advice | Agreed TAC [§] | ICES catches |
|------|---|-------------------------------|-------------------------|--------------|
| 2019 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 149550 | 149550 | 163180 |
| 2020 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 171982 | 171982 | 169405 |
| 2021 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 197779 | 197779 | 188175 |
| 2022 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 197212 | 197212 | |
| 2023 | Take account of coastal cod and <i>Sebastes norvegicus</i> bycatch; apply management plan | ≤ 226794 | | |

Predicted catch at *status quo F*.

TAC first set at 125 000 tonnes, then increased in May 1998 after an intersessional assessment.

TAC set after an intersessional assessment in December 1998.

^ TAC set after an intersessional assessment in December 1999.

^^ TAC first set at 152 000 tonnes, then increased in June 2003 after the spring 2002 assessment.

^^^ Set by Norwegian authorities based on national advice, where CPUE was excluded from the assessment.

§ TAC set by Norwegian authorities.

* Until 2014 this species was named *Sebastes marinus*, thereafter *Sebastes norvegicus*.

History of the catch and landings

Table 7 Saithe in subareas 1 and 2. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch (2021) | Commercial landings | | | | Discards |
|----------------|---------------------|-------------|-------------------|--------------------|--------------------------|
| 188 175 tonnes | 15.7% gillnets | 24.5% other | 16.4% purse-seine | 43.4% bottom trawl | Assumed to be negligible |

Table 8 Saithe in subareas 1 and 2. Catches inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES.

| Year | Inside the NEAFC RA (tonnes) | Outside the NEAFC RA (tonnes) | Total catches (tonnes) | Proportion inside the NEAFC RA (%) |
|------|------------------------------|-------------------------------|------------------------|------------------------------------|
| 2018 | 2 | 181278 | 181280 | < 0.01% |
| 2019 | 257 | 162923 | 163180 | < 0.01% |
| 2020 | 0 | 169405 | 169405 | 0% |
| 2021 | 0 | 188175 | 188175 | 0% |

Summary of the assessment

Table 9 Saithe in subareas 1 and 2. Assessment summary. High and low refer to 95% confidence bounds.

| Year | Recruitment | | | Spawning-stock biomass | | | Total | Fishing mortality | | |
|------|------------------------|--------|--------|------------------------|--------|--------|--------|-------------------|------|-------|
| | Recruitment (age 3) | High | Low | SSB | High | Low | | F (ages 4–7) | High | Low |
| | thousands | | | tonnes | | | tonnes | | | |
| 1960 | 84026 | 134326 | 52561 | 462688 | 632112 | 338674 | 133515 | 0.28 | 0.39 | 0.198 |
| 1961 | 116162 | 176295 | 76540 | 454708 | 616028 | 335633 | 105951 | 0.23 | 0.32 | 0.170 |
| 1962 | 206835 | 312245 | 137011 | 460869 | 618305 | 343520 | 120707 | 0.23 | 0.32 | 0.172 |
| 1963 | 273837 | 412927 | 181598 | 458340 | 608234 | 345386 | 148627 | 0.25 | 0.33 | 0.184 |
| 1964 | 80835 | 122880 | 53177 | 483760 | 632184 | 370183 | 197426 | 0.28 | 0.38 | 0.21 |
| 1965 | 254979 | 384110 | 169260 | 523809 | 676974 | 405297 | 185600 | 0.29 | 0.38 | 0.22 |
| 1966 | 134273 | 201748 | 89365 | 482581 | 627985 | 370844 | 203788 | 0.30 | 0.40 | 0.23 |
| 1967 | 174211 | 262323 | 115695 | 494141 | 637762 | 382863 | 181326 | 0.28 | 0.37 | 0.21 |
| 1968 | 143787 | 216229 | 95615 | 469782 | 608057 | 362951 | 111424 | 0.20 | 0.27 | 0.151 |
| 1969 | 267366 | 403313 | 177243 | 509859 | 646012 | 402401 | 140060 | 0.195 | 0.26 | 0.147 |
| 1970 | 220408 | 330662 | 146917 | 568159 | 705038 | 457854 | 264924 | 0.31 | 0.40 | 0.24 |
| 1971 | 229850 | 343220 | 153927 | 554682 | 680661 | 452021 | 241272 | 0.33 | 0.42 | 0.25 |
| 1972 | 154265 | 230043 | 103449 | 535848 | 652069 | 440342 | 210456 | 0.32 | 0.41 | 0.25 |
| 1973 | 201294 | 300013 | 135058 | 537224 | 645881 | 446847 | 213859 | 0.36 | 0.46 | 0.28 |
| 1974 | 100846 | 150854 | 67415 | 493712 | 590337 | 412902 | 264121 | 0.48 | 0.61 | 0.38 |
| 1975 | 168309 | 250872 | 112918 | 398963 | 475420 | 334802 | 233453 | 0.54 | 0.68 | 0.43 |
| 1976 | 220420 | 329412 | 147490 | 281331 | 337436 | 234555 | 242486 | 0.57 | 0.72 | 0.46 |
| 1977 | 202624 | 302023 | 135938 | 208941 | 251498 | 173586 | 182817 | 0.50 | 0.63 | 0.40 |
| 1978 | 136704 | 203960 | 91625 | 189086 | 225968 | 158224 | 155464 | 0.55 | 0.69 | 0.44 |
| 1979 | 195867 | 291824 | 131462 | 170439 | 203739 | 142582 | 164680 | 0.59 | 0.74 | 0.47 |
| 1980 | 118880 | 177178 | 79764 | 150189 | 179728 | 125504 | 144554 | 0.56 | 0.71 | 0.45 |
| 1981 | 232133 | 347614 | 155017 | 154449 | 185819 | 128375 | 175540 | 0.56 | 0.70 | 0.45 |
| 1982 | 127952 | 191143 | 85652 | 135715 | 163162 | 112885 | 168034 | 0.56 | 0.70 | 0.44 |
| 1983 | 100879 | 151234 | 67291 | 164048 | 198741 | 135411 | 156936 | 0.60 | 0.75 | 0.48 |
| 1984 | 94848 | 142751 | 63020 | 146889 | 177361 | 121652 | 158786 | 0.71 | 0.89 | 0.57 |
| 1985 | 104305 | 157235 | 69193 | 110715 | 133162 | 92052 | 107183 | 0.63 | 0.79 | 0.51 |
| 1986 | 178608 | 269107 | 118543 | 83490 | 100536 | 69335 | 67396 | 0.54 | 0.68 | 0.43 |
| 1987 | 144151 | 215734 | 96320 | 72061 | 86591 | 59969 | 92391 | 0.61 | 0.76 | 0.50 |
| 1988 | 80501 | 121721 | 53240 | 88318 | 106963 | 72923 | 114242 | 0.61 | 0.75 | 0.49 |
| 1989 | 78046 | 118292 | 51493 | 104092 | 134415 | 80609 | 122817 | 0.49 | 0.62 | 0.39 |
| 1990 | 87261 | 133215 | 57160 | 120178 | 150620 | 95890 | 95848 | 0.55 | 0.69 | 0.44 |
| 1991 | 226767 | 343375 | 149759 | 114661 | 139901 | 93974 | 107327 | 0.51 | 0.64 | 0.40 |
| 1992 | 281942 | 425764 | 186702 | 95211 | 113212 | 80072 | 127604 | 0.60 | 0.75 | 0.48 |
| 1993 | 211259 | 315927 | 141268 | 97293 | 116900 | 80974 | 154903 | 0.53 | 0.67 | 0.43 |
| 1994 | 150273 | 220647 | 102344 | 148467 | 182887 | 120525 | 146950 | 0.48 | 0.60 | 0.38 |
| 1995 | 274143 | 405903 | 185154 | 197554 | 246391 | 158396 | 168378 | 0.37 | 0.48 | 0.29 |
| 1996 | 158412 | 233241 | 107589 | 246590 | 302864 | 200772 | 171348 | 0.36 | 0.46 | 0.28 |
| 1997 | 164614 | 241966 | 111990 | 246211 | 301643 | 200966 | 143629 | 0.26 | 0.33 | 0.198 |
| 1998 | 104290 | 152695 | 71230 | 294713 | 360634 | 240842 | 153327 | 0.25 | 0.33 | 0.196 |
| 1999 | 241011 | 353040 | 164532 | 309916 | 383956 | 250154 | 150375 | 0.26 | 0.33 | 0.196 |
| 2000 | 159210 | 233216 | 108688 | 368993 | 456652 | 298161 | 135928 | 0.23 | 0.30 | 0.174 |
| 2001 | 212316 | 308116 | 146303 | 374833 | 457293 | 307242 | 135853 | 0.198 | 0.26 | 0.153 |
| 2002 | 357911 | 508475 | 251930 | 450424 | 540388 | 375437 | 154870 | 0.191 | 0.25 | 0.148 |
| 2003 | 150915 | 214855 | 106003 | 437861 | 520334 | 368459 | 161592 | 0.184 | 0.24 | 0.143 |
| 2004 | 153670 | 221003 | 106851 | 518880 | 610410 | 441074 | 164636 | 0.178 | 0.23 | 0.137 |
| 2005 | 436325 | 622375 | 305892 | 602367 | 711569 | 509925 | 178568 | 0.21 | 0.27 | 0.162 |
| 2006 | 73821 | 104591 | 52104 | 535304 | 628049 | 456254 | 212557 | 0.25 | 0.32 | 0.194 |
| 2007 | 113108 | 159694 | 80112 | 545628 | 637846 | 466743 | 198967 | 0.26 | 0.34 | 0.21 |
| 2008 | 200409 | 281971 | 142439 | 468492 | 556028 | 394737 | 184840 | 0.33 | 0.42 | 0.26 |
| 2009 | 145999 | 204967 | 103996 | 361785 | 429342 | 304858 | 161865 | 0.35 | 0.44 | 0.28 |
| 2010 | 269620 | 377489 | 192575 | 327806 | 387730 | 277143 | 195554 | 0.38 | 0.49 | 0.30 |
| 2011 | 113082 | 159583 | 80132 | 292358 | 346200 | 246890 | 157048 | 0.38 | 0.49 | 0.30 |

| Year | Recruitment | | | Spawning-stock biomass | | | Total | Fishing mortality | | |
|------|------------------------|--------|--------|------------------------|--------|--------|--------|-------------------|------|-------|
| | Recruitment (age 3) | High | Low | SSB | High | Low | | F (ages 4–7) | High | Low |
| | thousands | | | tonnes | | | tonnes | | | |
| 2012 | 153896 | 216571 | 109359 | 301256 | 355904 | 254999 | 160960 | 0.36 | 0.46 | 0.28 |
| 2013 | 209004 | 293333 | 148918 | 323389 | 386947 | 270270 | 131629 | 0.30 | 0.38 | 0.24 |
| 2014 | 108650 | 152865 | 77223 | 348814 | 417817 | 291208 | 132070 | 0.27 | 0.35 | 0.21 |
| 2015 | 165109 | 232047 | 117480 | 357938 | 429363 | 298395 | 132275 | 0.26 | 0.33 | 0.20 |
| 2016 | 252926 | 358158 | 178613 | 391741 | 474963 | 323101 | 141768 | 0.25 | 0.33 | 0.195 |
| 2017 | 178636 | 252660 | 126300 | 401931 | 489720 | 329879 | 145819 | 0.23 | 0.30 | 0.175 |
| 2018 | 130677 | 187881 | 90890 | 464929 | 571597 | 378166 | 181280 | 0.23 | 0.30 | 0.175 |
| 2019 | 257000 | 368558 | 179210 | 560109 | 704413 | 445368 | 163180 | 0.20 | 0.27 | 0.152 |
| 2020 | 122722 | 179818 | 83756 | 616956 | 792107 | 480534 | 169405 | 0.187 | 0.26 | 0.138 |
| 2021 | 147428 | 235474 | 92304 | 715674 | 943818 | 542678 | 188175 | 0.186 | 0.26 | 0.131 |
| 2022 | 161659* | | | 745913** | | | | | | |

* Geometric mean 1960–2021

**Predicted

Sources and references

ICES. 2005. Report of the Arctic Fisheries Working Group (AFWG), 19–28 April 2005, Murmansk, Russia. ICES CM 2005/ACFM:20. 564 pp

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Saithe (*Pollachius virens*) in subareas 1 and 2 (Northeast Arctic). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, pok.27.1-2, <https://doi.org/10.17895/ices.advice.19453646>.

Saithe (*Pollachius virens*) in Division 5.a (Iceland grounds)

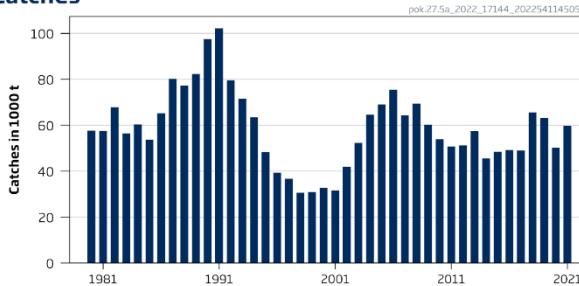
ICES advice on fishing opportunities

ICES advises that when the Icelandic management plan is applied, catches in the fishing year 2022/2023 should be no more than 71 300 tonnes.

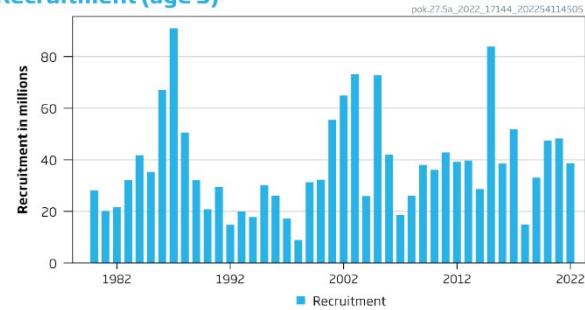
Stock development over time

Fishing pressure on this stock is above HR_{mgt} and HR_{MSY} but below HR_{pa} and HR_{lim} ; spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

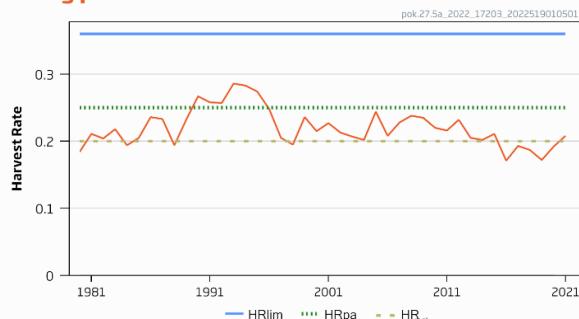
Catches



Recruitment (age 3)



Fishing pressure



Stock size



Figure 1 Saithe in Division 5.a. Summary of the stock assessment. Harvest rates are calculated based on biomass age 4+. All biomass reference points refer to SSB levels. For this stock, MGT $B_{trigger} = MSY B_{trigger} = B_{pa}$. $HR_{MSY} = HR_{mgt}$.

Catch scenarios

Table 1 Saithe in Division 5.a. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|---------------------------|--------|---|
| HR (2022) | 0.185 | Based on a catch of 57726 in 2021/22; tonnes |
| B4+ (2022) | 325190 | From assessment model; tonnes |
| SSB (2023) | 157132 | Short-term forecast; tonnes |
| R _{age 3} (2022) | 38727 | From assessment model; thousands |
| R _{age 3} (2023) | 36819 | Geometric mean of recruitment in all years in the assessment; thousands |
| Total catch (2021/22) | 57726 | Based on development of landings compared to 2020/21; tonnes |

* $HR(2022) = \text{catch}(2021/22)/B4+(2021)$.

Table 2 Saithe in Division 5.a. Annual catch scenarios. All weights are in tonnes.

| ICES advice basis | Total catch (2022/2023) | HR (2023) | SSB (2024) | % SSB change* | % advice change** |
|-------------------|-------------------------|-----------|------------|---------------|-------------------|
| Management plan | 71300 | 0.219 | 148 194 | -6 | -8 |

* SSB 2024 relative to SSB 2023.

** Advised catches for 2022/2023 relative to advice for 2021/2022 (77 561 tonnes).

*** HR(2023) = Advised catches (2022/23)/B4+(2022) = 71 300/325 190.

Basis of the advice

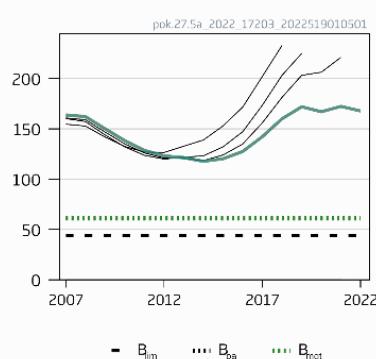
Table 3 Saithe in Division 5.a. The basis of the advice.

| Advice basis | Management plan (MII, 2019). |
|-----------------|---|
| Management plan | <p>The Icelandic Ministry of Food Agriculture and Fisheries has a management plan for Icelandic saithe (MII, 2019). The plan aims at providing long-term maximum sustainable yield and has been evaluated by ICES (ICES, 2019a) to be precautionary. According to the management plan, the TAC for the fishing year Y/Y+1 (1 September of year Y to 31 August of year Y+1) is calculated as follows:</p> $\text{If } \text{SSB}_Y \geq \text{MGT } B_{\text{trigger}}: \quad \text{TAC}_{Y/Y+1} = 0.5 \times 0.2 B_{4+,Y} + 0.5 \times \text{TAC}_{Y-1/Y}$ $\text{If } \text{SSB}_Y < \text{MGT } B_{\text{trigger}}: \quad \text{TAC}_{Y/Y+1} = \frac{\text{SSB}_Y}{\text{MGT } B_{\text{trigger}}} \left\{ \left(1 - 0.5 \frac{\text{SSB}_Y}{\text{MGT } B_{\text{trigger}}} \right) 0.2 B_{4+,Y} + 0.5 \text{TAC}_{Y-1/Y} \right\}$ <p>where $B_{4+,Y}$ is the biomass of saithe aged 4 and older in year Y, 0.2 equates to the HR_{mgt}, and $\text{MGT } B_{\text{trigger}} = 61 000$ tonnes.</p> <p>Realized harvest rates can range from 0.14 to 0.29.</p> |

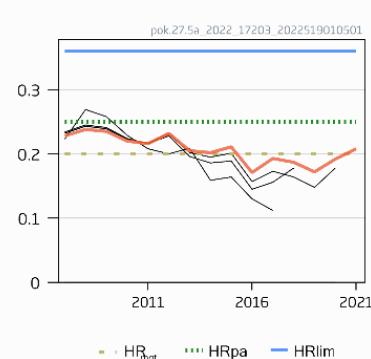
Quality of the assessment

The combination of uncertain survey indices, particularly for recruitment, and time-varying fleet selectivity leads to high uncertainty in the estimates of current SSB and fishing mortality.

SSB (1000 t)



Fishing pressure



Rec (age 3; Millions)

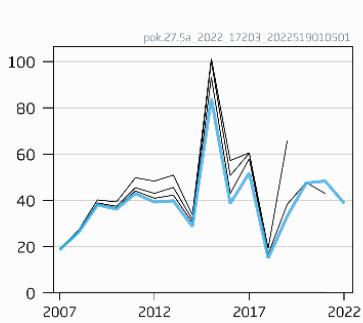


Figure 2

Saithe in Division 5.a. Historical assessment results. The reference points were revised in 2019 following a benchmark, and only assessment results from the last four years should be compared to the reference points indicated. No ICES assessment was conducted in 2020.

Issues relevant for the advice

The assessment for this year shows considerable reduction in stock size compared to recent assessments.

The trend for last five years has been overestimation, caused by very high survey indices in 2018 followed by a substantial decrease from 2019–2022. This follows periods of underestimation. The evaluation of the management plan incorporated uncertainties of this magnitude.

Reference points

Table 4 Saithe in Division 5.a. Reference points, values, and their technical basis. All weights are in tonnes.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-------------------|--------|---|--------------|
| MSY approach | MSY $B_{trigger}$ | 61 000 | B_{pa} ; in tonnes | ICES(2019b) |
| | HR _{MSY} | 0.2 | Stochastic HCR evaluation (SSB 95% of the time over B_{lim}) | ICES (2019b) |
| Precautionary approach | B_{lim} | 44 000 | $B_{pa}/\exp(1.645 \times \sigma)$, $\sigma = 0.2$; in tonnes | ICES (2019b) |
| | B_{pa} | 61 000 | B_{loss} | ICES (2019b) |
| | HR _{lim} | 0.36 | Equilibrium HR that will maintain the stock above B_{lim} with a 50% probability. | ICES (2019b) |
| | HR _{pa} | 0.25 | HR leading to $P(SSB > B_{lim}) > 95\%$ with $B_{trigger}$ | ICES (2021) |
| Management plan | MGT $B_{trigger}$ | 61 000 | From the management plan | ICES (2019b) |
| | HR _{mgt} | 0.2 | From the management plan | ICES (2019b) |

Basis of the assessment

Table 5 Saithe in Division 5.a. Basis of the assessment and advice.

| | |
|--------------------------|--|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Separable statistical catch-at-age model, with changes in selectivity for three different time periods, using catches in the model and in the forecast (ICES, 2022b) |
| Input data | Catch-at-age and age-disaggregated abundance indices from the Icelandic bottom trawl survey -Spring (IS-SMB [G3239]) |
| Discards and bycatch | Discarding is considered negligible |
| Indicators | None |
| Other information | The stock was benchmarked and harvest control rules evaluated in 2019 (ICES, 2019a, 2019b) |
| Working group | Northwestern Working Group (NWWG) |

History of the advice, catch, and management

Table 6 Saithe in Division 5.a. ICES advice, TACs, and catches (for fishing year after 1991). All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Agreed TAC | ICES catch |
|-----------|--|-------------------------------|------------|------------|
| 1987* | TAC | 64 000 | 70 000 | 80 531 |
| 1988* | TAC | 64 000 | 80 000 | 77 247 |
| 1989* | TAC | 80 000 | 80 000 | 82 411 |
| 1990* | TAC | 80 000 | 90 000 | 98 127 |
| 1991* | TAC | 87 000 | 65 000 | 102 737 |
| 1991/1992 | TAC | 70 000 | 75 000 | 88 000 |
| 1992/1993 | Marginal gains from increase in F | 75 000 | 95 000 | 78 000 |
| 1993/1994 | No measurable gains from increase in F | 84 000 | 85 000 | 69 000 |
| 1994/1995 | No measurable gains from increase in F | 72 000 | 75 000 | 61 000 |
| 1995/1996 | No measurable gains from increase in F | 65 000 | 70 000 | 41 000 |
| 1996/1997 | No measurable gains from increase in F | 52 000 | 50 000 | 38 000 |
| 1997/1998 | F below $F_{med} = 0.23$ | 30 000 | 30 000 | 33 000 |
| 1998/1999 | F below 60% of $F_{(97)}$ | 28 000 | 30 000 | 30 816 |
| 1999/2000 | F below 60% of $F_{(98)}$ | 24 000 | 30 000 | 29 646 |
| 2000/2001 | F = 70% of $F_{(99)}$ | 25 000 | 30 000 | 31 337 |
| 2001/2002 | No directed fishing | - | 37 000 | 36 230 |
| 2002/2003 | 2/3 F_{pa} to rebuild stock | 24 000 | 45 000 | 47 471 |

| Year | ICES advice | Catch corresponding to advice | Agreed TAC | ICES catch |
|-----------|---------------------------|-------------------------------|------------|------------|
| 2003/2004 | No advice | - | 50 000 | 55 953 |
| 2004/2005 | F_{pa} | 69 000 | 70 000 | 70 609 |
| 2005/2006 | F_{pa} | 78 000 | 80 000 | 77 882 |
| 2006/2007 | F_{pa} | 81 000 | 80 000 | 66 467 |
| 2007/2008 | No advice | - | 75 000 | 66 719 |
| 2008/2009 | Maintain SSB > B_{pa} | < 22 000 | 65 000 | 61 981 |
| 2009/2010 | F reduced below 0.22 | < 34 000 | 50 000 | 57 404 |
| 2010/2011 | F_{MSY} | < 40 000 | 50 000 | 51 592 |
| 2011/2012 | F_{MSY} | $\leq 45 000$ | 52 000 | 49 664 |
| 2012/2013 | MSY framework [B-rule] | $\leq 49 000$ | 50 000 | 51 275 |
| 2013/2014 | Management plan [20% HCR] | 57 000 | 57 000 | 54 335 |
| 2014/2015 | Management plan [20% HCR] | 58 000 | 58 000 | 52 033 |
| 2015/2016 | Management plan [20% HCR] | 55 000 | 55 000 | 49 253 |
| 2016/2017 | Management plan [20% HCR] | < 55 000 | 55 000 | 44 980 |
| 2017/2018 | Management plan [20% HCR] | 60 237 | 60 237 | 59 018 |
| 2018/2019 | Management plan | 79 092 | 79 092 | 70 324 |
| 2019/2020 | Management plan | $\leq 80 588$ | 80 588 | 53 221 |
| 2020/2021 | No advice requested | ** | 78 574 | 56 333 |
| 2021/2022 | Management plan | $\leq 77 561$ | 77 561 | |
| 2022/2023 | Management plan | $\leq 71 300$ | | |

* Calendar year.

** Advice for 2020/2021 was issued by MFRI based the same method agreed by ICES (78 574 tonnes).

History of the catch and landings

Table 7 Saithe in Division 5.a. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

| Catch (2021) | Landings | | | Discards |
|--------------|------------------|-------------|--------------------------|----------|
| | Bottom trawl 89% | Gillnets 5% | Other 6% | |
| 59774 | 59774 | | Discarding is negligible | |

Summary of the assessment

Table 8 Saithe in Division 5.a. Assessment summary. Weights are in tonnes.

| Year | Recruitment (age 3) in thousands | Stock size | | Harvest rate B_{4+} | Total catch |
|------|----------------------------------|------------|---------------------------|-----------------------|-------------|
| | | SSB | Reference biomass ages 4+ | | |
| 1980 | 28194 | 113844 | 313210 | 0.184 | 57659 |
| 1981 | 20200 | 120803 | 305796 | 0.211 | 57548 |
| 1982 | 21587 | 137948 | 295536 | 0.204 | 67865 |
| 1983 | 32176 | 137885 | 270934 | 0.218 | 56504 |
| 1984 | 41845 | 140591 | 288126 | 0.194 | 60405 |
| 1985 | 35340 | 138908 | 300230 | 0.205 | 53728 |
| 1986 | 67101 | 137191 | 319223 | 0.236 | 65230 |
| 1987 | 90981 | 128893 | 335997 | 0.233 | 80237 |
| 1988 | 50576 | 125932 | 415344 | 0.194 | 77244 |
| 1989 | 32086 | 129370 | 397933 | 0.232 | 82339 |
| 1990 | 20854 | 136640 | 377550 | 0.267 | 97537 |
| 1991 | 29494 | 146412 | 337083 | 0.258 | 102201 |
| 1992 | 14916 | 137968 | 288848 | 0.257 | 79568 |
| 1993 | 19972 | 114293 | 231610 | 0.286 | 71539 |
| 1994 | 17862 | 94886 | 188599 | 0.283 | 63559 |
| 1995 | 30190 | 71030 | 154737 | 0.274 | 48296 |
| 1996 | 26067 | 62499 | 151431 | 0.248 | 39352 |
| 1997 | 17231 | 63747 | 159365 | 0.205 | 36671 |
| 1998 | 8955 | 70538 | 157812 | 0.195 | 30657 |
| 1999 | 31354 | 75485 | 136435 | 0.236 | 30898 |
| 2000 | 32322 | 77980 | 148364 | 0.215 | 32751 |

| Year | Recruitment (age 3) in thousands | Stock size | | Harvest rate B_{4+} | Total catch |
|------|----------------------------------|------------|---------------------------|-----------------------|-------------|
| | | SSB | Reference biomass ages 4+ | | |
| 2001 | 55573 | 85582 | 169929 | 0.227 | 31570 |
| 2002 | 64990 | 103865 | 229739 | 0.213 | 41969 |
| 2003 | 73114 | 128421 | 292820 | 0.207 | 52306 |
| 2004 | 25973 | 148710 | 334806 | 0.202 | 64668 |
| 2005 | 72850 | 159450 | 300772 | 0.244 | 69054 |
| 2006 | 41946 | 167787 | 326328 | 0.208 | 75462 |
| 2007 | 18583 | 163771 | 297054 | 0.228 | 64261 |
| 2008 | 26069 | 162159 | 265710 | 0.238 | 69426 |
| 2009 | 38008 | 150028 | 238651 | 0.235 | 60266 |
| 2010 | 36151 | 138308 | 235635 | 0.22 | 53853 |
| 2011 | 42905 | 128618 | 236694 | 0.216 | 50769 |
| 2012 | 39235 | 123151 | 238935 | 0.232 | 51252 |
| 2013 | 39735 | 121399 | 241432 | 0.205 | 57522 |
| 2014 | 28627 | 117718 | 234649 | 0.202 | 45538 |
| 2015 | 83965 | 120310 | 231664 | 0.211 | 48476 |
| 2016 | 38622 | 127521 | 287821 | 0.171 | 49223 |
| 2017 | 51816 | 142285 | 312092 | 0.193 | 49054 |
| 2018 | 14939 | 160004 | 342972 | 0.187 | 65583 |
| 2019 | 33070 | 171929 | 316665 | 0.172 | 63130 |
| 2020 | 47444 | 167026 | 295506 | 0.192 | 50245 |
| 2021 | 48299 | 172309 | 312448 | 0.208 | 59774 |
| 2022 | 38727 | 167743 | 325190 | | |

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Saithe (*Pollachius virens*) in Division 5.a (Iceland grounds). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, pok.27.5a, <https://doi.org/10.17895/ices.advice.19453652>

Golden redfish (*Sebastes norvegicus*) in subareas 1 and 2 (Northeast Arctic)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2023 and 2024.

Stock development over time

Spawning-stock size is below B_{pa} , and B_{lim} ; no reference points for fishing pressure have been defined for this stock.

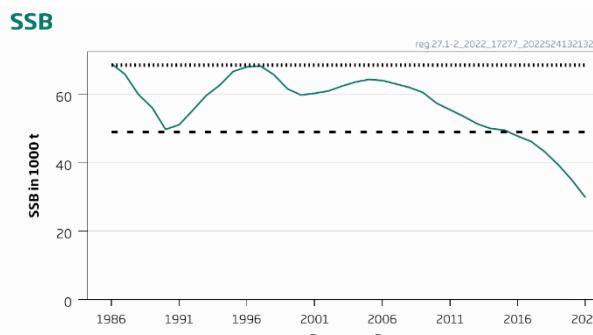
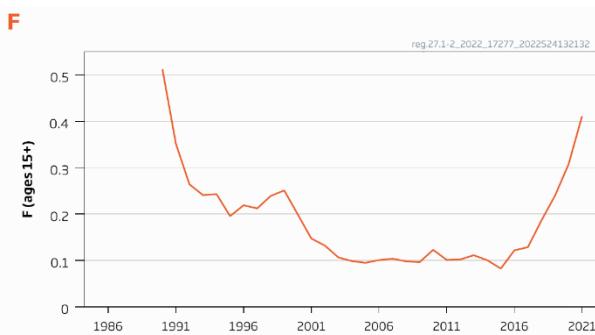
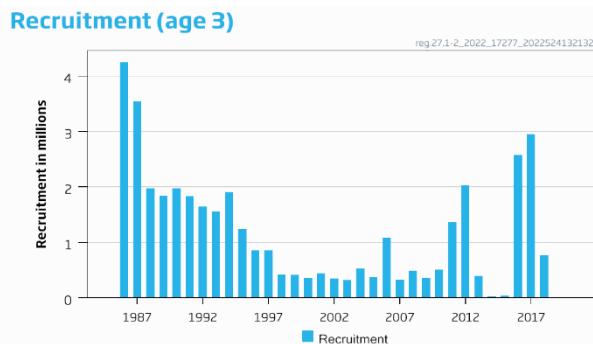
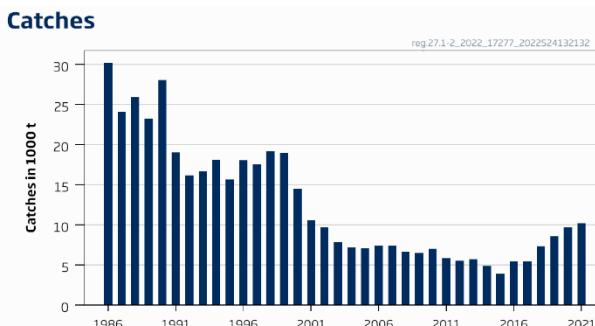


Figure 1 Golden redfish in subareas 1 and 2. Summary of the stock assessment. Recruitment is shown until 2018 only; recruitment estimates for 2019–2021 are not available.

Catch scenarios

The stock is below the biomass limit reference point (B_{lim}). The contribution of the relatively strong 2003 year class to the fishable biomass is still small and uncertain. Until there is evidence that recruits are contributing to the fishable population, ICES is not able to identify catch levels that will, with high probability, give an increase in stock size above B_{lim} . Therefore, the advice is for zero catch. This applies to both commercial and recreational fishing.

Table 1 Golden redfish in subareas 1 and 2. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|-----------------------------|--------|--|
| $F_{ages\ 15+}$ (2022) | 0.36 | Based on a catch of 10 193 tonnes for 2022. |
| SSB (2023) | 25 088 | Short-term forecast; tonnes. |
| $R_{age\ 3}$ (2022 onwards) | n/a | Recruits in the intermediate year do not enter the fishery or the SSB in the forecast. |
| Total catch (2022) | 10 193 | <i>Status quo</i> catch (2021); tonnes. |

Table 2 Golden redfish in subareas 1 and 2. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | F total (2023) | SSB (2024) | % SSB change * | % TAC change** | % advice change*** |
|-------------------|--------------------|----------------|------------|----------------|----------------|--------------------|
| ICES advice basis | | | | | | |
| F = 0 | 0 | 0 | 29 362 | 17 | 0 | 0 |

* SSB 2024 relative to SSB 2023.

** Catch advice in 2023 relative to TAC in 2022 (0 tonnes).

*** Catch advice in 2023 relative to the advice value for 2022 (0 tonnes).

Basis of the advice

Table 3 Golden redfish in subareas 1 and 2. The basis of the advice.

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

Quality of the assessment

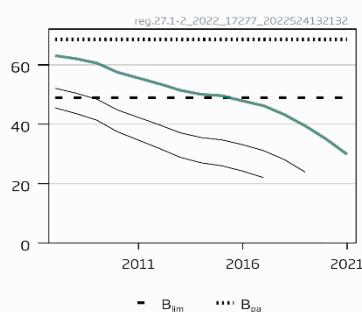
This species is difficult to distinguish from the *Sebastes mentella* stock in the same area, particularly for juvenile specimens. Given that the *S. mentella* stock is at a much higher biomass level, this raises the possibility that some or all of those identified as juvenile *S. norvegicus* in the survey data, and as larger individuals in the catch, may be misidentified *S. mentella*. This implies a high level of uncertainty concerning the size of the most recent sign of good recruitment (the 2008- and 2009-year classes), and some uncertainty remains around the size of the 2003-year class as these fish are similar sizes to *S. mentella*.

A change in the method for splitting redfish catch between *S. mentella* and *S. norvegicus* has resulted in an upwards revision of the catch history and hence a large upward revision in the 2022 assessment. This is in addition to an ongoing trend for upward retrospectives in the SSB, which will need to be examined at the next benchmark.

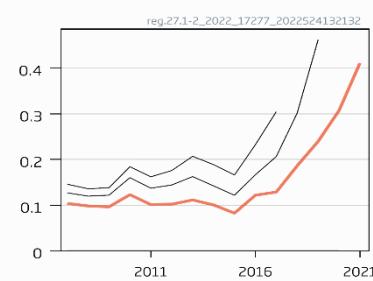
The available survey data only cover the younger portions of the stock and therefore the model tuning data does not have good coverage of mature fish. This leads to a high dependency on fisheries data. Most fisheries report only “redfish”, and the fraction that is *S. norvegicus* is estimated based on historical landing patterns. Biological sampling data from the commercial catch are only available from the Norwegian fleet.

There has been a notable change in the age reading since 2018, which has affected the distribution and proportion of fish assessed as over age 30. The age data above age 29 was therefore excluded from the model tuning in 2018, 2019, and 2020. For 2021 no age data were available.

SSB (1000 t)



F (ages 15+)



Rec (age 3; Millions)

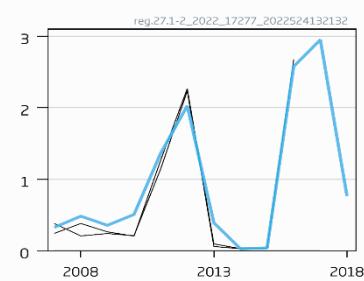


Figure 2

Golden redfish in subareas 1 and 2 (Northeast Arctic). Historical assessment results (Recruitment until 2018 only; recruitment estimates for 2019–2021 are not available).

Issues relevant for the advice

There is no significant direct fishery, and area closures have been enacted to attempt to reduce the bycatch mortality. However, fishing mortality has been rising in recent years, and a further bycatch reduction is needed to minimize all sources of fishing mortality. It is imperative to minimize catches of the remaining mature fish and to protect incoming recruits.

Reference points

Table 4 Golden redfish in subareas 1 and 2. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|--------------------|----------------|---|--------------|
| MSY approach | MSY $B_{trigger}$ | Not defined | | |
| | F_{MSY} | Not defined | | |
| Precautionary approach | B_{lim} | 49 000 | Defined as the lowest SSB leading to good recruitment (SSB in 2002, as estimated at AFWG in 2018) | ICES (2018a) |
| | B_{pa} | 68 600 | $B_{lim} \times \exp(1.645 \times 0.2)$ | ICES (2018a) |
| | F_{lim} | Not defined | | |
| | F_{pa} | Not defined | | |
| Management plan | SSB _{mgt} | Not applicable | | |
| | F_{mgt} | Not applicable | | |

Basis of the assessment

Table 5 Golden redfish in subareas 1 and 2. The basis of the assessment.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) . |
| Assessment type | Age-length structured model (Gadget [ICES, 2022b]). |
| Input data | Catch numbers-at-age and -length from the trawl, gillnet, and longline fisheries, by year; numbers-at-age-and -length from the winter survey in the Barents Sea (BS-NoRu-Q1-Btr; A6996); numbers-at-length from the coastal survey in the Barents Sea (NOcoast-Aco-Q4; A6335); commercial catches (total catch in tonnes, split by gear); one survey index (Barents Sea winter survey, total swept area estimate, length distributions, age and length distributions); annual maturity data from the Barents Sea winter survey; natural mortalities are assumed constant (at 0.05, following the WKRED 2012 benchmark). |
| Discards and bycatch | Discard estimates are not available. Discarding is assumed negligible. Bycatch is included. |
| Indicators | None. |
| Other information | The latest benchmark was in February 2018 (WKREDFISH; ICES, 2018b). |
| Working group | Arctic Fisheries Working Group (AFWG). |

History of the advice, catch, and management

Table 6 Golden redfish in subareas 1 and 2. History of ICES advice, the agreed TAC, and the official and ICES catches. Weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Agreed TAC | Official catches* | ICES catches |
|------|---|-------------------------------|------------|-------------------|--------------|
| 1987 | Precautionary TAC | - | - | 34595 | 24075 |
| 1988 | Reduction in F; TAC | 15000 | - | 41494 | 25908 |
| 1989 | <i>Status quo</i> F; TAC | 24000 | - | 46688 | 23234 |
| 1990 | <i>Status quo</i> F; TAC | 23000 | - | 63156 | 28072 |
| 1991 | Precautionary TAC | 24000 | - | 67768 | 19041 |
| 1992 | If required, precautionary TAC | 25000 | - | 31773 | 16185 |
| 1993 | Precautionary TAC | 12000 | 12000 | 29465 | 16651 |
| 1994 | If required, precautionary TAC | - | - | 30841 | 18120 |
| 1995 | If required, precautionary TAC | - | - | 25900 | 15616 |
| 1996 | If required, precautionary TAC | - | - | 26118 | 18043 |
| 1997 | If required, precautionary TAC | - | - | 26109 | 17511 |
| 1998 | Management plan required as a prerequisite to continued fishing | - | - | 33200 | 19155 |

| Year | ICES advice | Catch corresponding to advice | Agreed TAC | Official catches* | ICES catches |
|------|---|-------------------------------|------------|-------------------|--------------|
| 1999 | Management plan required as a prerequisite to continued fishing | - | - | 30195 | 18986 |
| 2000 | Management plan required as a prerequisite to continued fishing | - | - | 24536 | 14461 |
| 2001 | Management plan required as a prerequisite to continued fishing | - | - | 28965 | 10547 |
| 2002 | Management plan required as a prerequisite to continued fishing | - | - | 16636 | 9643 |
| 2003 | Management plan required as a prerequisite to continued fishing | - | - | 10360 | 7840 |
| 2004 | No directed trawl fishery and low bycatch limits | - | - | 12699 | 7206 |
| 2005 | More stringent protective measures | - | - | 15502 | 7036 |
| 2006 | More stringent protective measures | - | - | 40649 | 7388 |
| 2007 | More stringent protective measures | - | - | 27591 | 7372 |
| 2008 | No directed fishery and low bycatch limits | - | - | 19695 | 6599 |
| 2009 | No directed fishery and low bycatch limits | - | - | 16733 | 6487 |
| 2010 | No directed fishery and low bycatch limits | - | - | 18906 | 6981 |
| 2011 | Same advice as last year | - | - | 18814 | 5852 |
| 2012 | Same advice as last year | - | - | 16576 | 5517 |
| 2013 | No fishery | - | - | 15082 | 5673 |
| 2014 | No fishery | - | - | 23219 | 4825 |
| 2015 | No fishery | - | - | 29485 | 3873 |
| 2016 | No fishery | - | - | 40217 | 5463 |
| 2017 | Precautionary approach: zero catch advice | 0 | - | 36192 | 5472 |
| 2018 | Precautionary approach: zero catch advice | 0 | - | 45395 | 7341 |
| 2019 | Precautionary approach: zero catch advice | 0 | - | 54199 | 8559 |
| 2020 | Precautionary approach: zero catch advice | 0 | - | 63277 | 9644 |
| 2021 | Precautionary approach: zero catch advice | 0 | - | 73675** | 10193** |
| 2022 | Precautionary approach: zero catch advice | 0 | - | | |
| 2023 | Precautionary approach: zero catch advice | 0 | | | |
| 2024 | Precautionary approach: zero catch advice | 0 | | | |

* Includes both *Sebastes mentella* and *S. norvegicus*. The working group has allocated redfish catches by species.

** Provisional figures.

Table 7 Golden redfish in subareas 1 and 2. Catches inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES.

| Year | Inside the NEAFC RA (tonnes) | Outside the NEAFC RA (tonnes) | Total catches (tonnes) | Proportion inside the NEAFC RA (%) |
|------|------------------------------|-------------------------------|------------------------|------------------------------------|
| 2017 | 5 | 5467 | 5472 | 0.1% |
| 2018 | 0 | 7341 | 7341 | 0% |
| 2019 | 0 | 8559 | 8559 | 0% |
| 2020 | 0 | 9644 | 9644 | 0% |
| 2021 | 0 | 10193 | 10193 | 0% |

History of the catch and landings

Table 8 Golden redfish in subareas 1 and 2. Catch distribution by fleet in 2021 as estimated by ICES.

| Total catch (2021) | Commercial landings | | | | Discards | Recreational Fisheries |
|--------------------|---------------------|-------------|-----------|----------------|--------------------------|------------------------|
| | 15% gillnet | 6% longline | 74% trawl | 5% other gears | | |
| 10 193 tonnes | 10 193 tonnes | | | | Assumed to be negligible | Unknown |
| | | | | | | |

Table 9 Golden redfish in subareas 1 and 2. History of ICES estimated commercial catches for each country participating in the fishery.

| Year | Faroe Islands | France | Germany** | Greenland | Iceland | Netherlands | Norway | Portugal | Russian Federation*** | Spain | UK (Eng. & Wales) | UK (Scot.)^ | Ireland | Poland | Denmark | Total |
|-------|---------------|--------|-----------|-----------|---------|-------------|--------|----------|-----------------------|-------|-------------------|-------------|---------|--------|---------|-------|
| 1989 | 3 | 796 | 412 | - | - | - | 20662 | - | 1264 | - | 97 | - | - | - | - | 23234 |
| 1990 | 278 | 1679 | 387 | 1 | - | - | 23917 | - | 1549 | - | 261 | - | - | - | - | 28072 |
| 1991 | 152 | 706 | 981 | - | - | - | 15872 | - | 1052 | - | 268 | 10 | - | - | - | 19041 |
| 1992 | 35 | 1289 | 530 | 623 | - | - | 12700 | 5 | 758 | 2 | 241 | 2 | - | - | - | 16185 |
| 1993 | 139 | 871 | 650 | 14 | - | - | 13137 | 77 | 1313 | 8 | 441 | 1 | - | - | - | 16651 |
| 1994 | 22 | 697 | 1008 | 5 | 4 | - | 14955 | 90 | 1199 | 4 | 135 | 1 | - | - | - | 18120 |
| 1995 | 27 | 732 | 517 | 5 | 1 | 1 | 13516 | 9 | 639 | - | 159 | 9 | 1 | - | - | 15616 |
| 1996 | 38 | 671 | 499 | 34 | - | - | 15622 | 55 | 716 | 81 | 229 | 98 | - | - | - | 18043 |
| 1997 | 3 | 974 | 457 | 23 | - | - | 14182 | 61 | 1584 | 36 | 164 | 22 | 5 | - | - | 17511 |
| 1998 | 78 | 494 | 131 | 33 | - | - | 16540 | 6 | 1632 | 51 | 118 | 53 | 19 | - | - | 19155 |
| 1999 | 35 | 35 | 228 | 47 | 14 | - | 16750 | 3 | 1691 | 7 | 135 | 34 | 7 | - | - | 18986 |
| 2000 | 17 | 13 | 160 | 22 | 16 | - | 13032 | 16 | 1112 | - | - | 73 | - | - | - | 14461 |
| 2001 | 37 | 30 | 238 | 17 | - | - | 9134 | 7 | 963 | 1 | - | 119 | 1 | - | - | 10547 |
| 2002 | 60 | 31 | 42 | 31 | 3 | - | 8561 | 34 | 832 | 3 | - | 46 | - | - | - | 9643 |
| 2003 | 109 | 8 | 122 | 36 | 4 | 89 | 6853 | 6 | 479 | - | - | 134 | - | - | - | 7840 |
| 2004 | 19 | 4 | 68 | 20 | 30 | 33 | 6233 | 5 | 722 | 3 | - | 69 | - | - | - | 7206 |
| 2005 | 47 | 10 | 72 | 36 | 8 | 48 | 6085 | 56 | 614 | 8 | - | 52 | - | - | - | 7036 |
| 2006 | 111 | 8 | 35 | 44 | 31 | 21 | 6305 | 69 | 713 | 9 | - | 39 | 3 | - | - | 7388 |
| 2007 | 146 | 15 | 67 | 84 | 68 | 20 | 5784 | 225 | 890 | 5 | - | 55 | 13 | - | - | 7372 |
| 2008 | 274 | 63 | 30 | 71 | 27 | 2 | 5216 | 72 | 749 | 4 | - | 85 | 6 | - | - | 6599 |
| 2009 | 70 | 1 | 58 | 81 | 66 | 1 | 5451 | 30 | 698 | - | - | 31 | - | - | - | 6487 |
| 2010 | 171 | 51 | 31 | 72 | 22 | - | 5994 | 28 | 565 | 3 | - | 44 | - | 1 | - | 6981 |
| 2011 | 24 | 53 | 9 | 51 | 22 | 1 | 4681 | 25 | 919 | 6 | - | 13 | - | 48 | - | 5852 |
| 2012 | 87 | 182 | 71 | 58 | 23 | 5 | 4247 | 17 | 681 | - | - | 100 | 12 | 34 | - | 5517 |
| 2013 | 83 | 353 | 1 | 45 | 8 | - | 3836 | 36 | 797 | - | - | 493 | 1 | 19 | 1 | 5673 |
| 2014 | 67 | 219 | 6 | 20 | 29 | 1 | 3440 | 5 | 806 | - | - | 211 | - | 21 | - | 4825 |
| 2015 | 76 | 53 | 24 | 211 | 35 | - | 2733 | - | 664 | 2 | - | 57 | - | 17 | 1 | 3873 |
| 2016 | 183 | 30 | 4 | 87 | 55 | - | 4131 | - | 864 | - | - | 76 | - | 26 | 7 | 5463 |
| 2017 | 123 | 17 | 19 | 61 | 65 | 2 | 3567 | 90 | 1297 | 44 | - | 160 | - | 27 | - | 5472 |
| 2018 | 146 | 37 | 66 | 77 | 67 | - | 4961 | 67 | 1834 | 12 | - | 37 | - | 36 | 1 | 7341 |
| 2019 | 236 | 25 | 93 | 56 | 83 | - | 5951 | 73 | 1929 | 65 | - | 25 | - | 20 | - | 8559 |
| 2020 | 166 | 1 | 88 | 99 | 52 | - | 6503 | 86 | 2615 | 6 | - | 19 | - | 9 | - | 9644 |
| 2021* | 323 | 6 | 76 | 92 | 72 | - | 7701 | 60 | 1737 | 8 | - | 96 | - | 20 | 2 | 10193 |

* Preliminary figures.

** Includes former GDR prior to 1991.

*** USSR prior to 1991.

^ From 2000 corresponds to UK (Eng. & Wales) and UK (Scot.).

Summary of the assessment

Table 10 Golden redfish in subareas 1 and 2. Assessment summary. Weights are in tonnes.

| Year | Recruitment age 3 (thousands) | SSB | Landings | F ages 15+ |
|------|-------------------------------------|-------|----------|---------------|
| 1986 | 4247 | 69060 | 30203 | |
| 1987 | 3542 | 65923 | 24077 | |
| 1988 | 1977 | 60020 | 25908 | |
| 1989 | 1840 | 56214 | 23234 | |
| 1990 | 1978 | 49821 | 28072 | 0.51 |
| 1991 | 1835 | 51167 | 19041 | 0.35 |
| 1992 | 1647 | 55389 | 16185 | 0.26 |
| 1993 | 1560 | 59707 | 16651 | 0.24 |

| Year | Recruitment age 3 (thousands) | SSB | Landings | F ages 15+ |
|------|-------------------------------------|-------|----------|---------------|
| 1994 | 1909 | 62754 | 18120 | 0.24 |
| 1995 | 1245 | 66785 | 15616 | 0.196 |
| 1996 | 852 | 68079 | 18043 | 0.22 |
| 1997 | 852 | 68372 | 17511 | 0.21 |
| 1998 | 424 | 65809 | 19155 | 0.24 |
| 1999 | 417 | 61683 | 18986 | 0.25 |
| 2000 | 355 | 59867 | 14461 | 0.199 |
| 2001 | 444 | 60372 | 10547 | 0.147 |
| 2002 | 353 | 61035 | 9643 | 0.132 |
| 2003 | 316 | 62447 | 7840 | 0.107 |
| 2004 | 523 | 63657 | 7206 | 0.099 |
| 2005 | 378 | 64410 | 7036 | 0.095 |
| 2006 | 1085 | 64135 | 7388 | 0.101 |
| 2007 | 328 | 63130 | 7372 | 0.104 |
| 2008 | 485 | 62083 | 6599 | 0.098 |
| 2009 | 357 | 60628 | 6487 | 0.096 |
| 2010 | 509 | 57504 | 6981 | 0.123 |
| 2011 | 1364 | 55565 | 5852 | 0.101 |
| 2012 | 2028 | 53642 | 5517 | 0.102 |
| 2013 | 391 | 51467 | 5673 | 0.111 |
| 2014 | 30 | 50073 | 4825 | 0.101 |
| 2015 | 41 | 49631 | 3873 | 0.083 |
| 2016 | 2580 | 47861 | 5463 | 0.122 |
| 2017 | 2953 | 46259 | 5472 | 0.129 |
| 2018 | 768 | 43259 | 7341 | 0.186 |
| 2019 | * | 39446 | 8559 | 0.24 |
| 2020 | * | 35027 | 9644 | 0.31 |
| 2021 | * | 29892 | 10193 | 0.41 |

*Recruitment estimates for 2019 –2021 are not available

Sources and references

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Recommended citation: ICES. 2022. Golden redfish (*Sebastes norvegicus*) in subareas 1 and 2 (Northeast Arctic). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, reg.27.1-2, <https://doi.org/10.17895/ices.advice.19453697>.

Golden redfish (*Sebastes norvegicus*) in subareas 5, 6, 12, and 14 (Iceland and Faroes grounds, West of Scotland, North of Azores, East of Greenland)

ICES advice on fishing opportunities

ICES advises that when the Greenlandic and Icelandic management plan for golden redfish is applied, catches in 2023 should be no more than 25 545 tonnes.

Stock development over time

Fishing pressure on the stock is above F_{MSY} and below F_{pa} and F_{lim} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

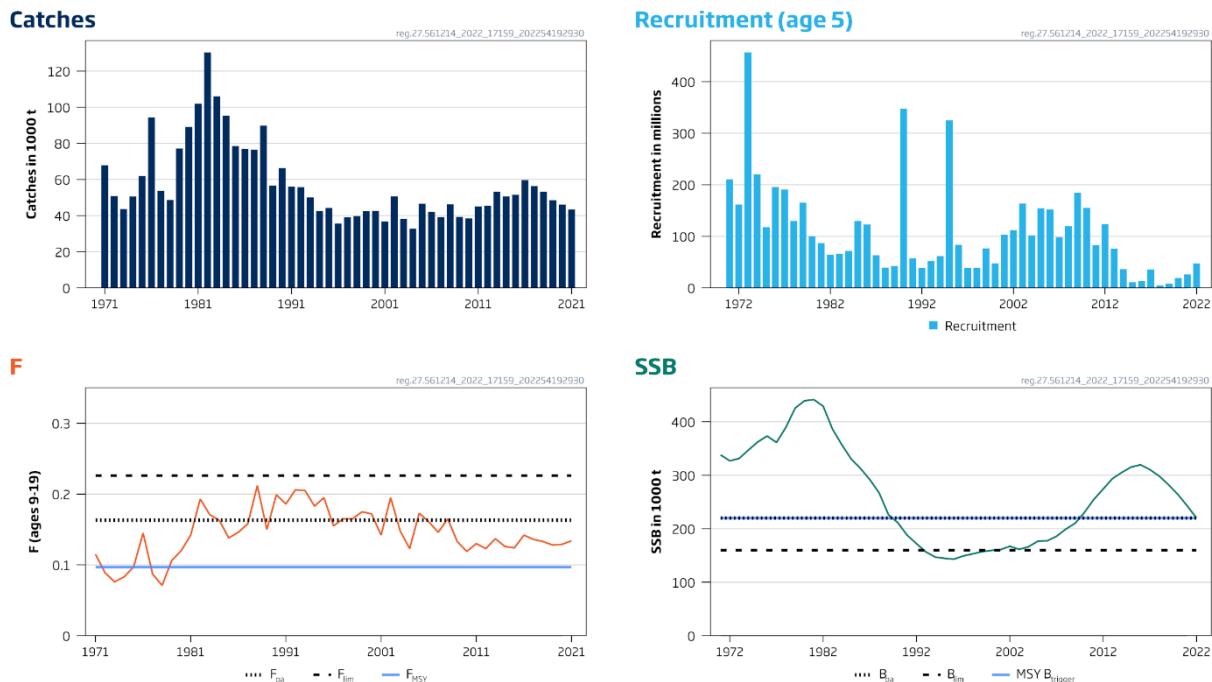


Figure 1 Golden redfish in subareas 5, 6, 12, and 14. Summary of the stock assessment. $F_{mgt} = F_{MSY}$; $SSB_{mgt} = MSY B_{trigger}$

Catch scenarios

Table 1 Golden redfish in subareas 5, 6, 12, and 14. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|--------------------------|--------|---|
| $F_{ages\ 9-19}\ (2022)$ | 0.128 | Based on assumed catch in 2022 |
| SSB (2023) | 200045 | Short-term forecast; tonnes |
| $R_{age\ 5}\ (2022)$ | 47.2 | From the assessment; millions |
| $R_{age\ 5}\ (2023)$ | 39.5 | Average of the five smallest year classes in 1980–2007; millions |
| $R_{age\ 5}\ (2024)$ | 39.5 | Average of the five smallest year classes in 1980–2007; millions |
| Total catch (2022) | 37241 | Sum of expected landings, accounting for interannual transfer from 2021; tonnes |

Table 2 Golden redfish in subareas 5, 6, 12, and 14. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | F_{9-19} (2023) | SSB (2024) | % SSB change* | % advice change** |
|---------------------|--------------------|-------------------|------------|---------------|-------------------|
| ICES advice basis | | | | | |
| Management plan | 25 545 | 0.097 | 189 588 | -5.2 | -20 |
| Other scenarios | | | | | |
| $F = 0$ | 0 | 0 | 213 812 | 6.9 | -100 |
| $F_{sq} = F_{2021}$ | 31 152 | 0.134 | 184 271 | -7.9 | -2.2 |

* SSB 2024 relative to SSB 2023 (200 045 tonnes).

** Advice value for 2023 relative to the advice value for 2022 (31 855 tonnes).

The advised catch has decreased because the biomass is in a downwards trajectory, and its estimate has been revised downwards in this year's assessment (Figure 2).

Basis of the advice

Table 3 Golden redfish in subareas 5, 6, 12, and 14. The basis of the advice.

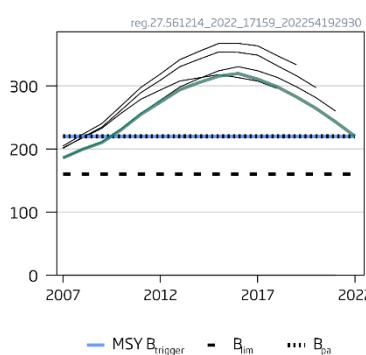
| | |
|-----------------|--|
| Advice basis | Greenland and Iceland management plan for golden redfish |
| Management plan | <p>A management plan for golden redfish, aimed at providing maximum sustainable yield, has been evaluated by ICES (ICES, 2014a) and is considered to be precautionary. ICES has been requested to give advice according to this plan.</p> <p>The management plan states that:</p> <p>If $SSB_Y \geq SSB_{mgt}$: the catch for year $Y+1$ corresponds to the fishing mortality $F_{Y+1} = F_{mgt}$</p> <p>If $SSB_Y < SSB_{mgt}$: the catch for year $Y+1$ corresponds to $F_{Y+1} = F_{mgt} \times SSB_Y / SSB_{mgt}$</p> <p>where SSB_Y is the spawning-stock biomass in year Y, $F_{mgt} = 0.097$, and $SSB_{mgt} = 220\,000$ tonnes. The expected range of realized fishing mortality (F) following the management plan (F_{mgt}) is between 0.07 and 0.16</p> |

Quality of the assessment

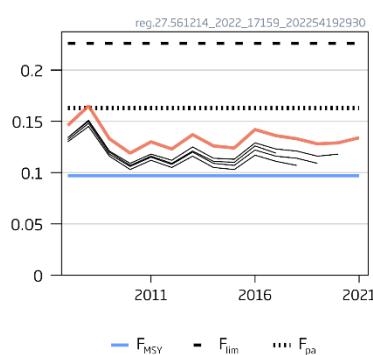
The latest assessment shows downwards revision of the stock biomass (about 6%) and a corresponding upward revision of fishing mortality for a long period. For a long-lived species the assessment is likely to show slower convergence back in time compared to shorter-lived species.

This assessment is considered to be uncertain but consistent with previous assessments. Because of the aggregating behavior of the species, survey indices are often largely dominated by a few large hauls. This causes high uncertainties in the survey indices and large interannual fluctuation in estimates of the biomass index. The catch-at-age data show very low recruitment, which is consistent with the information from the survey indices.

SSB (1000 t)



F (ages 9-19)



Rec (age 5; Millions)

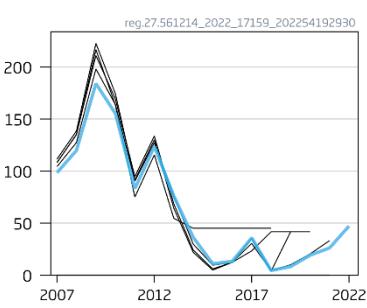


Figure 2 Golden redfish in subareas 5, 6, 12, and 14. Historical assessment results.

Issues relevant for the advice

Since 2009, surveys of golden redfish have consistently shown very low abundance of small fish (≤ 30 cm). While current indices of adult biomass are high they are decreasing and the absence of any indications of incoming cohorts raises concerns about the productivity of the stock. This is reflected in the current assessment of this stock as the spawning-stock biomass is projected to decline below MGT $B_{trigger}$ in 2023.

Catches from Subarea 6 are not included in the stock assessment.

Reference points

Table 4 Golden redfish in subareas 5, 6, 12, and 14. Reference points, values, and their technical basis. All weights are in tonnes.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|--------------------|---------|---|--------------|
| MSY approach | MSY $B_{trigger}$ | 220 000 | B_{pa} | ICES (2014b) |
| | F_{MSY} | 0.097 | Average of ages 9–19. F_{max} in the 2012 Gadget assessment, leading to <1% probability of going below B_{lim} , based on recruitment patterns between 1975 and 2012 and with large assessment uncertainty. | ICES (2014b) |
| Precautionary approach | B_{lim} | 160 000 | Lowest SSB in the 2012 Gadget assessment | ICES (2014b) |
| | B_{pa} | 220 000 | $B_{lim} \times \exp(0.2 \times 1.645)$ | ICES (2014b) |
| | F_{lim} | 0.226 | The F that leads to B_{lim} in the long term. From stochastic simulations. | ICES (2014b) |
| | F_{pa} | 0.163 | $F_{lim}/\exp(0.2 \times 1.645)$ | ICES (2014b) |
| Management plan | SSB _{mgt} | 220 000 | From the management plan | ICES (2014b) |
| | F_{mgt} | 0.097 | From the management plan | ICES (2014b) |

Basis of the assessment

Table 5 Golden redfish in subareas 5, 6, 12, and 14. Basis of assessment and advice.

| | |
|--------------------------|--|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Analytical assessment (Gadget model) that uses catches in the model and in the forecast (ICES, 2022b) |
| Input data | Landings data and length distributions of catches from Iceland, Greenland, and the Faroes; survey data by length from the Icelandic bottom trawl survey - Spring (IS-SMB [G3239]) and Greenlandic Groundfish survey (GGS [G3244]); age data from Icelandic catches and the Icelandic bottom trawl survey - Autumn (IS-SMH [G4493]) |
| Discards and bycatch | Considered negligible |
| Indicators | None |
| Other information | Benchmarked in 2014 (ICES, 2014b) |
| Working group | Northwestern Working Group (NWWG) |

History of the advice, catch, and management

Table 6 Golden redfish in subareas 5, 6, 12, and 14. ICES advice, TACs, and ICES catch. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Iceland TAC *, ## | Greenland TAC | ICES catch |
|------|--------------------------------|-------------------------------|-------------------|---------------|------------|
| 1987 | No increase in F | 83 000 | 95 000 | | 77 127 |
| 1988 | No increase in F | 84 000 | 85 000 | | 89 989 |
| 1989 | TAC* | 117 000* | 77 000 | | 57 050 |
| 1990 | TAC* | 116 000* | 80 000 | | 66 632 |
| 1991 | Precautionary TAC | 77 000 (117 000*) | 55 000# | | 56 364 |
| 1992 | Precautionary TAC | 76 000 (116 000*) | 90 000 | | 55 710 |
| 1993 | Precautionary TAC* | 120 000* | 104 000 | | 50 350 |
| 1994 | Precautionary TAC, if required | 100 000* | 90 000 | | 42 515 |
| 1995 | TAC | 90 000* | 77 000 | | 44 765 |

| Year | ICES advice | Catch corresponding to advice | Iceland TAC *, ## | Greenland TAC | ICES catch |
|------|--|-------------------------------|-------------------|-------------------|------------|
| 1996 | TAC for Division 5.a (28000 tonnes); precautionary TAC for Division 5.b and Subarea 15 (4000 tonnes) | 32 000** | 65 000 | | 36 597 |
| 1997 | Effort 75% of 1995 value | 32 000** | 65 000 | | 39 761 |
| 1998 | Effort reduced in steps of 25% from the 1995 level | 37 200** | 65 000 | | 39 825 |
| 1999 | Effort not increased compared to 1997 | 35 000** | 65 000 | | 42 040 |
| 2000 | Catch not increased compared to 1998 | 35 000** | 60 000 | | 43 550 |
| 2001 | Effort not increased compared to 1999 | 33 000**,^ | 57 000 | | 37 326 |
| 2002 | 25% reduction in effort | 29 000^^ | 65 000 | | 51 092 |
| 2003 | 25% reduction in effort (2001) | 31 000^^ | 60 000 | | 39 220 |
| 2004 | 25% reduction in effort (2002) | 37 400^^ | 57 000 | | 33 451 |
| 2005 | Maintain fishable biomass above U_{pa} | 37 000^^ | 57 000 | | 45 329 |
| 2006 | Maintain fishable biomass above U_{pa} | 37 000^^ | 57 000 | | 42 211 |
| 2007 | Maintain fishable biomass above U_{pa} | 37 000^^ | 57 000 | 5000 [‡] | 39 134 |
| 2008 | Maintain fishable biomass above U_{pa} | 37 000^^ | 57 000 | 1000 [‡] | 46 251 |
| 2009 | Maintain fishable biomass above U_{pa} | < 30 000 | 50 000 | | 39 177 |
| 2010 | Maintain fishable biomass above U_{pa} | < 30 000 | 50 000 | 6000 [‡] | 38 648 |
| 2011 | Same advice as last year | < 30 000 | 37 500 | 8500 [‡] | 45 354 |
| 2012 | Maintain catches | < 40 000 | 40 000 | 8500 [‡] | 45 635 |
| 2013 | Maintain catches | < 40 000 | 45 000 | 8500 [‡] | 53 263 |
| 2014 | 20% increase in catches (relative to 2010–2012) | < 51 980 | 52 000 | 8500 [‡] | 50 736 |
| 2015 | Management plan | < 47 300 | 45 600 | 8500 [‡] | 51 645 |
| 2016 | Management plan | < 51 000 | 48 500 | 8500 [‡] | 59 707 |
| 2017 | Management plan | ≤ 52 800 | 47 205 | 7520 [‡] | 56 141 |
| 2018 | Management plan | ≤ 50 800 | 45 450 | 6222 [‡] | 53 227 |
| 2019 | Management plan | ≤ 43 600 | 39 240 | 5274 [‡] | 48 530 |
| 2020 | Management plan | ≤ 43 568 | 38 896 | 5271 [‡] | 46 197 |
| 2021 | Management plan | ≤ 38 343 | 34 379 | 4748 [‡] | 43 426 |
| 2022 | Management plan | ≤ 31 855 | 28 554 | 3186 [‡] | |
| 2023 | Management plan | ≤ 25 545 | | | |

* Deep-sea *S. mentella* and *S. norvegicus* combined until 2010.

** *S. norvegicus* only.

^ In Division 5.a only.

^^ Both divisions 5.a and 5.b and Subarea 14.

Fishing year ending 31 August.

From 1992 onwards: fishing year 1 September – 31 August.

[‡]Demersal redfish (*Sebastes norvegicus* and *S. mentella*).

History of the catch and landings

Table 7 Golden redfish in subareas 5, 6, 12, and 14. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

| Catch (2021) | Landings | | Discards Discarding is considered negligible |
|--------------|------------------|---------------|---|
| | Bottom trawl 95% | Other gear 5% | |
| | 43 426 | | |

Table 8 Golden redfish in subareas 5, 6, 12, and 14. History of commercial catch; ICES estimated values are presented by area in the fishery. All weights are in tonnes.

| Year | Area | | | | Total |
|-------|--------------|--------------|-----------|------------|---------|
| | Division 5.a | Division 5.b | Subarea 6 | Subarea 14 | |
| 1978 | 31 300 | 2039 | 313 | 15 477 | 49 129 |
| 1979 | 56 616 | 4805 | 6 | 15 787 | 77 214 |
| 1980 | 62 052 | 4920 | 2 | 22 203 | 89 177 |
| 1981 | 75 828 | 2538 | 3 | 23 608 | 101 977 |
| 1982 | 97 899 | 1810 | 28 | 30 692 | 130 429 |
| 1983 | 87 412 | 3394 | 60 | 15 636 | 106 502 |
| 1984 | 84 766 | 6228 | 86 | 5040 | 96 120 |
| 1985 | 67 312 | 9194 | 245 | 2117 | 78 868 |
| 1986 | 67 772 | 6300 | 288 | 2988 | 77 348 |
| 1987 | 69 212 | 6143 | 576 | 1196 | 77 127 |
| 1988 | 80 472 | 5020 | 533 | 3964 | 89 989 |
| 1989 | 51 852 | 4140 | 373 | 685 | 57 050 |
| 1990 | 63 156 | 2407 | 382 | 687 | 66 632 |
| 1991 | 49 677 | 2140 | 292 | 4255 | 56 364 |
| 1992 | 51 464 | 3460 | 40 | 746 | 55 710 |
| 1993 | 45 890 | 2621 | 101 | 1738 | 50 350 |
| 1994 | 38 669 | 2274 | 129 | 1443 | 42 515 |
| 1995 | 41 516 | 2581 | 606 | 62 | 44 765 |
| 1996 | 33 558 | 2316 | 664 | 59 | 36 597 |
| 1997 | 36 342 | 2839 | 542 | 37 | 39 761 |
| 1998 | 36 771 | 2565 | 379 | 109 | 39 825 |
| 1999 | 39 824 | 1436 | 773 | 7 | 42 040 |
| 2000 | 41 187 | 1498 | 776 | 89 | 43 550 |
| 2001 | 35 067 | 1631 | 535 | 93 | 37 326 |
| 2002 | 48 570 | 1941 | 392 | 189 | 51 092 |
| 2003 | 36 577 | 1459 | 968 | 215 | 39 220 |
| 2004 | 31 686 | 1139 | 519 | 107 | 33 451 |
| 2005 | 42 593 | 2484 | 137 | 115 | 45 329 |
| 2006 | 41 521 | 656 | 0 | 34 | 42 211 |
| 2007 | 38 364 | 689 | 0 | 83 | 39 134 |
| 2008 | 45 538 | 569 | 64 | 80 | 46 251 |
| 2009 | 38 442 | 462 | 50 | 224 | 39 177 |
| 2010 | 36 155 | 620 | 220 | 1653 | 38 648 |
| 2011 | 43 773 | 493 | 83 | 1005 | 45 354 |
| 2012 | 43 103 | 491 | 41 | 2017 | 45 635 |
| 2013 | 51 330 | 372 | 92 | 1499 | 53 263 |
| 2014 | 47 769 | 201 | 60 | 2706 | 50 736 |
| 2015 | 48 769 | 270 | 44 | 2562 | 51 645 |
| 2016 | 54 041 | 179 | 50 | 5442 | 59 707 |
| 2017 | 50 119 | 1418 | 93 | 4501 | 56 141 |
| 2018 | 48 014 | 1129 | 80 | 4004 | 53 227 |
| 2019 | 44 746 | 1119 | 101 | 2665 | 48 530 |
| 2020 | 40 688 | 1304 | 100 | 4105 | 46 197 |
| 2021* | 39 616 | 178 | 100 | 3532 | 43 426 |

* Preliminary.

Summary of the assessment

Table 9 Golden redfish in subareas 5, 6, 12, and 14. Assessment summary. Catches from ICES Subarea 6 are not included in the assessment. Weights are in tonnes. Recruitment in thousands.

| Year | Recruitment age 5 | SSB | Catches | F Ages 9–19 |
|------|-------------------|--------|---------|-------------|
| 1971 | 210600 | 338242 | 67880 | 0.115 |
| 1972 | 161700 | 326889 | 50890 | 0.089 |
| 1973 | 456700 | 331438 | 43719 | 0.076 |
| 1974 | 220500 | 347290 | 50598 | 0.083 |
| 1975 | 117900 | 362455 | 61920 | 0.097 |
| 1976 | 195900 | 373340 | 94420 | 0.145 |
| 1977 | 191000 | 361350 | 53753 | 0.087 |
| 1978 | 129600 | 389424 | 48736 | 0.071 |
| 1979 | 165500 | 425542 | 77212 | 0.106 |
| 1980 | 100200 | 439297 | 89143 | 0.120 |
| 1981 | 86900 | 441430 | 101966 | 0.142 |
| 1982 | 64200 | 429215 | 130322 | 0.193 |
| 1983 | 66100 | 386355 | 106050 | 0.171 |
| 1984 | 71800 | 357097 | 95288 | 0.163 |
| 1985 | 129500 | 330502 | 78531 | 0.138 |
| 1986 | 123300 | 312661 | 76908 | 0.146 |
| 1987 | 63400 | 291881 | 76559 | 0.158 |
| 1988 | 39100 | 266908 | 89804 | 0.21 |
| 1989 | 42500 | 226159 | 56645 | 0.150 |
| 1990 | 347600 | 211258 | 66314 | 0.199 |
| 1991 | 57500 | 187851 | 56015 | 0.186 |
| 1992 | 38600 | 172180 | 55826 | 0.21 |
| 1993 | 52100 | 156762 | 50179 | 0.21 |
| 1994 | 61700 | 147027 | 42520 | 0.183 |
| 1995 | 325400 | 144733 | 44263 | 0.195 |
| 1996 | 83500 | 143002 | 35595 | 0.155 |
| 1997 | 38500 | 149041 | 38996 | 0.165 |
| 1998 | 38800 | 152952 | 39694 | 0.165 |
| 1999 | 76500 | 157102 | 42463 | 0.175 |
| 2000 | 47500 | 159403 | 42607 | 0.172 |
| 2001 | 103200 | 160947 | 36744 | 0.142 |
| 2002 | 111800 | 167273 | 50730 | 0.195 |
| 2003 | 163600 | 161447 | 38219 | 0.148 |
| 2004 | 101600 | 166336 | 32766 | 0.123 |
| 2005 | 154300 | 176691 | 46619 | 0.173 |
| 2006 | 151700 | 177413 | 42108 | 0.161 |
| 2007 | 98400 | 185875 | 39154 | 0.146 |
| 2008 | 119800 | 199321 | 46195 | 0.165 |
| 2009 | 184100 | 210288 | 39301 | 0.133 |
| 2010 | 155300 | 230741 | 38504 | 0.119 |
| 2011 | 83200 | 254843 | 45146 | 0.130 |
| 2012 | 123600 | 274185 | 45423 | 0.123 |
| 2013 | 76100 | 293834 | 53223 | 0.137 |
| 2014 | 36300 | 305377 | 50697 | 0.126 |
| 2015 | 11000 | 315360 | 51621 | 0.124 |
| 2016 | 13300 | 319575 | 59711 | 0.142 |
| 2017 | 35900 | 310673 | 56355 | 0.136 |
| 2018 | 4500 | 298542 | 53167 | 0.133 |
| 2019 | 8200 | 282338 | 48550 | 0.128 |
| 2020 | 19100 | 264207 | 46116 | 0.129 |
| 2021 | 26200 | 242926 | 43337 | 0.134 |
| 2022 | 47200 | 220056 | | |

Sources and references

ICES. 2014a. Iceland, Faroe Islands, and Greenland request to ICES on evaluation of a proposed long-term management plan and harvest control rule for golden redfish (*Sebastes marinus*). In Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 2, Section 2.2.3.1.

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ICES. 2022b. Northwestern Working Group (NWWG). ICES Scientific Reports. 4:42. <http://doi.org/10.17895/ices.pub.19771381>.

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Recommended citation: ICES. 2022. Golden redfish (*Sebastes norvegicus*) in subareas 5, 6, 12, and 14 (Iceland and Faroes grounds, West of Scotland, North of Azores, East of Greenland). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, reg.27.561214, <https://doi.org/10.17895/ices.advice.19453700>.

Sandeel (*Ammodytes spp.*) in divisions 4.b–c, Sandeel Area 1r (central and southern North Sea, Dogger Bank)

ICES advice on fishing opportunities

ICES advises that when the MSY approach and precautionary considerations are applied, there should be zero catch in 2022.

Stock development over time

Spawning-stock size is below MSY $B_{\text{escapement}}$ and between B_{pa} and B_{lim} . No reference points for fishing pressure have been defined for this stock.

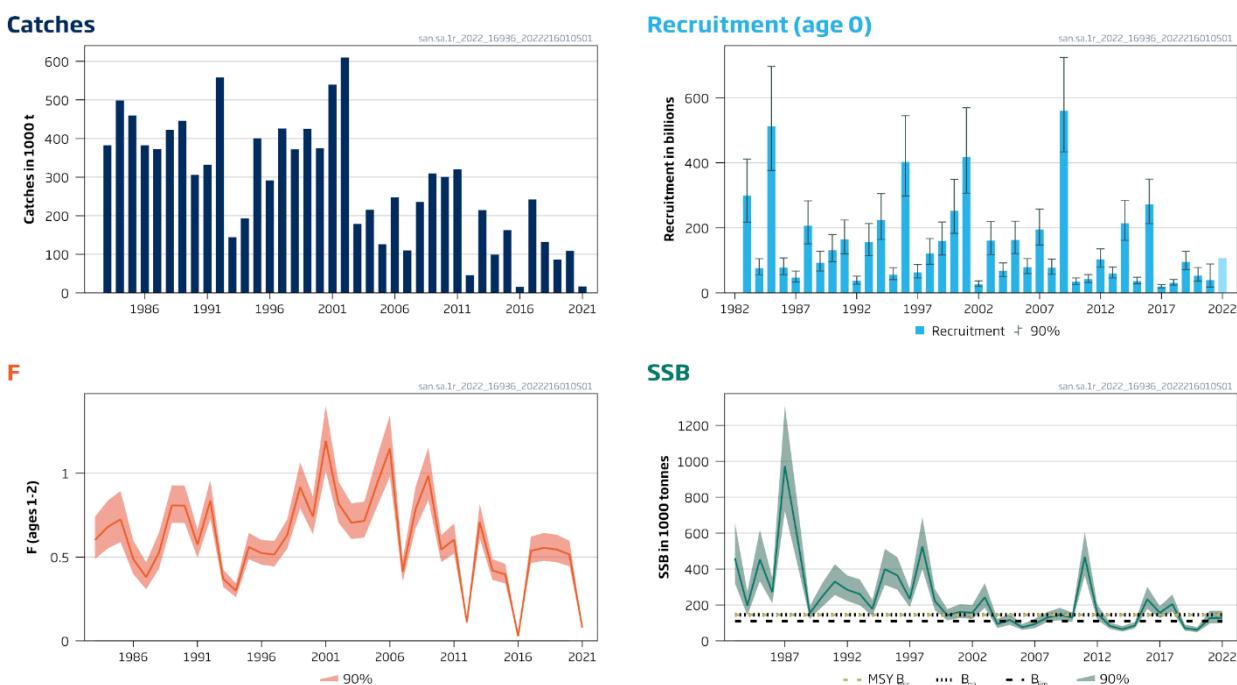


Figure 1 Sandeel in divisions 4.b–c, Sandeel Area 1r. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Sandeel in divisions 4.b–c, Sandeel Area 1r. Values in the forecast.

| Variable | Value | Notes |
|-------------------------------|-----------|--|
| $F_{\text{ages } 1-2}$ (2021) | 0.079 | Assessment model estimate. Selection pattern in 2022 assumed to be the same as 2021. |
| Recruitment (2021) | 39626157 | Assessment model estimate; Thousands |
| Recruitment (2022) | 106885513 | Geometric mean recruitment (GM, 1983–2020); Thousands |
| SSB (2022) | 128284 | Assessment model estimate; Tonnes |

Table 2 Sandeel in divisions 4.b–c, Sandeel Area 1r. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2022) | F _{total} (2022) | SSB (2023) | % SSB change * | % TAC change ** | % advice change *** |
|---|--------------------|---------------------------|------------|----------------|-----------------|---------------------|
| ICES advice basis | | | | | | |
| SSB(2023) ≥ MSY B _{escapement} | 0 | 0 | 136622 | 6.5 | -100 | -100 |
| Other scenarios | | | | | | |
| F = 0 | 0 | 0 | 136622 | 6.5 | -100 | -100 |
| SSB(2023) = MSY B _{escapement} = B _{pa} ^ | - | - | - | | | |
| B _{lim} | 41998 | 0.175 | 110000 | -14.3 | 685 | 669 |
| F = F ₂₀₂₁ | 20290 | 0.079 | 123790 | -3.5 | 279 | 271 |
| 5000 tonnes monitoring TAC | 5000 | 0.0189 | 133376 | 4.0 | -6.6 | -8.5 |

* SSB₂₀₂₃ relative to SSB₂₀₂₂.

** Catch scenario for 2022 relative to TAC in 2021 (5351 t).

*** Advice value 2022 relative to advice value 2021 (5464 t).

^ MSY B_{escapement} and B_{pa} cannot be achieved by 2023 even with zero catch advice

The catch advice for 2022 is zero because there is no fishing mortality that can bring the stock above MSY B_{escapement} due to the low stock size and low year class size in 2021.

Basis of the advice

Table 3 Sandeel in divisions 4.b–c, Sandeel Area 1r. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach (escapement strategy with F _{cap}) |
| Management plan | ICES is not aware of any agreed precautionary management plan for sandeel in this area |

Quality of the assessment

The 2019 recruitment value have been revised further downwards by this year's assessment.

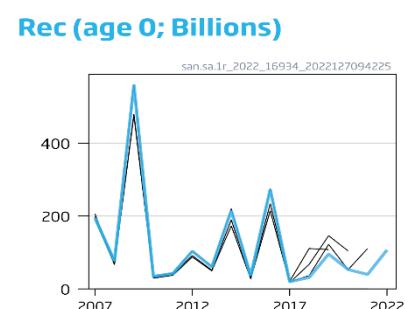
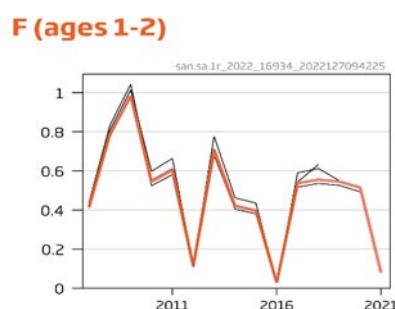
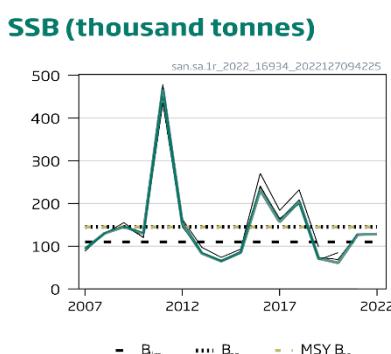


Figure 2 Sandeel in divisions 4.b–c, Sandeel Area 1r. Historical assessment results (final-year recruitment is the geometric mean).

Issues relevant for the advice

The large change in the advice from year to year is caused by the marked interannual variability of recruitment and biomass as well as early maturation, both of which are typical for a short-lived species.

In order to obtain samples to assess the status of the stock in 2023, ICES recommends a monitoring TAC in 2022 (ICES, 2017). Catches should not exceed 5000 tonnes and should have an associated sampling protocol in the fishery.

Catches in 2021 were 16 944 tonnes which exceeded ICES advice by 11 593 tonnes predominantly due to banking/borrowing of quota in 2020. The management strategy evaluation (MSE) conducted for this stock has not accounted for the interannual quota flex practised for this fishery, and such a practice therefore may be unprecautionary (ICES, 2017).

The dredge survey does not provide reliable information on the abundance of ages 2+. Information on the age structure and mean weights of older fish are obtained from samples from the commercial fishery. The advice monitoring TAC of 5000 tonnes in 2022 is based on obtaining a minimum of 30 samples in order to provide information on abundance and the mean weight of sandeel in the assessment (ICES, 2014).

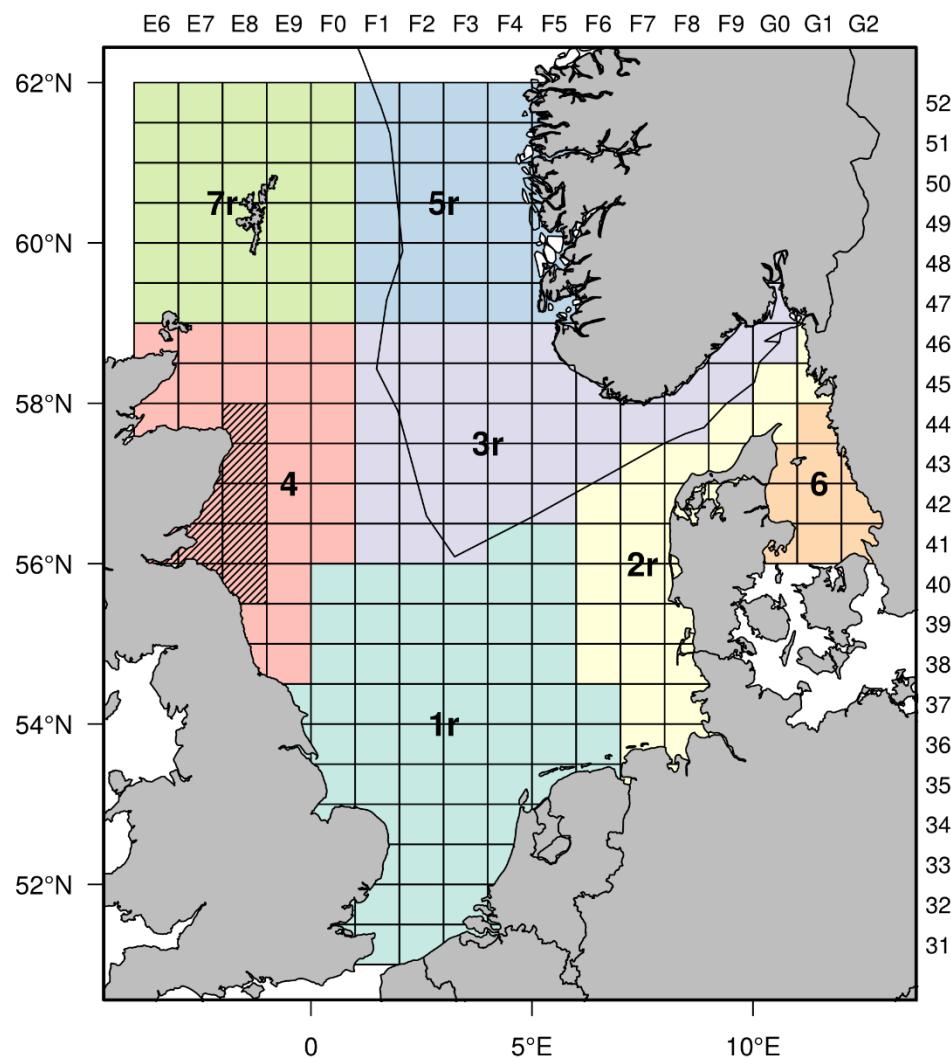


Figure 3 Sandeel in divisions 4.b-c, Sandeel Area 1r. Stock areas for the seven sandeel stocks. The border of the Norwegian Exclusive Economic Zone (EEZ) is shown as a black line. The closed part of Sandeel Area 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.b–c, Sandeel Area 1r. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------------|-------------|--|-------------|
| MSY approach | MSY $B_{\text{escapement}}$ | 145 000 | B_{pa} ; tonnes | ICES (2017) |
| | F_{MSY} | Not defined | | |
| | F_{cap}^* | 0.49 | Maximum F , estimated from the management strategy evaluation (MSE), resulting in < 5% probability of $\text{SSB} < B_{\text{lim}}$ | ICES (2017) |
| Precautionary approach | B_{lim} | 110 000 | The lowest SSB at which a high recruitment is observed; tonnes | ICES (2017) |
| | B_{pa} | 145 000 | $B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.17$ estimated from the assessment uncertainty in the terminal year; tonnes. | ICES (2017) |
| | F_{lim} | Not defined | | |
| Management plan | SSB_{MGT} | Not defined | | |
| | F_{MGT} | Not defined | | |

* Not used as a biological reference point but used in ICES MSY approach for stocks of short-lived species.

Basis of the assessment

Table 5 Sandeel in divisions 4.b–c, Sandeel Area 1r. The basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (see ICES, 2021a) |
| Assessment type | Age-structured model (SMS-effort), half-yearly time-steps (ICES, 2022) |
| Input data | One survey index (D9376) in December (dredge survey since 2004) and commercial catch rates in April. Total international catch and fishing effort. Annual natural mortality estimated from multispecies assessment (ICES, 2021b). Constant maturity-at-age from surveys. Age frequencies from catch sampling. |
| Discards and bycatch | Discarding is considered to be negligible |
| Indicators | None |
| Other information | Last benchmarked in 2016 (ICES, 2017) |
| Working group | Herring Assessment Working Group (HAWG) |

History of the advice, catch, and management

Table 6 Sandeel in divisions 4.b–c, Sandeel Area (SA) 1r. History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes. Values of catches for the period 2005 to 2015 are presented to the nearest thousand tonnes.

| Year | ICES advice | Catch corresponding to advice | TAC | ICES catch SA 1 | ICES catch SA 1r | Total ICES catch (SAs 1r–7r) |
|-------|--|-------------------------------|----------|-----------------|------------------|------------------------------|
| 2005* | Exploitation to be kept below the level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class | - | 661000** | 104000 | | 177000 |
| 2006* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2007 | - | 300000** | 238000 | | 293000 |
| 2007* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2008 | - | 173000** | 109000 | | 230000 |
| 2008* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2009 | - | 375000** | 239000 | | 348000 |
| 2009* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2010 | - | 377000** | 309000 | | 353000 |

| Year | ICES advice | Catch corresponding to advice | TAC | ICES catch SA 1 | ICES catch SA 1r | Total ICES catch (SAs 1r–7r) |
|-------|---|-------------------------------|----------|-----------------|------------------|------------------------------|
| 2010* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2011 | - | 377000** | 301000 | | 414000 |
| 2011 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 320000 | 320000 | 312000 | | 438000 |
| 2012 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 23000 | 23000 | 46000 | | 102000 |
| 2013 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 224544 | 225000 | 210000 | | 278000 |
| 2014 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 57000 | 57000 | 99000 | | 264000 |
| 2015 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 133000 | 133000 | 163000 | | 312000 |
| 2016 | Catches for monitoring purposes should not exceed 5000 t | ≤ 5000 | 13000 | 12751 | 15407 | 75405 |
| 2017^ | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 255956 | 255956 | | 242069 | 517499 |
| 2018^ | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 134461 | 134461 | | 131898 | 269579 |
| 2019^ | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 91916 | 91916 | | 86723 | 235537 |
| 2020^ | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 113987 | 113987 | | 108944 | 446765 |
| 2021^ | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 5464 | 5351 | | 16944*** | 233178*** |
| 2022 | MSY approach: zero catch | 0 | | | | |

* Advice for Subarea 4, excluding the Shetland area.

** Set for EU waters of divisions 2.a and 3.a and Subarea 4.

*** Preliminary.

^ ICES statistical rectangles included in this sandeel area changed with the 2017 assessment and advice.

History of catch and landings

Table 7 Sandeel in divisions 4.b–c, Sandeel Area 1r. Catch distribution by fleet in 2021 as estimated by ICES (in tonnes).

| Total catch (2021) | Landings | Discards |
|--------------------|--|--------------------------------------|
| 16944 | 100% industrial trawl fisheries 16944 | Discarding is considered negligible. |

Summary of the assessment

Table 8 Sandeel in divisions 4.b–c, Sandeel Area 1r. Assessment summary. Weights are in tonnes, recruitment is in thousands. The SSB is estimated for 1 January. High and Low refer to 90% confidence intervals.

| Year | Recruitment (age 0) | | | SSB | | | Total catch tonnes | F ages 1–2 | High | Low |
|------|------------------------|-----------|-----------|---------|---------|--------|--------------------------|------------------|-------|-------|
| | | High | Low | | tonnes | tonnes | | | | |
| 1983 | 299013715 | 411469855 | 217292229 | 460929 | 660290 | 321762 | 382629 | 0.60 | 0.74 | 0.49 |
| 1984 | 75981466 | 105247612 | 54853341 | 196025 | 273966 | 140258 | 498671 | 0.68 | 0.84 | 0.55 |
| 1985 | 512084393 | 696698200 | 376390273 | 453160 | 618287 | 332133 | 460057 | 0.73 | 0.89 | 0.59 |
| 1986 | 77593949 | 107672304 | 55918009 | 270493 | 349955 | 209074 | 382844 | 0.49 | 0.60 | 0.40 |
| 1987 | 47393706 | 66941932 | 33553908 | 973838 | 1311153 | 723303 | 373021 | 0.38 | 0.47 | 0.31 |
| 1988 | 206539038 | 283161681 | 150650237 | 574928 | 773879 | 427124 | 422805 | 0.53 | 0.65 | 0.43 |
| 1989 | 92618550 | 127802093 | 67120933 | 154662 | 194566 | 122943 | 446129 | 0.81 | 0.93 | 0.70 |
| 1990 | 131169377 | 179290552 | 95963816 | 247707 | 322071 | 190513 | 306302 | 0.81 | 0.93 | 0.70 |
| 1991 | 163938186 | 224243270 | 119850771 | 330050 | 426826 | 255217 | 332204 | 0.57 | 0.67 | 0.50 |
| 1992 | 37021153 | 51367729 | 26681455 | 284361 | 364332 | 221944 | 558602 | 0.84 | 0.96 | 0.73 |
| 1993 | 155942826 | 213236630 | 114043094 | 260407 | 342229 | 198147 | 144389 | 0.37 | 0.43 | 0.32 |
| 1994 | 223964922 | 305480402 | 164201323 | 177726 | 228440 | 138271 | 193241 | 0.30 | 0.34 | 0.26 |
| 1995 | 56119842 | 77608020 | 40581330 | 399113 | 512290 | 310940 | 400759 | 0.56 | 0.64 | 0.49 |
| 1996 | 403222872 | 545163007 | 298238660 | 364762 | 466453 | 285241 | 291709 | 0.52 | 0.60 | 0.45 |
| 1997 | 63148522 | 87172958 | 45745101 | 232815 | 290293 | 186718 | 426414 | 0.52 | 0.60 | 0.44 |
| 1998 | 121084596 | 167026740 | 87779235 | 524919 | 689627 | 399550 | 372604 | 0.63 | 0.73 | 0.55 |
| 1999 | 159252253 | 218274806 | 116189681 | 222348 | 289456 | 170798 | 425478 | 0.92 | 1.06 | 0.79 |
| 2000 | 252772391 | 349202113 | 182971062 | 142059 | 177052 | 113982 | 374724 | 0.74 | 0.86 | 0.64 |
| 2001 | 418003348 | 569607755 | 306749333 | 161297 | 203782 | 127669 | 540248 | 1.19 | 1.40 | 1.01 |
| 2002 | 26722060 | 37165427 | 19213246 | 156217 | 200225 | 121881 | 610161 | 0.82 | 0.95 | 0.70 |
| 2003 | 160691992 | 219535551 | 117620660 | 243045 | 321134 | 183944 | 178642 | 0.71 | 0.82 | 0.61 |
| 2004 | 67998758 | 91921669 | 50301862 | 93246 | 121926 | 71313 | 215352 | 0.72 | 0.83 | 0.62 |
| 2005 | 163120541 | 220417956 | 120717528 | 116425 | 151646 | 89384 | 126261 | 0.94 | 1.10 | 0.80 |
| 2006 | 79319932 | 105651738 | 59550857 | 75508 | 93327 | 61092 | 247510 | 1.15 | 1.35 | 0.98 |
| 2007 | 194900553 | 257767551 | 147366204 | 93620 | 123830 | 70780 | 110395 | 0.41 | 0.48 | 0.35 |
| 2008 | 77129779 | 103893583 | 57260541 | 129832 | 160591 | 104965 | 236069 | 0.78 | 0.92 | 0.67 |
| 2009 | 560309574 | 724195244 | 433511296 | 145365 | 184107 | 114775 | 309712 | 0.99 | 1.16 | 0.84 |
| 2010 | 34552829 | 45925002 | 25996689 | 129573 | 157611 | 106523 | 300896 | 0.54 | 0.63 | 0.47 |
| 2011 | 42287412 | 56278312 | 31774677 | 467895 | 605667 | 361463 | 320241 | 0.60 | 0.70 | 0.52 |
| 2012 | 103284720 | 135216288 | 78893848 | 152970 | 201741 | 115990 | 45954 | 0.112 | 0.130 | 0.097 |
| 2013 | 60128831 | 79158502 | 45673885 | 83200 | 102667 | 67424 | 214787 | 0.71 | 0.82 | 0.61 |
| 2014 | 214109902 | 283751264 | 161560690 | 64861 | 82390 | 51061 | 99059 | 0.42 | 0.49 | 0.36 |
| 2015 | 36579554 | 48392958 | 27649968 | 85221 | 105341 | 68943 | 162861 | 0.40 | 0.46 | 0.34 |
| 2016 | 273004818 | 349942971 | 212982219 | 231422 | 301235 | 177789 | 15407 | 0.028 | 0.032 | 0.024 |
| 2017 | 19481970 | 25344842 | 14975322 | 156530 | 193514 | 126613 | 242069 | 0.54 | 0.62 | 0.46 |
| 2018 | 31171039 | 40992247 | 23702865 | 204843 | 257982 | 162650 | 131898 | 0.56 | 0.64 | 0.48 |
| 2019 | 95439204 | 127732107 | 71310510 | 71254 | 90837 | 55892 | 86723 | 0.55 | 0.63 | 0.47 |
| 2020 | 52904555 | 77823291 | 35964708 | 60901 | 76356 | 48574 | 108944 | 0.52 | 0.60 | 0.45 |
| 2021 | 39626157 | 88716305 | 17699479 | 126880 | 167765 | 95959 | 16944^ | 0.079 | 0.092 | 0.068 |
| 2022 | 106885513** | | | 128284* | 167159* | 98450* | | | | |

* Using mean weight-at-age from 2017 to 2021.

** Geometric mean (1983–2020).

^ Preliminary.

Sources and references

- ICES. 2014. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG), 11-20 March 2014, ICES HQ, Copenhagen, Denmark. ICES CM 2014/ACOM:06. 1257 pp
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- ICES. 2021a. Advice on fishing opportunities. In Report of the ICES Advisory Committee, 2021. ICES Advice 2021, section 1.1.1. <https://doi.org/10.17895/ices.advice.7720>.
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- ICES. 2022. Herring Assessment Working Group for the Area South of 62° N (HAWG). ICES Scientific Reports. 4:16. <http://doi.org/10.17895/ices.pub.10072>.

[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Sandeel (*Ammodytes* spp.) in divisions 4.b and 4.c, Sandeel Area 1r (central and southern North Sea, Dogger Bank). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, san.sa.1r, <https://doi.org/10.17895/ices.advice.10000>.

Sandeel (*Ammodytes spp.*) in divisions 4.b–c and Subdivision 20, Sandeel Area 2r (central and southern North Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2022 should be no more than 71 859 tonnes.

Stock development over time

Spawning-stock size is below MSY $B_{\text{escapement}}$, B_{pa} , and B_{lim} . No reference points for fishing pressure have been defined for this stock.

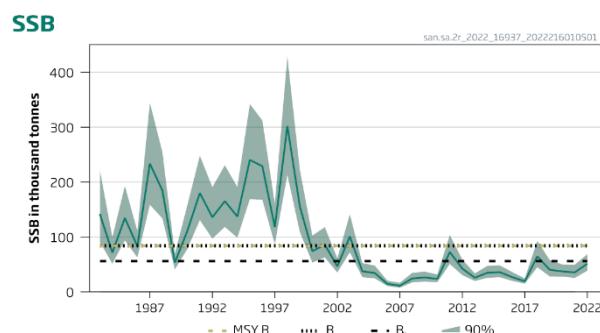
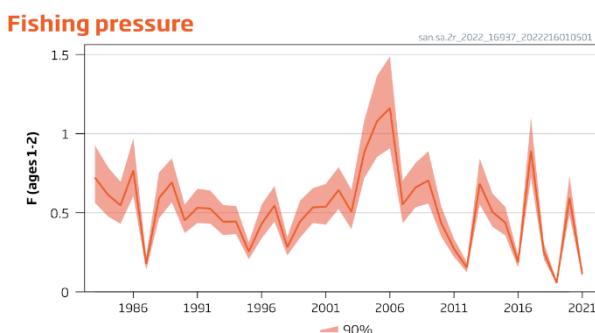
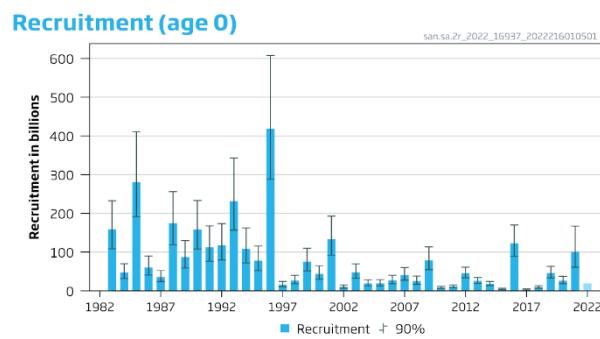
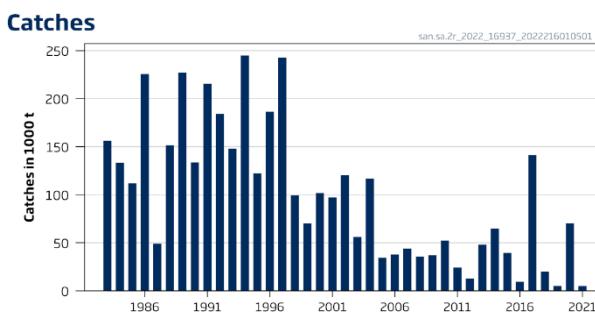


Figure 1 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Values in the forecast.

| Variable | Value | Notes |
|--------------------|-----------|--------------------------------------|
| F (2021) | 0.112 | Assessment model estimate |
| Recruitment (2021) | 100936282 | Assessment model estimate; thousands |
| Recruitment (2022) | 19066388 | Geometric mean 2011–2020; thousands |
| SSB (2022) | 51277 | Assessment model estimate; tonnes |

Table 2 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2022) | F _{total} (2022) | SSB (2023) | % SSB change * | % TAC change ** | % advice change *** |
|---|--------------------|---------------------------|------------|----------------|-----------------|---------------------|
| ICES advice basis | | | | | | |
| SSB ₂₀₂₃ ≥ MSY B _{escapement} with F _{cap} | 71859 | 0.44 | 93977 | 83 | 1367 | - |
| Other scenarios | | | | | | |
| F = 0 | 0 | 0 | 137618 | 168 | -100 | - |
| SSB ₂₀₂₃ = MSY B _{escapement} = B _{pa} ^ | 88771 | 0.57 | 84000 | 64 | 1713 | - |
| B _{lim} | 137759 | 1.00 | 56000 | 9.2 | 2713 | - |
| F ₂₀₂₂ = F _{sq} | 20970 | 0.112 | 124704 | 143 | 328 | - |

* SSB₂₀₂₃ relative to SSB₂₀₂₂.

** Catch scenario for 2022 relative to TAC in 2021 (4897 t).

*** Advice value 2022 relative to advice value 2021 (0 t).

The large increase in advice from a zero advice for 2021 is due to the large 2021 year class. This year class is expected to contribute to a large extent to the catches in 2022, resulting in an SSB above MSY B_{escapement} by 1 January 2023.

Basis of the advice

Table 3 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach (escapement strategy with F _{cap}) |
| Management plan | ICES is not aware of any agreed precautionary management plan for sandeel in this area |

Quality of the assessment

There is a tendency of the assessment to downscale SSB.

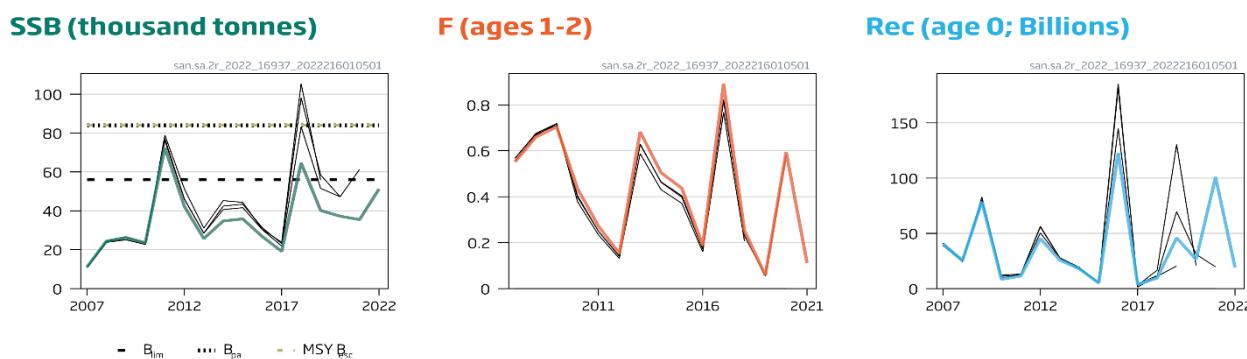


Figure 2 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Historical assessment results (final-year recruitment is the geometric mean).

Issues relevant for the advice

The large change in the advice from year to year is caused by the marked interannual variability of biomass and recruitment as well as the early maturation, both of which are typical for a short-lived species.

The assessment model has a density-dependent parameter which was introduced in the 2020 interbenchmark (ICES, 2020) to reduce the tendency of the model to overestimate both recruitment and SSB especially in years with incoming high year classes. The strong signal of the 2021 year class from the dredge survey is suppressed by the assessment model, supporting the precautionary objectives of this advice.

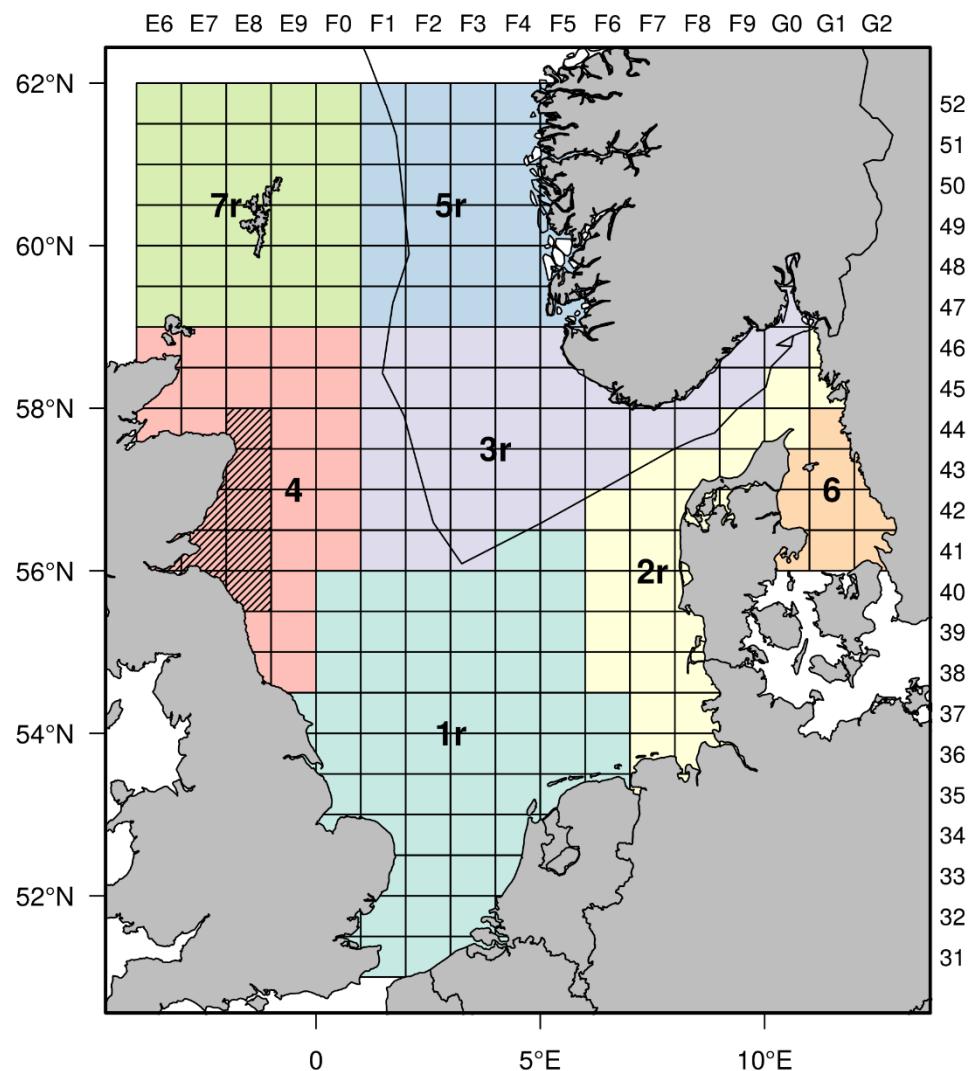


Figure 3 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Stock areas for the seven sandeel stocks. The border of the Norwegian Exclusive Economic Zone (EEZ) is shown as a black line. The closed part of Sandeel Area 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------------|-------------|---|-------------|
| MSY approach | MSY $B_{\text{escapement}}$ | 84 000 | B_{pa} ; tonnes | ICES (2017) |
| | F_{MSY} | Not defined | | |
| | F_{cap}^* | 0.44 | Maximum F, estimated from a management strategy evaluation (MSE), resulting in < 5% probability of SSB < B_{lim} | ICES (2017) |
| Precautionary approach | B_{lim} | 56 000 | Average SSB of the two lowest SSB estimates (in 2001 and 2009) that provide high recruitment; tonnes | ICES (2017) |
| | B_{pa} | 84 000 | $B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.25$ estimated from the assessment uncertainty in the terminal year; tonnes | ICES (2017) |
| | F_{lim} | Not defined | | |
| Management plan | SSB_{MGT} | Not defined | | |
| | F_{MGT} | Not defined | | |

* Not used as a biological reference point but used in ICES MSY approach for stocks of short-lived species.

Basis of the assessment

Table 5 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. The basis of the assessment and advice.

| | |
|--------------------------|--|
| ICES stock data category | 1 (see ICES, 2021) |
| Assessment type | Analytical age-based (SMS-effort), half-yearly time-steps (ICES, 2022) |
| Input data | One survey index (D9376; dredge survey since 2010). Total international catch and fishing effort. Constant maturity-at-age from surveys. Natural mortality estimated from multispecies assessment (assumed constant over time; ICES, 2018). Age frequencies from catch sampling. |
| Discards and bycatch | Discarding is considered to be negligible |
| Indicators | None |
| Other information | Last benchmarked in 2016 (ICES, 2017). Interbenchmark in 2020 (ICES, 2020). |
| Working group | Herring Assessment Working Group (HAWG) |

History of advice, catch, and management

Table 6 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes. Values of catch for the period 2005 to 2015 are presented to the nearest thousand tonnes.

| Year | ICES advice | Catch corresponding to advice | TAC | ICES catch SA 2 | ICES catch SA 2r | Total ICES catch (SAs 1r–7r) |
|-------|---|-------------------------------|----------|-----------------|------------------|------------------------------|
| 2005* | Exploitation to be kept below the level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class | - | 661000** | 41000 | | 177000 |
| 2006* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2007 | - | 300000** | 35000 | | 293000 |
| 2007* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2008 | - | 173000** | 6000 | | 230000 |
| 2008* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2009 | - | 375000** | 13000 | | 348000 |
| 2009* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2010 | - | 377000** | 10000 | | 353000 |
| 2010* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2011 | - | 377000** | 32000 | | 414000 |
| 2011 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 34000 | 34000 | 30000 | | 438000 |
| 2012 | Catches for monitoring purposes should not exceed 5000 t | < 5000 | 5000 | 8000 | | 102000 |
| 2013 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 17544 | 18000 | 23000 | | 278000 |
| 2014 | Catches for monitoring purposes should not exceed 5000 t | < 5000 | 5000 | 8900 | | 264000 |
| 2015 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 29000 | 29000 | 21000 | | 312000 |
| 2016 | Catches for monitoring purposes should not exceed 5000 t | ≤ 5000 | 5000 | 4037 | 9569 | 75405 |
| 2017^ | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 175941 | 175941 | | 141314 | 517499 |
| 2018^ | Catches for monitoring purposes should not exceed 5000 t | ≤ 5000 | 5000 | | 20240 | 269579 |

| Year | ICES advice | Catch corresponding to advice | TAC | ICES catch SA 2 | ICES catch SA 2r | Total ICES catch (SAs 1r–7r) |
|-------------------|--|-------------------------------|-------|-----------------|------------------|------------------------------|
| 2019 [^] | Catches for monitoring purposes should not exceed 5000 t | ≤ 5000 | 5000 | | 5151 | 235537 |
| 2020 [^] | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 62658 | 62658 | | 70198 | 446765 |
| 2021 [^] | MSY approach: zero catch. Monitoring TAC should not exceed 5000 t. | ≤ 5000 | 4897 | | 4980*** | 233178*** |
| 2022 [^] | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 71859 | | | | |

* Advice for Subarea 4, excluding the Shetland area.

** Set for EU waters of divisions 2.a and 3.a and Subarea 4.

*** Preliminary.

[^] ICES statistical rectangles included in this sandeel area changed with the 2017 assessment and advice.

History of catch and landings

Table 7 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Catch distribution by fleet in 2021 data as estimated by ICES (in tonnes).

| Total catch (2021) | Landings | Discards |
|--------------------|---|-------------------------------------|
| 4980 | 100% industrial trawl fisheries 4980 | Discarding is considered negligible |

Summary of the assessment

Table 8 Sandeel in divisions 4.b–c and Subdivision 20, Sandeel Area 2r. Assessment summary. Weights are in tonnes, recruitment is in thousands. The SSB is estimated for 1 January. High and Low represent 90% confidence intervals.

| Year | Recruitment (age 0) | High | Low | SSB | High | Low | Total Catch tonnes | Fishing pressure ages 1–2 | High | Low |
|------|---------------------|-----------|-----------|--------|--------|--------|--------------------|---------------------------|------|-------|
| | thousands | | tonnes | | | | | | | |
| 1983 | 158934067 | 232803940 | 108503480 | 141775 | 221674 | 90675 | 156208 | 0.72 | 0.93 | 0.56 |
| 1984 | 47204510 | 69944022 | 31857845 | 71396 | 99382 | 51291 | 133398 | 0.62 | 0.79 | 0.48 |
| 1985 | 280476360 | 410803249 | 191495536 | 134592 | 193065 | 93828 | 111889 | 0.55 | 0.70 | 0.43 |
| 1986 | 60430228 | 89840385 | 40647783 | 83200 | 110863 | 62439 | 225581 | 0.77 | 0.97 | 0.61 |
| 1987 | 35462984 | 52416830 | 23992737 | 233748 | 344368 | 158663 | 49067 | 0.176 | 0.23 | 0.138 |
| 1988 | 174773254 | 256051242 | 119295224 | 184795 | 255103 | 133864 | 151543 | 0.59 | 0.76 | 0.47 |
| 1989 | 87312134 | 129589678 | 58827283 | 53316 | 69542 | 40877 | 227292 | 0.69 | 0.84 | 0.57 |
| 1990 | 158775212 | 233095979 | 108151020 | 111190 | 158079 | 78210 | 133796 | 0.45 | 0.55 | 0.37 |
| 1991 | 113011484 | 167628133 | 76190048 | 180052 | 248012 | 130714 | 215565 | 0.53 | 0.65 | 0.44 |
| 1992 | 117388558 | 173511551 | 79418768 | 135944 | 190682 | 96920 | 184241 | 0.53 | 0.64 | 0.43 |
| 1993 | 231710661 | 342958527 | 156549047 | 165215 | 230661 | 118337 | 147964 | 0.44 | 0.55 | 0.36 |
| 1994 | 108254988 | 162534157 | 72102643 | 137173 | 191015 | 98508 | 244944 | 0.45 | 0.54 | 0.37 |
| 1995 | 77827080 | 115747714 | 52329797 | 240386 | 342127 | 168900 | 122155 | 0.25 | 0.31 | 0.21 |
| 1996 | 418421560 | 607756439 | 288070337 | 228891 | 312353 | 167730 | 186460 | 0.43 | 0.55 | 0.34 |
| 1997 | 16078604 | 24281821 | 10646710 | 117948 | 160367 | 86749 | 242680 | 0.55 | 0.67 | 0.44 |
| 1998 | 26963644 | 40150314 | 18107906 | 302247 | 428814 | 213037 | 99305 | 0.28 | 0.35 | 0.23 |
| 1999 | 75225438 | 110029557 | 51430421 | 155749 | 222662 | 108944 | 70085 | 0.45 | 0.58 | 0.34 |
| 2000 | 43969202 | 64847598 | 29812835 | 74013 | 102624 | 53379 | 101952 | 0.53 | 0.66 | 0.44 |
| 2001 | 133284967 | 192925334 | 92081646 | 85905 | 117837 | 62627 | 97210 | 0.54 | 0.68 | 0.42 |
| 2002 | 10282973 | 15289750 | 6915714 | 46444 | 61254 | 35214 | 120520 | 0.64 | 0.79 | 0.52 |
| 2003 | 47583661 | 69592050 | 32535394 | 100912 | 141546 | 71942 | 56248 | 0.51 | 0.65 | 0.40 |
| 2004 | 19115307 | 28733283 | 12716785 | 37459 | 52406 | 26775 | 116837 | 0.88 | 1.08 | 0.72 |
| 2005 | 19288122 | 29144634 | 12765013 | 34269 | 47887 | 24524 | 34569 | 1.08 | 1.37 | 0.85 |
| 2006 | 27044656 | 40323314 | 18138724 | 14644 | 20325 | 10551 | 37952 | 1.16 | 1.49 | 0.91 |
| 2007 | 40588689 | 60330465 | 27306962 | 11142 | 16524 | 7513 | 44069 | 0.55 | 0.70 | 0.43 |

| Year | Recruitment (age 0) | High | Low | SSB | High | Low | Total Catch | Fishing pressure ages 1–2 | High | Low |
|------|------------------------|-----------|----------|---------|---------|---------|----------------|---------------------------------|-------|-------|
| | thousands | | tonnes | | | tonnes | | | | |
| 2008 | 25418810 | 38241126 | 16895838 | 24441 | 34790 | 17170 | 35655 | 0.66 | 0.82 | 0.54 |
| 2009 | 78609255 | 113402953 | 54490777 | 26265 | 36799 | 18747 | 37049 | 0.70 | 0.89 | 0.56 |
| 2010 | 8418986 | 11480184 | 6174059 | 23576 | 31770 | 17496 | 52470 | 0.44 | 0.54 | 0.35 |
| 2011 | 11330401 | 15375160 | 8349701 | 72475 | 103490 | 50755 | 24310 | 0.27 | 0.34 | 0.22 |
| 2012 | 45353595 | 61039926 | 33698412 | 42319 | 58879 | 30417 | 12672 | 0.153 | 0.188 | 0.124 |
| 2013 | 25699960 | 34407708 | 19195930 | 25745 | 33599 | 19727 | 48172 | 0.68 | 0.84 | 0.55 |
| 2014 | 17948193 | 24196056 | 13313642 | 34787 | 47333 | 25567 | 64707 | 0.51 | 0.62 | 0.41 |
| 2015 | 4965378 | 6843382 | 3602748 | 35846 | 48198 | 26660 | 39492 | 0.44 | 0.54 | 0.36 |
| 2016 | 122914555 | 170023044 | 88858472 | 26796 | 36046 | 19920 | 9569 | 0.188 | 0.23 | 0.153 |
| 2017 | 3782894 | 5465529 | 2618281 | 19141 | 24494 | 14958 | 141314 | 0.89 | 1.10 | 0.72 |
| 2018 | 9559060 | 13313701 | 6863278 | 64602 | 92803 | 44971 | 20240 | 0.25 | 0.31 | 0.21 |
| 2019 | 45901117 | 63280560 | 33294783 | 40175 | 57807 | 27921 | 5151 | 0.058 | 0.071 | 0.048 |
| 2020 | 26403312 | 37878638 | 18404433 | 37235 | 49893 | 27788 | 70198 | 0.60 | 0.73 | 0.48 |
| 2021 | 100936282 | 167049301 | 60988779 | 35490 | 49517 | 25436 | 4980^ | 0.112 | 0.138 | 0.092 |
| 2022 | 19066388* | | | 51277** | 68422** | 38428** | | | | |

* Geometric mean (2011–2020).

** Using mean weight-at-age from 2017 to 2021.

^ Preliminary.

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Sandeel (*Ammodytes spp.*) in divisions 4.a–b and Subdivision 20, Sandeel Area 3r (northern and central North Sea, Skagerrak)

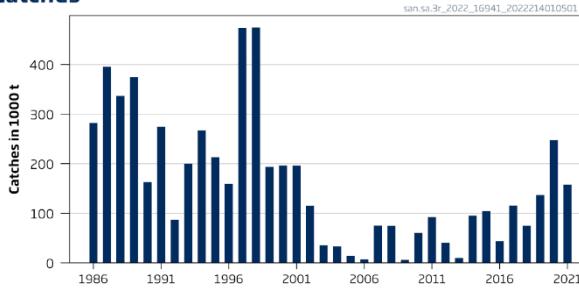
ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2022 should be no more than 85 559 tonnes.

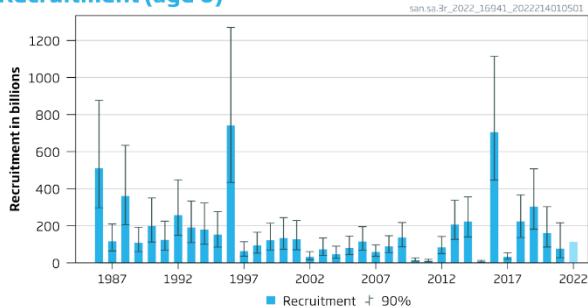
Stock development over time

Spawning-stock size is above MSY $B_{\text{escapement}}$, B_{pa} , and B_{lim} . No reference points for fishing pressure have been defined for this stock.

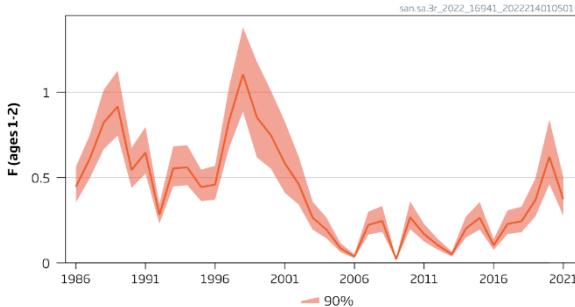
Catches



Recruitment (age 0)



F



SSB

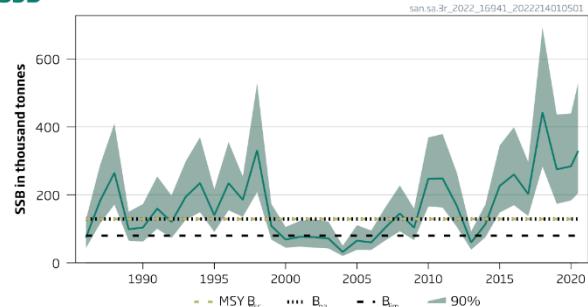


Figure 1

Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Values in the forecast .

| Variable | Value | Notes |
|--------------------|-----------|--------------------------------------|
| F (2021) | 0.37 | Assessment model estimate |
| Recruitment (2021) | 77206947 | Assessment model estimate; thousands |
| Recruitment (2022) | 112945768 | Geometric mean 1986–2020; thousands |
| SSB (2022) | 210029 | Assessment model estimate; tonnes |

Table 2 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2022) | F _{total} (2022) | SSB (2023) | % SSB change * | % TAC change ** | % advice change *** |
|---|--------------------|---------------------------|------------|----------------|-----------------|---------------------|
| ICES advice basis | | | | | | |
| SSB ₂₀₂₃ ≥ MSY B _{escapement} with F _{cap} | 85559 | 0.29 | 151563 | -28 | -46 | -47 |
| Other scenarios | | | | | | |
| F = 0 | 0 | 0 | 200747 | -4 | -100 | -100 |
| SSB ₂₀₂₃ = B _{pa} = B _{escapement} | 126038 | 0.46 | 129000 | -39 | -20 | -22 |
| SSB ₂₀₂₃ = B _{lim} | 218345 | 0.99 | 80000 | -62 | 39 | 35 |
| F ₂₀₂₁ | 106151 | 0.37 | 140019 | -33 | -33 | -34 |

* SSB₂₀₂₃ relative to SSB₂₀₂₂.

** Catch scenario for 2022 relative to the TAC in 2021 (157 641 t = the sum of the Norwegian [145 000 t] and EU [12 641 t] TAC).

*** Advice value 2022 relative to advice value 2021 (161 335 t).

The large decrease in advice from 2021 is due to the lower 2021 year class.

Basis of the advice

Table 3 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach (escapement strategy with F _{cap}) |
| Management plan | ICES is not aware of any agreed precautionary management plan for sandeel in this area |

Quality of the assessment

The 2019 and 2020 recruitment values have been revised further downwards by this year's assessment.

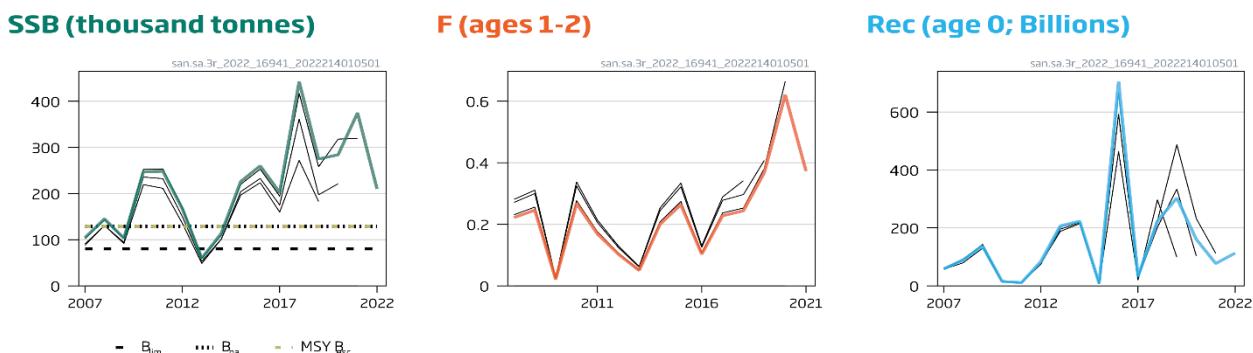


Figure 2 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Historical assessment results (final-year recruitment is the geometric mean).

Issues relevant for the advice

The large change in the advice from year to year is caused by the marked interannual variability of biomass and recruitment as well as the early maturation, both of which are typical for a short-lived species.

The assessment model has a density-dependent parameter which was introduced in the 2020 interbenchmark (ICES, 2020) to reduce the tendency of the model to overestimate both recruitment and SSB especially in years with incoming high year classes. This change reduced the overestimation of SSB and recruitment.

Most of Sandeel Area 3r is within the Norwegian Exclusive Economic Zone (EEZ), where fisheries are managed by areas that are alternately open and closed based on an acoustic measurement of the stock each May and the setting of minimum biomass limits. ICES has not been requested to evaluate this management approach.

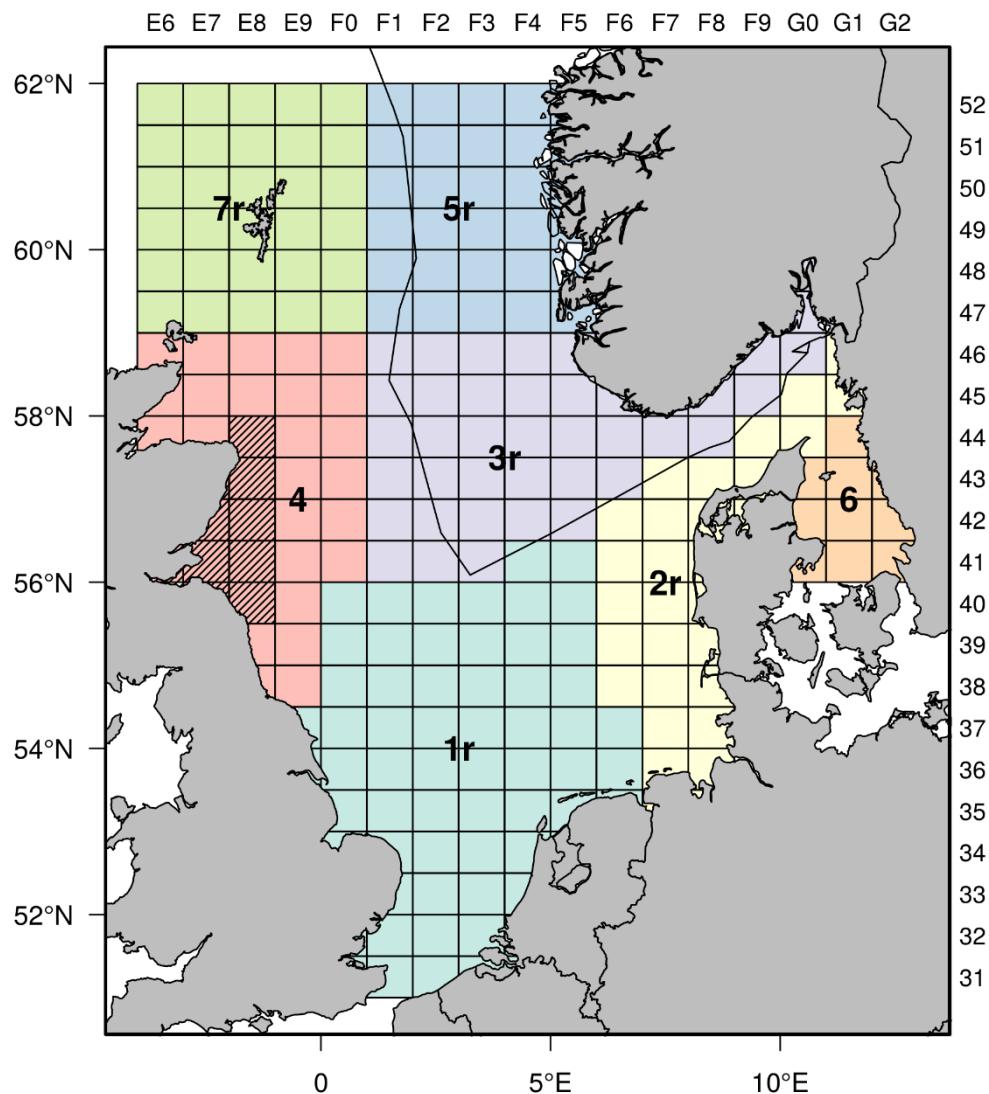


Figure 3 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Stock areas for the seven sandeel stocks. The border of the Norwegian Exclusive Economic Zone (EEZ) is shown as a black line. The closed part of Sandeel Area 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------------|-------------|---|-------------|
| MSY approach | MSY $B_{\text{escapement}}$ | 129 000 | B_{pa} ; Tonnes | ICES (2017) |
| | F_{MSY} | Not defined | | |
| | F_{cap}^* | 0.29 | The maximum F , as estimated from the management strategy evaluation (MSE), that results in < 5% probability of $\text{SSB} < B_{\text{lim}}$ | ICES (2017) |
| Precautionary approach | B_{lim} | 80 000 | The lowest SSB at which a high recruitment is observed; tonnes | ICES (2017) |
| | B_{pa} | 129 000 | $B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.29$ estimated from the assessment uncertainty in the terminal year; tonnes | ICES (2017) |
| | F_{lim} | Not defined | | |
| Management plan | SSB_{MGT} | Not defined | | |
| | F_{MGT} | Not defined | | |

* Not used as a biological reference point but used in ICES MSY approach for stocks of short-lived species.

Basis of the assessment

Table 5 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. The basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (see ICES, 2021) |
| Assessment type | Age-structured model (SMS-effort), half-yearly time-step (ICES, 2022) |
| Input data | Acoustic survey index (A6823; 2010–2021) and dredge survey index (D9376; 2005–2021). Total international catch and fishing effort. Constant maturity-at-age estimated from the dredge survey. Natural mortality estimated from multispecies assessment (ICES, 2018). Age frequencies from catch sampling. |
| Discards and bycatch | Discarding is considered to be negligible |
| Indicators | None |
| Other information | Last benchmarked in 2016 (ICES, 2017). Interbenchmarked in 2020 (ICES, 2020) |
| Working group | Herring Assessment Working Group (HAWG) |

History of advice, catch, and management

Table 6 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes. Values of catch for the period 2005 to 2015 are presented to the nearest thousand tonnes.

| Year | ICES advice | Catch corresponding to advice | EU zone TAC | Norwegian zone TAC | ICES catch SA 3 | ICES catch SA 3r | Total ICES catch (SAs 1r–7r) |
|-------|---|-------------------------------|-------------|--------------------|-----------------|------------------|------------------------------|
| 2005* | Exploitation to be kept below the level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class | - | 661000** | 10000*** | 30000 | | 177000 |
| 2006* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2007 | - | 300000** | 0 | 19000 | | 293000 |
| 2007* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2008 | - | 173000** | 51000 | 114000 | | 230000 |
| 2008* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2009 | - | 375000** | 128000 | 95000 | | 348000 |
| 2009* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2010 | - | 377000** | 0 | 34000 | | 353000 |
| 2010* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2011 | - | 377000** | 50000 | 81000 | | 414000 |
| 2011 | No fishery | 0 | 10000 | 90000 | 95000 | | 438000 |
| 2012 | Catches for monitoring purposes should not exceed 5 000 t | < 5000 | 5000 | 42000 | 46000 | | 102000 |
| 2013 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 78331 | 40000 | 20000 | 39000 | | 278000 |
| 2014 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | < 270000 | 140000 | 90000 | 143000 | | 264000 |
| 2015 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment, with additional F_{cap} | < 370000 | 190000 | 100000 | 122000 | | 312000 |
| 2016 | MSY approach: allow for sufficient stock (MSY $B_{escapement}$) to remain for successful recruitment | ≤ 123135 | 63000 | 40000 | 50737 | 44074 | 75405 |

| Year | ICES advice | Catch corresponding to advice | EU zone TAC | Norwegian zone TAC | ICES catch SA 3 | ICES catch SA 3r | Total ICES catch (SAs 1r–7r) |
|-------------------|--|-------------------------------|-------------|--------------------|-----------------|----------------------|------------------------------|
| 2017 ^a | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 74176 | 0 | 120000 | | 115642 | 517499 |
| 2018 ^a | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 108365 | 8669 | 70000 | | 75143 | 269579 |
| 2019 ^a | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 133610 | 10689 | 125000 | | 136901 | 235537 |
| 2020 ^a | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 155072 | 12406 | 250000 | | 247411 | 446765 |
| 2021 ^a | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 161335 | 12641 | 145000 | | 157752 ^{^^} | 233178 ^{^^} |
| 2022 ^a | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 85559 | | | | | |

* Advice for Subarea 4, excluding the Shetland area.

** Set for EU waters of divisions 2.a and 3.a, and Subarea 4.

*** TAC for EU fisheries set at 10 000 t; seasonal effort limitations set for Norwegian fisheries.

^a ICES statistical rectangles included in this sandeel area have changed with the 2017 assessment and advice.

^{^^} Preliminary.

History of catch and landings

Table 7 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Catch distribution by fleet in 2021 as estimated by ICES (in tonnes).

| Total catch (2021) | Landings | | Discards |
|--------------------|---------------------------------|--|-------------------------------------|
| | 100% industrial trawl fisheries | | |
| 157752 | 157752 | | Discarding is considered negligible |

Summary of the assessment

Table 8 Sandeel in divisions 4.a–b and Subdivision 20, Sandeel Area 3r. Assessment summary with weights (in tonnes) and recruitment (at age 0, in thousands). The SSB is estimated for 1 January. High and Low refer to 90% confidence intervals.

| Year | Recruitment (age 0) | High | Low | SSB | High | Low | Total catch tonnes | F ages 1–2 | High | Low |
|------|---------------------|------------|-----------|--------|--------|--------|--------------------|------------|------|------|
| | | thousands | | | tonnes | | | | | |
| 1986 | 510550442 | 877195005 | 297153714 | 74236 | 126969 | 43404 | 282334 | 0.45 | 0.56 | 0.35 |
| 1987 | 116104360 | 209605576 | 64312327 | 182773 | 288440 | 115816 | 395298 | 0.61 | 0.75 | 0.50 |
| 1988 | 360859773 | 634158425 | 205342657 | 265136 | 409945 | 171480 | 336919 | 0.82 | 1.01 | 0.67 |
| 1989 | 107715064 | 191848424 | 60477614 | 98913 | 150266 | 65110 | 374252 | 0.92 | 1.13 | 0.75 |
| 1990 | 198044042 | 350054629 | 112043777 | 104089 | 173079 | 62598 | 163224 | 0.54 | 0.67 | 0.44 |
| 1991 | 124149867 | 225094659 | 68474257 | 159692 | 254263 | 100295 | 274839 | 0.65 | 0.80 | 0.52 |
| 1992 | 257878732 | 448084201 | 148412821 | 120451 | 198453 | 73108 | 87022 | 0.28 | 0.35 | 0.23 |
| 1993 | 190850317 | 333350948 | 109265757 | 194464 | 298962 | 126491 | 200123 | 0.55 | 0.68 | 0.45 |
| 1994 | 180456444 | 323687689 | 100604778 | 234685 | 369792 | 148941 | 267281 | 0.56 | 0.69 | 0.46 |
| 1995 | 153314205 | 276694775 | 84950088 | 140225 | 216789 | 90701 | 213168 | 0.44 | 0.55 | 0.36 |
| 1996 | 742104035 | 1270032485 | 433625443 | 234451 | 355601 | 154575 | 159304 | 0.46 | 0.57 | 0.37 |
| 1997 | 63910869 | 113888005 | 35865052 | 185350 | 253765 | 135379 | 474093 | 0.83 | 1.03 | 0.67 |
| 1998 | 93175931 | 165307428 | 52518839 | 331373 | 528129 | 207919 | 474843 | 1.10 | 1.38 | 0.89 |
| 1999 | 121448395 | 213758123 | 69001882 | 108662 | 173244 | 68155 | 193621 | 0.85 | 1.18 | 0.62 |
| 2000 | 133953060 | 244295178 | 73449761 | 68665 | 105592 | 44653 | 196525 | 0.75 | 1.01 | 0.55 |

| Year | Recruitment (age 0) | High | Low | SSB | High | Low | Total catch | F ages 1–2 | High | Low |
|------|------------------------|------------|-----------|---------|---------|---------|----------------|------------------|-------|--------|
| | | thousands | | tonnes | | | tonnes | | | |
| 2001 | 127038405 | 228730898 | 70557832 | 76726 | 123535 | 47654 | 196209 | 0.58 | 0.83 | 0.41 |
| 2002 | 31960138 | 60479691 | 16889148 | 75660 | 127557 | 44877 | 115207 | 0.46 | 0.62 | 0.34 |
| 2003 | 72783512 | 134638053 | 39345783 | 71754 | 121412 | 42407 | 35365 | 0.27 | 0.36 | 0.195 |
| 2004 | 47110195 | 90165035 | 24614536 | 32048 | 50490 | 20343 | 33658 | 0.194 | 0.26 | 0.143 |
| 2005 | 80277505 | 144355577 | 44643081 | 65382 | 110917 | 38540 | 13994 | 0.086 | 0.116 | 0.063 |
| 2006 | 114949102 | 195037993 | 67747293 | 60114 | 95142 | 37982 | 7094 | 0.037 | 0.050 | 0.027 |
| 2007 | 58644245 | 97163113 | 35395608 | 104402 | 164332 | 66327 | 75376 | 0.22 | 0.30 | 0.165 |
| 2008 | 89701675 | 146182937 | 55043295 | 145365 | 227593 | 92845 | 74943 | 0.25 | 0.33 | 0.182 |
| 2009 | 137206823 | 217544555 | 86537272 | 103570 | 159865 | 67098 | 6161 | 0.021 | 0.028 | 0.0150 |
| 2010 | 15665948 | 27074762 | 9064602 | 247459 | 369038 | 165934 | 60542 | 0.27 | 0.36 | 0.198 |
| 2011 | 11106044 | 19302371 | 6390107 | 248451 | 379062 | 162844 | 92450 | 0.169 | 0.23 | 0.125 |
| 2012 | 84309069 | 142072104 | 50031069 | 167376 | 265196 | 105638 | 40141 | 0.103 | 0.139 | 0.076 |
| 2013 | 207159586 | 337954622 | 126984782 | 59934 | 92570 | 38804 | 9838 | 0.050 | 0.067 | 0.037 |
| 2014 | 223070852 | 355966153 | 139790271 | 113777 | 172072 | 75232 | 95426 | 0.20 | 0.27 | 0.148 |
| 2015 | 8121294 | 13978527 | 4718337 | 226160 | 345513 | 148036 | 104607 | 0.26 | 0.36 | 0.195 |
| 2016 | 705205636 | 1114483743 | 446229020 | 260146 | 399086 | 169578 | 44074 | 0.103 | 0.139 | 0.076 |
| 2017 | 32475613 | 54517311 | 19345515 | 202400 | 297048 | 137909 | 115642 | 0.23 | 0.31 | 0.169 |
| 2018 | 223741069 | 366412939 | 136621993 | 442856 | 692580 | 283175 | 75143 | 0.24 | 0.33 | 0.180 |
| 2019 | 303229348 | 506679863 | 181471663 | 275130 | 436111 | 173572 | 136901 | 0.37 | 0.50 | 0.27 |
| 2020 | 160691992 | 303021501 | 85214799 | 284077 | 439649 | 183555 | 247411 | 0.62 | 0.84 | 0.46 |
| 2021 | 77206947 | 216344460 | 27552879 | 375120 | 620220 | 226879 | 157752^ | 0.37 | 0.50 | 0.28 |
| 2022 | 112945768** | | | 210029* | 358096* | 123185* | | | | |

* Using mean weight-at-age from 2017 to 2021.

** Geometric mean (1986–2020).

^ Preliminary.

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Sandeel (*Ammodytes spp.*) in divisions 4.a–b, Sandeel Area 4 (northern and central North Sea)

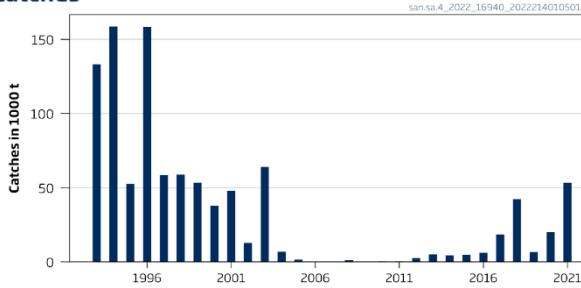
ICES advice on fishing opportunities

ICES advises that when the MSY approach and precautionary considerations are applied, there should be zero catch in 2022.

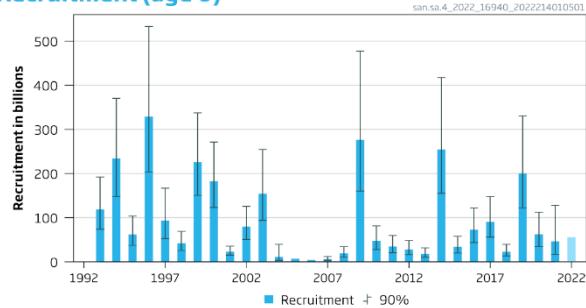
Stock development over time

Spawning-stock size is below MSY $B_{\text{escapement}}$ and between B_{pa} and B_{lim} . No reference points for fishing pressure have been defined for this stock.

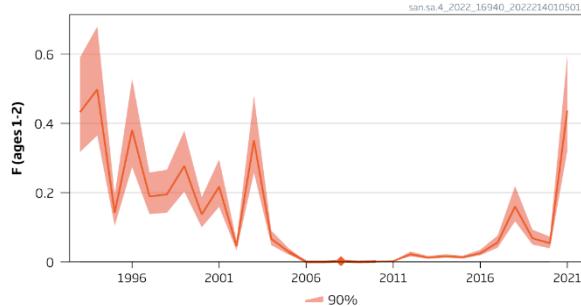
Catches



Recruitment (age 0)



F



SSB

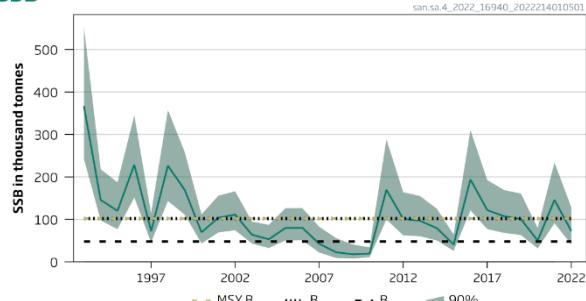


Figure 1

Sandeel in divisions 4.a–b, Sandeel Area 4. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. Uncertainty bounds of recruitment in 2005 and 2006 are not shown as these could not be reliably estimated.

Catch scenarios

Table 1 Sandeel in divisions 4.a–b, Sandeel Area 4. Values in the forecast.

| Variable | Value | Notes |
|--------------------|----------|--|
| F_{1-2} (2021) | 0.44 | Assessment model estimate. Selection pattern in 2022 assumed to be the same as 2021. |
| Recruitment (2021) | 46548252 | Assessment model estimate.;thousands |
| Recruitment (2022) | 55898143 | Geometric mean 2011–2020; thousands |
| SSB (2022) | 72766 | Assessment model estimate; tonnes |

Table 2 Sandeel in divisions 4.a–b, Sandeel Area 4. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2022) | F _{total} (2022) | SSB (2023) | % SSB change * | % TAC change ** | % advice change *** |
|---|--------------------|---------------------------|------------|----------------|-----------------|---------------------|
| ICES advice basis | | | | | | |
| SSB(2023) ≥ MSY B _{escapement} with F _{cap} | 0 | 0 | 70783 | -2.7 | -100 | -100 |
| Other scenarios | | | | | | |
| F = 0 | 0 | 0 | 70783 | -2.7 | -100 | -100 |
| SSB(2023) = MSY B _{escapement} = B _{pa} ^ | - | - | - | - | - | - |
| SSB(2023) = B _{lim} | 38317 | 0.32 | 48000 | -34 | -50 | -51 |
| F = F ₂₀₂₁ | 49577 | 0.44 | 41872 | -42 | -35 | -36 |
| 5000 tonnes monitoring TAC | 5000 | 0.0349 | 67714 | -6.9 | -93 | -94 |

* SSB₂₀₂₃ relative to SSB₂₀₂₂.

** Catch scenario for 2022 relative to the TAC in 2021 (75 914 t).

*** Advice value 2022 relative to advice value 2021 (77 512 t).

^ MSY B_{escapement} and B_{pa} cannot be achieved by 2023 even with zero catch advice.

Zero catch is advised because there is no catch that will maintain the stock above MSY B_{escapement} in 2023 due to low recruitment since 2020

Basis of the advice

Table 3 Sandeel in divisions 4.a–b, Sandeel Area 4. The basis of the advice.

| | |
|-----------------|--|
| Advice basis | MSY approach (escapement strategy with F _{cap}) |
| Management plan | ICES is not aware of any agreed precautionary management plan for sandeel in this area |

Quality of the assessment

The uncertainty of the estimated SSB and F is large in the assessment. This uncertainty results from a period of low commercial fishing effort (2004–2016), no data on catch age composition (2006–2011), and no survey indices (2004–2007).

The 2022 assessment estimates lower SSB and recruitment across the time-series compared to previous assessments. The 2019 and 2020 recruitments were downscaled by 23% and 79%, respectively, as compared to last year.

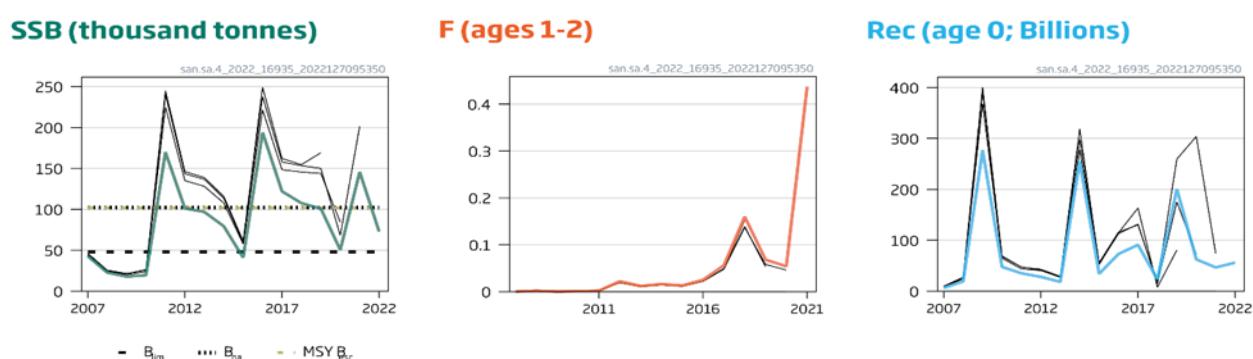


Figure 2 Sandeel in divisions 4.b–c, Sandeel Area 4. Historical assessment results (final-year recruitment includes geometric means).

Issues relevant for the advice

The large change in the advice from year to year is caused by the marked interannual variability of recruitment and biomass as well as early maturation, both of which are typical for a short-lived species.

In order to obtain samples to assess the status of the stock in 2023, ICES recommends a monitoring TAC in 2022. Catches should not exceed 5000 tonnes and should have an associated sampling protocol in the fishery (ICES, 2017).

The dredge survey does not provide reliable information on the abundance of ages 2+. Information on the age structure and mean weights of older fish are obtained from samples from the commercial fishery.

The advice monitoring TAC of 5000 t in 2022 is based on obtaining a minimum of 30 samples in order to provide information on abundance and the mean weight of sandeel in the assessment (ICES, 2014).

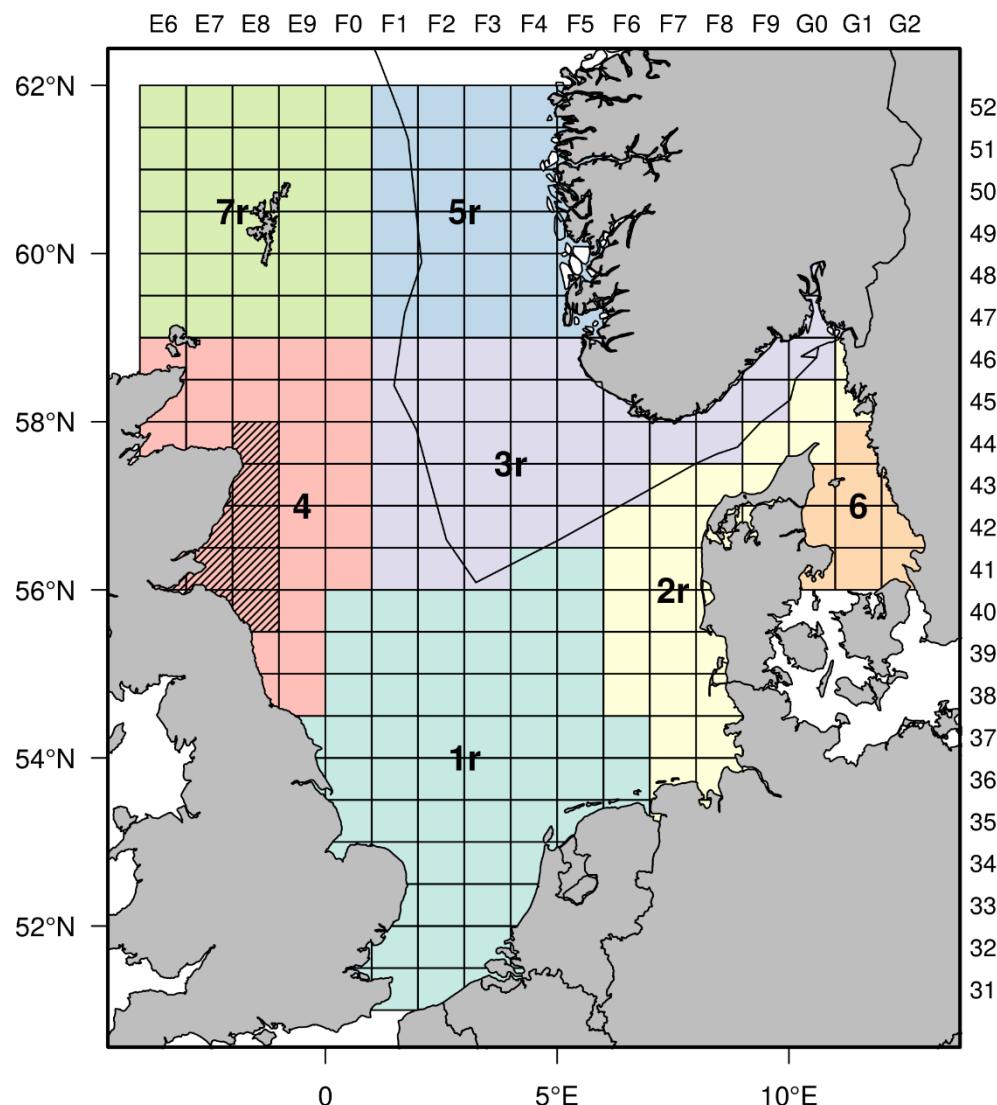


Figure 3 Sandeel in divisions 4.a–b, Sandeel Area 4. Stock areas for the seven sandeel stocks. The border of the Norwegian Exclusive Economic Zone (EEZ) is shown as a black line. The closed area in Sandeel Area 4 is shown with hatched markings.

Reference points

Table 4 Sandeel in divisions 4.a and 4.b, Sandeel Area 4. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------------|-------------|---|-------------|
| MSY approach | MSY $B_{\text{escapement}}$ | 102000 | B_{pa} ; tonnes | ICES (2017) |
| | F_{MSY} | Not defined | | |
| | F_{cap}^* | 0.15 | The maximum F estimated from the management strategy evaluation (MSE) that results in < 5% probability of $\text{SSB} < B_{\text{lim}}$ | ICES (2017) |
| Precautionary approach | B_{lim} | 48000 | The average SSB of the two lowest SSB estimates that provide high recruitment (2003, 2009); tonnes. | ICES (2017) |
| | B_{pa} | 102000 | $B_{\text{pa}} = B_{\text{lim}} \times \exp(\sigma \times 1.645)$, with $\sigma = 0.46$ estimated from the assessment uncertainty in the terminal year; tonnes | ICES (2017) |
| | F_{lim} | Not defined | | |
| Management plan | SSB_{MGT} | Not defined | | |
| | F_{MGT} | Not defined | | |

* Not used as a biological reference point but used in ICES MSY approach for stocks of short-lived species.

Basis of the assessment

Table 5 Sandeel in divisions 4.a and 4.b, Sandeel Area 4. The basis of the assessment.

| | |
|--------------------------|---|
| ICES stock data category | 1 (see ICES, 2021) |
| Assessment type | Age-structured model (SMS-effort), half-yearly time-step (ICES, 2022) |
| Input data | One survey index available in January (dredge survey since 1999; D9376). Total international catch and fishing effort. Fixed maturity data. Natural mortality estimated from multispecies assessment (assumed constant over time; ICES, 2018). Age frequencies from catch sampling. |
| Discards and bycatch | Discarding is considered to be negligible |
| Indicators | None |
| Other information | Last benchmarked in 2016 (ICES, 2017) |
| Working group | Herring Assessment Working Group (HAWG) |

History of advice, catch, and management

Table 6 Sandeel in divisions 4.a–b, Sandeel Area 4. History of ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes. Values of catch for the period 2005 to 2015 are presented to the nearest thousand tonnes.

| Year | ICES advice | Catch corresponding to advice | TAC | ICES catch SA 4 | Total ICES catch (SAs 1r–7r) |
|-------|--|-------------------------------|----------|-----------------|------------------------------|
| 2005* | Exploitation to be kept below level of 2003. Adjustment to be made conditional on the abundance of the 2004 year class | - | 661000** | 1557 | 177000 |
| 2006* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2007 | - | 300000** | 55 | 293000 |
| 2007* | The fishery should remain closed until information is available which assures that the stock can be rebuilt to B_{pa} by 2008 | - | 173000** | 11 | 230000 |
| 2008* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2009 | - | 375000** | 1168 | 348000 |
| 2009* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2010 | - | 377000** | 0 | 353000 |
| 2010* | The fishery should only be allowed if monitoring information is available and shows that the stock can be rebuilt to B_{pa} by 2011 | - | 377000** | 275 | 414000 |
| 2011 | A TAC at 5000–10 000 tonnes will impose a low risk of overfishing sandeel in this area | 5000–10000 | 10000 | 272 | 438000 |

| Year | ICES advice | Catch corresponding to advice | TAC | ICES catch SA 4 | Total ICES catch (SAs 1r–7r) |
|------|--|-------------------------------|-------|-----------------|------------------------------|
| 2012 | Catches for monitoring purposes should not exceed 5000 tonnes | < 5000 | 5000 | 2585 | 102000 |
| 2013 | Catch in 2012 reduced by 20% as a precautionary buffer | < 2041 | 4000 | 5225 | 278000 |
| 2014 | Catches for monitoring purposes should not exceed 5000 tonnes (with associated sampling protocol) | < 5000 | 5000 | 4414 | 264000 |
| 2015 | Catches for monitoring purposes should not exceed 5000 tonnes (with associated sampling protocol) | < 5000 | 5000 | 4392 | 312000 |
| 2016 | Precautionary approach | ≤ 6000 | 6000 | 6232 | 75405 |
| 2017 | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 54043 | 54043 | 18474 | 517499 |
| 2018 | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 59345 | 59345 | 42298 | 269579 |
| 2019 | Catches for monitoring purposes should not exceed 5000 tonnes | ≤ 5000 | 5000 | 6666 | 235537 |
| 2020 | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 39611 | 39611 | 20116 | 446765 |
| 2021 | MSY approach: allow for sufficient stock (MSY $B_{\text{escapement}}$) to remain for successful recruitment | ≤ 77512 | 75914 | 53370*** | 233178*** |
| 2022 | MSY approach: zero catch | 0 | | | |

* Advice for Subarea 4, excluding the Shetland area.

** Set for EU waters of divisions 2.a and 3.a, and Subarea 4.

*** Preliminary.

History of catch and landings

Table 7 Sandeel in divisions 4.a–b, Sandeel Area 4. Catch distribution by fleet in 2021 as estimated by ICES (in tonnes).

| Total catch (2021) | Landings | Discards |
|--------------------|--|-------------------------------------|
| 53370 | 100% industrial trawl fisheries 53370 | Discarding is considered negligible |

Summary of the assessment

Table 8 Sandeel in divisions 4.a–b, Sandeel Area 4. Assessment summary. All weights are in tonnes, recruitment age 0 is in thousands. The SSB is estimated for 1 January. Zero catch denotes years with very low catches in which there was no biological sampling of the fishery.

| Year | Recruitment Age 0 | High | Low | SSB | High | Low | Total catches | Pages 1–2 | High | Low |
|------|-------------------|-----------|-----------|--------|--------|--------|---------------|-----------|-------|-------|
| | | thousands | | | tonnes | | | | | |
| 1993 | 119043556 | 192154809 | 73749745 | 366957 | 554222 | 242967 | 133136 | 0.43 | 0.59 | 0.32 |
| 1994 | 233805469 | 370551496 | 147523348 | 145801 | 218176 | 97435 | 158690 | 0.50 | 0.68 | 0.37 |
| 1995 | 62332904 | 103761589 | 37445368 | 120090 | 187296 | 76999 | 52591 | 0.142 | 0.194 | 0.104 |
| 1996 | 329142057 | 533203902 | 203176483 | 228662 | 344978 | 151564 | 158490 | 0.38 | 0.53 | 0.27 |
| 1997 | 93642978 | 166771290 | 52581036 | 72330 | 114759 | 45589 | 58446 | 0.189 | 0.26 | 0.138 |
| 1998 | 42118600 | 69222822 | 25627046 | 226387 | 357574 | 143330 | 58911 | 0.195 | 0.27 | 0.142 |
| 1999 | 225538177 | 337649852 | 150651537 | 169397 | 258679 | 110930 | 53338 | 0.28 | 0.38 | 0.20 |
| 2000 | 182817693 | 271442814 | 123128361 | 69564 | 111850 | 43264 | 37792 | 0.137 | 0.187 | 0.100 |
| 2001 | 23277552 | 35655074 | 15196839 | 103881 | 155708 | 69304 | 47918 | 0.22 | 0.30 | 0.159 |
| 2002 | 79957036 | 125640160 | 50884428 | 111302 | 166215 | 74531 | 12762 | 0.046 | 0.062 | 0.033 |
| 2003 | 154545638 | 254593083 | 93813837 | 63831 | 94800 | 42979 | 64049 | 0.35 | 0.48 | 0.26 |
| 2004 | 11570855 | 39609504 | 3380115 | 53210 | 87217 | 32462 | 6882 | 0.066 | 0.090 | 0.048 |

| Year | Recruitment Age 0 | High | | Low | | SSB | High | Low | Total catches | Pages 1–2 | High | Low |
|------|----------------------|-----------|-----------|---------|----------|---------|--------|---------|------------------|--------------|------|-----|
| | | thousands | | tonnes | | | | | | | | |
| 2005 | 6948247 | *** | *** | 79937 | 126376 | 50563 | 1557 | 0.029 | 0.039 | 0.021 | | |
| 2006 | 4248175 | *** | *** | 80178 | 126531 | 50805 | 86 | 0.00 | 0.00100 | 0.00 | | |
| 2007 | 6305924 | 12043831 | 3301663 | 42702 | 82816 | 22018 | 11 | 0.00 | 0.00 | 0.00 | | |
| 2008 | 19038999 | 34330243 | 10558721 | 22652 | 55990 | 9164 | 1168 | 0.0020 | 0.0030 | 0.0020 | | |
| 2009 | 276577049 | 477115971 | 160327612 | 17771 | 40950 | 7712 | 0 | 0.00 | 0.00 | 0.00 | | |
| 2010 | 47583661 | 81477276 | 27789402 | 19456 | 34133 | 11090 | 275 | 0.00100 | 0.0020 | 0.00100 | | |
| 2011 | 35039971 | 59745657 | 20550441 | 169736 | 288604 | 99827 | 270 | 0.0020 | 0.0030 | 0.0020 | | |
| 2012 | 27979985 | 48334297 | 16197185 | 101114 | 164142 | 62287 | 2618 | 0.022 | 0.030 | 0.0160 | | |
| 2013 | 18201235 | 31753247 | 10433105 | 96761 | 155002 | 60404 | 5119 | 0.0120 | 0.0170 | 0.0090 | | |
| 2014 | 254548005 | 417578167 | 155167803 | 79301 | 125009 | 50305 | 4505 | 0.0160 | 0.022 | 0.0120 | | |
| 2015 | 34038405 | 58018823 | 19969605 | 40905 | 64536 | 25926 | 4736 | 0.0130 | 0.0180 | 0.0100 | | |
| 2016 | 73075229 | 121962231 | 43783957 | 193881 | 310217 | 121173 | 6232 | 0.025 | 0.035 | 0.0190 | | |
| 2017 | 90966330 | 147839632 | 55971955 | 121905 | 192811 | 77075 | 18474 | 0.056 | 0.076 | 0.041 | | |
| 2018 | 23115178 | 39717628 | 13452753 | 107474 | 169039 | 68331 | 42298 | 0.160 | 0.22 | 0.117 | | |
| 2019 | 200635422 | 330601350 | 121761671 | 100811 | 160964 | 63137 | 6666 | 0.068 | 0.093 | 0.050 | | |
| 2020 | 62395268 | 112408369 | 34634160 | 50312 | 80027 | 31631 | 20116 | 0.054 | 0.073 | 0.039 | | |
| 2021 | 46548252 | 127859805 | 16946215 | 145656 | 233765 | 90756 | 53370^ | 0.44 | 0.60 | 0.32 | | |
| 2022 | 55898143* | | | 72766** | 128613** | 41169** | | | | | | |

* Geometric mean (2011–2020).

** Mean weight-at-age (2017–2021).

*** Uncertainty bounds not reliably estimated.

^ Preliminary.

Sources and references

ICES. 2014. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG), 11–20 March 2014, ICES HQ, Copenhagen, Denmark. ICES CM 2014/ACOM:06. 1257 pp

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Sole (*Solea solea*) in Division 7.a (Irish Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 605 tonnes.

Stock development over time

Fishing pressure on the stock is above F_{MSY} and between F_{pa} and F_{lim} ; spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

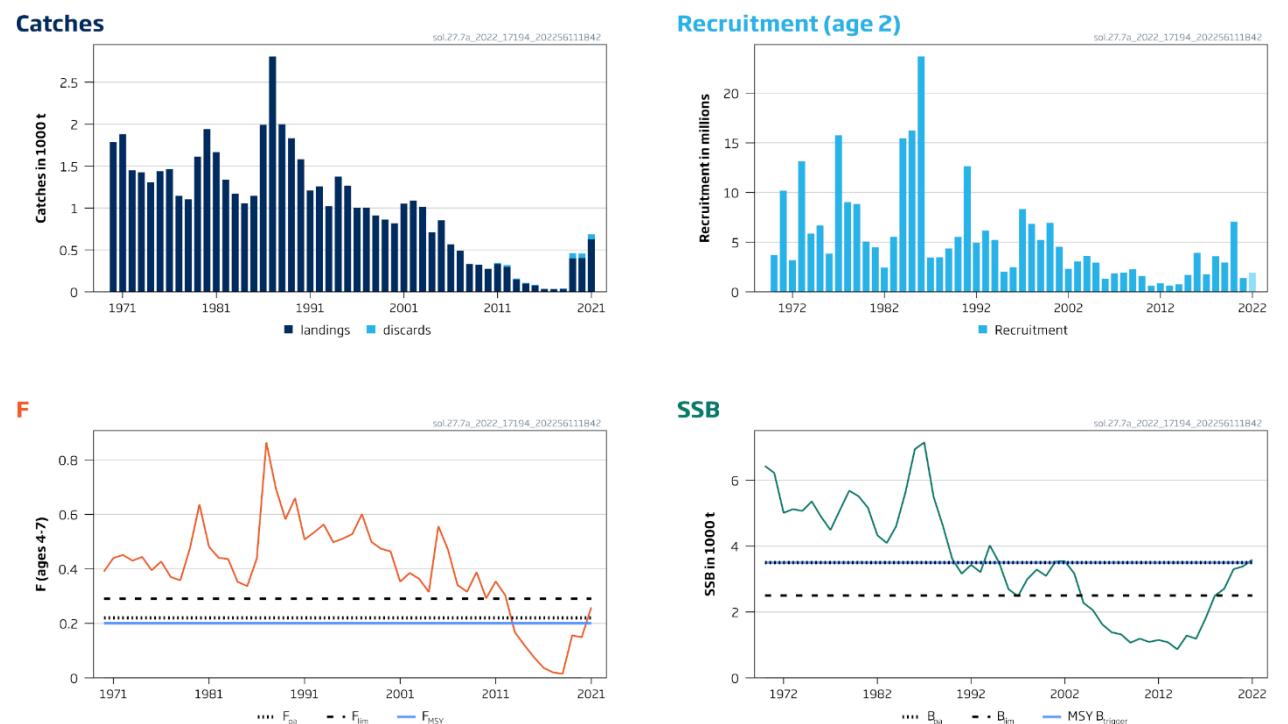


Figure 1 Sole in Division 7.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. Discard values have only been available since 2011.

Catch scenarios

Table 1 Sole in Division 7.a. Assumptions made for the interim year and in the forecast.

| Variable | Value | Notes |
|-----------------------------|-------|--|
| $F_{ages\ 4-7}\ (2022)$ | 0.22 | Based on landings of 696 tonnes for 2022 |
| SSB_{2023} | 3299 | Short-term forecast; tonnes |
| $R_{age\ 2}\ (2022,\ 2023)$ | 1937 | Geometric mean of recruitment (GM, 2012–2020); thousands |
| Total catch (2022) | 787 | TAC for 2022; tonnes |
| Projected landings (2022) | 696 | Assuming average landings rate by age 2019–2021; tonnes |
| Projected discards (2022) | 91 | Assuming average discard rate by age 2019–2021; tonnes |

Table 2 Sole in Division 7.a. Annual catch scenarios. Weights are in tonnes.

| Basis | Total catch * (2023) | Projected landings (2023) | Projected discards* (2023) | $F_{\text{projected landings}}$ (2023) | SSB (2024) | % SSB change** | % TAC change*** | % advice change^ |
|--|-------------------------|------------------------------|-------------------------------|---|---------------|-------------------|--------------------|---------------------|
| ICES advice basis | | | | | | | | |
| MSY approach: $F = F_{\text{MSY}} \times SSB_{2023} / \text{MSY } B_{\text{trigger}}$ | 605 | 535 | 70 | 0.189 | 3129 | -5.2 | -23 | -23 |
| Other scenarios | | | | | | | | |
| $F = F_{\text{MSY lower}} \times SSB_{2023} / \text{MSY } B_{\text{trigger}}$ | 492 | 435 | 57 | 0.151 | 3230 | -2.1 | -37 | -37 |
| $F = 0$ | 0 | 0 | 0 | 0 | 3674 | 11.4 | -100 | -100 |
| $F = F_{pa}$ | 695 | 615 | 81 | 0.22 | 3047 | -7.6 | -11.6 | -11.6 |
| $F = F_{lim}$ | 888 | 786 | 103 | 0.29 | 2874 | -12.9 | 12.9 | 12.9 |
| $SSB_{2024} = B_{lim}$ | 1305 | 1154 | 151 | 0.46 | 2500 | -24 | 66 | 66 |
| $SSB_{2024} = B_{pa} = \text{MSY } B_{\text{trigger}}$ | 192 | 170 | 22 | 0.056 | 3500 | 6.1 | -76 | -76 |
| $SSB_{2024} = SSB_{2023}$ | 415 | 367 | 48 | 0.126 | 3299 | 0 | -47 | -47 |
| $F = F_{2022}$ | 687 | 608 | 80 | 0.22 | 3054 | -7.4 | -12.7 | -12.7 |
| $F = F_{\text{MSY lower}}$ | 520 | 460 | 60 | 0.16 | 3205 | -2.9 | -34 | -34 |
| $F = F_{\text{MSY}}$ | 638 | 564 | 74 | 0.20 | 3099 | -6.1 | -18.9 | -18.9 |
| $F = F_{\text{MSY upper}}$ | 752 | 665 | 87 | 0.24 | 2996 | -9.2 | -4.5 | -4.5 |

* Total catches and projected discards are calculated from projected landings based on the average discard rate in 2019–2021 (11.6% in weight).

** SSB 2024 relative to SSB 2023.

*** Total catch in 2023 relative to TAC 2022 (787 tonnes).

^ Advice value for 2023 relative to the corresponding 2022 value (787 tonnes).

The reduction in catch advice is caused by a combination of a downward revision of stock size and a further projected decline because of low incoming recruitments. In addition, the target F is reduced since SSB is estimated to be below MSY B_{trigger} in 2023.

Basis of the advice

Table 3 Sole in Division 7.a. The basis of the advice.

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

Quality of the assessment

The UK (E & W)-BTS-Q3 survey was unable to cover Division 7.a in 2020 because of COVID-19 restrictions. As a result, in last year's assessment the 2020 recruitment was assumed. This year's assessment resulted in a substantial higher estimate of the 2020 recruitment compared to last year's assumption.

Last year's advice was derived using a shorter time series for the recruitment assumption. However, this year with the decrease in recruitment in 2021 the longer time period recommended was considered more representative of present recruitment.



Figure 2 Sole in Division 7.a. Historical assessment results (final-year recruitment assumption and SSB estimate included).

Issues relevant for the advice

Discards have increased recently from 3.5% (average 2016–2018) to 12% (average 2019–2021), but are not currently included in the assessment. Discards are, however, taken into account in the calculation of the advice.

Reference points

Table 4 Sole in Division 7.a. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-------------------------|----------------|---|--------------------|
| MSY approach | $MSY B_{trigger}$ | 3500 | B_{pa} ; in tonnes | ICES (2016) |
| | F_{MSY} | 0.20 | Stochastic simulations with a segmented regression stock–recruitment relationship | ICES (2016) |
| | $F_{MSY} \text{ lower}$ | 0.16 | The minimum F which produces at least 95% of maximum yield | ICES (2016) |
| | $F_{MSY} \text{ upper}$ | 0.24 | The maximum F which produces at least 95% of maximum yield | ICES (2016) |
| Precautionary approach | B_{lim} | 2500 | The lowest value with above-average recruitment (1997); in tonnes | ICES (2017) |
| | B_{pa} | 3500 | $B_{pa} \sim B_{lim} \times 1.4$; in tonnes | ICES (2017) |
| | F_{lim} | 0.29 | Based on simulated recruitment to give median biomass = B_{lim} | ICES (2017) |
| | F_{pa} | 0.22 | F_{POS} ; F that leads to SSB $\geq B_{lim}$ with 95% probability | ICES (2017, 2021a) |
| Management plan | SSB_{mgt} | Not applicable | | |
| | F_{mgt} | Not applicable | | |

Basis of the assessment

Table 5 Sole in Division 7.a. The basis of the assessment.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical assessment (XSA) that uses landings in the model (ICES, 2022b) |
| Input data | International landings, age and length frequencies from catch sampling; one survey index (UK [E & W]-BTS-Q3 [B6596]); fixed maturity data from UK survey information; natural mortality is assumed to be constant |
| Discards and bycatch | Not included in the assessment, but used to provide catch advice |
| Indicators | None |
| Other information | This stock was benchmarked in 2011 (ICES, 2011) |
| Working group | Working Group for the Celtic Seas Ecoregion (WGCSE) |

History of the advice, catch, and management

Table 6 Sole in Division 7.a. History of ICES advice, the agreed TAC, official landings, and ICES estimates of landings and discards. Weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice | Agreed TAC | Official landings | ICES discards | ICES landings |
|------|---|----------------------------------|-------------------------------|------------|-------------------|---------------|---------------|
| 1987 | No increase in F | 1900 | | 2100 | 2041 | - | 2808 |
| 1988 | 80% of F (86); TAC | 1600 | | 1750 | 1885 | - | 1999 |
| 1989 | 80% of F (87); TAC | < 1480 | | 1480 | 1823 | - | 1833 |
| 1990 | Interim advice | 1050* | | 1500 | 1576 | - | 1583 |
| 1991 | 90% of F (89); TAC | 1300 | | 1500 | 1223 | - | 1212 |
| 1992 | No long-term gains in increased F | 1200** | | 1350 | 1234 | - | 1259 |
| 1993 | F = F (91) ~ 920 tonnes | 920 | | 1000 | 971 | - | 1023 |
| 1994 | No long-term gains in increased F | 1510** | | 1500 | 1367 | - | 1374 |
| 1995 | 20% reduction in F | 800 | | 1300 | 1300 | - | 1266 |
| 1996 | 20% reduction in F | 800 | | 1000 | 1023 | - | 1002 |
| 1997 | 20% reduction in F | 800 | | 1000 | 1027 | - | 1003 |
| 1998 | 20% reduction in F | 850 | | 900 | 895 | - | 911 |
| 1999 | Reduce F below F_{pa} | 830 | | 900 | 810 | - | 863 |
| 2000 | Reduce F below F_{pa} | < 1080 | | 1080 | 833 | - | 818 |
| 2001 | Reduce F below F_{pa} | < 930 | | 1100 | 1012 | - | 1053 |
| 2002 | Keep F below F_{pa} | < 1100 | | 1100 | 1085 | - | 1090 |
| 2003 | Keep F below F_{pa} | < 1010 | | 1010 | 1014 | - | 1014 |
| 2004 | Maintain SSB above B_{pa} | < 790 | | 800 | 712 | - | 709 |
| 2005 | $F < F_{pa}$ | < 1000 | | 960 | 854 | - | 855 |
| 2006 | Recent catch levels (2002–2004) | < 930 | | 960 | 576 | - | 569 |
| 2007 | Maintain SSB above B_{pa} | 0 | | 820 | 492 | - | 492 |
| 2008 | Zero catch | 0 | | 669 | 320 | - | 332 |
| 2009 | Zero catch and recovery plan | 0 | | 502 | 325 | - | 325 |
| 2010 | Zero catch and recovery plan | 0 | | 402 | 277 | - | 277 |
| 2011 | See scenarios | - | | 390 | 330 | 14 | 330 |
| 2012 | MSY transition | < 200 | | 300 | 297 | 23 | 298 |
| 2013 | No directed fisheries, bycatch and discards should be minimized | 0 | | 140 | 148 | 12 | 148 |
| 2014 | No directed fisheries, bycatch and discards should be minimized | 0 | | 95 | 96 | 9 | 99 |
| 2015 | No directed fisheries, bycatch and discards should be minimized | 0 | | 90 | 75 | 7 | 76 |
| 2016 | MSY approach (minimize all catches) | 0 | | 40 | 35 | 1 | 35 |
| 2017 | MSY approach | | 0 | 40 | 34 | 1 | 34 |
| 2018 | MSY approach | | 0 | 40 | 36 | 2 | 36 |
| 2019 | MSY approach | | ≤ 414 | 414 | 345† | 63 | 400 |
| 2020 | MSY approach | | ≤ 561 | 457 | 398*** | 56 | 404 |
| 2021 | MSY approach | | ≤ 768 | 768 | 633*** | 61 | 629 |
| 2022 | MSY approach | | ≤ 787 | 787 | | | |
| 2023 | MSY approach | | ≤ 605 | | | | |

* Revised to 1500 tonnes in 1990.

** Catch at *status quo* F.

*** Preliminary.

† Incomplete/missing due to part of the data being unavailable under data confidentiality clauses.

History of the catch and landings

Table 7 Sole in Division 7.a. Catch distribution by fleet in 2021 as estimated by ICES.

| Total catch | Landings | | | Discards |
|-------------|---------------|----------------|-------------|-----------|
| | Beam trawlers | Otter trawlers | Other gears | |
| 690 tonnes | 87% | 12% | < 1% | 61 tonnes |

| | | | | | | | | | | |
|--|------------|--|--|--|--|--|--|--|--|--|
| | 629 tonnes | | | | | | | | | |
|--|------------|--|--|--|--|--|--|--|--|--|

Table 8 Sole in Division 7.a. History of official and ICES estimated landings. Weights are in tonnes.

| Year | Belgium | France | Ireland | Netherlands | UK (E + W) | UK (Isle of Man) | UK (NI)* | UK (Scotland) | Officially reported | ICES landings |
|--------|---------|--------|---------|-------------|------------|------------------|----------|---------------|---------------------|---------------|
| 1973 | 793 | 12 | 27 | 281 | 258 | - | 46 | 11 | 1428 | 1428 |
| 1974 | 664 | 54 | 28 | 320 | 218 | - | 23 | - | 1307 | 1307 |
| 1975 | 805 | 59 | 24 | 234 | 281 | - | 24 | 15 | 1442 | 1441 |
| 1976 | 674 | 72 | 74 | 381 | 195 | - | 49 | 18 | 1463 | 1463 |
| 1977 | 566 | 39 | 84 | 227 | 160 | - | 49 | 21 | 1146 | 1147 |
| 1978 | 453 | 65 | 127 | 177 | 189 | - | 57 | 30 | 1098 | 1106 |
| 1979 | 779 | 48 | 134 | 247 | 290 | - | 47 | 42 | 1587 | 1614 |
| 1980 | 1002 | 41 | 229 | 169 | 367 | - | 44 | 68 | 1920 | 1941 |
| 1981 | 884 | 13 | 167 | 186 | 311 | - | 41 | 45 | 1647 | 1667 |
| 1982 | 669 | 9 | 161 | 138 | 277 | - | 31 | 44 | 1329 | 1338 |
| 1983 | 544 | 3 | 203 | 224 | 219 | - | 33 | 29 | 1255 | 1169 |
| 1984 | 425 | 10 | 187 | 113 | 230 | - | 38 | 17 | 1020 | 1058 |
| 1985 | 589 | 9 | 180 | 546 | 269 | - | 36 | 28 | 1657 | 1146 |
| 1986 | 930 | 17 | 235 | - | 637 | 1 | 50 | 46 | 1916 | 1995 |
| 1987 | 987 | 5 | 312 | - | 599 | 3 | 72 | 63 | 2041 | 2808 |
| 1988 | 915 | 11 | 366 | - | 507 | 1 | 47 | 38 | 1885 | 1999 |
| 1989 | 1010 | 5 | 155 | - | 613 | 2 | - | 38 | 1823 | 1833 |
| 1990 | 786 | 2 | 170 | - | 569 | 10 | - | 39 | 1576 | 1583 |
| 1991 | 371 | 3 | 198 | - | 581 | 44 | - | 26 | 1223 | 1212 |
| 1992 | 531 | 11 | 164 | - | 477 | 14 | - | 37 | 1234 | 1259 |
| 1993 | 495 | 8 | 98 | - | 338 | 4 | - | 28 | 971 | 1023 |
| 1994 | 706 | 7 | 226 | - | 409 | 5 | - | 14 | 1367 | 1374 |
| 1995 | 675 | 5 | 176 | - | 424 | 12 | - | 8 | 1300 | 1266 |
| 1996 | 533 | 5 | 133 | 149 | 194 | 4 | - | 5 | 1023 | 1002 |
| 1997 | 570 | 3 | 130 | 123 | 189 | 5 | - | 7 | 1027 | 1003 |
| 1998 | 525 | 3 | 134 | 60 | 161 | 3 | - | 9 | 895 | 911 |
| 1999 | 469 | < 1 | 120 | 46 | 165 | 1 | - | 8 | 810 | 863 |
| 2000 | 493 | 3 | 135 | 60 | 133 | 1 | - | 8 | 833 | 818 |
| 2001 | 674 | 4 | 135 | - | 195 | - | - | 4 | 1012 | 1053 |
| 2002 | 817 | 4 | 96 | - | 165 | - | - | 3 | 1085 | 1090 |
| 2003 | 687 | 4 | 103 | - | 217 | - | - | 3 | 1014 | 1014 |
| 2004 | 527 | 1 | 77 | - | 106 | - | - | 1 | 712 | 709 |
| 2005 | 662 | 3 | 85 | - | 103 | - | - | 1 | 854 | 855 |
| 2006 | 419 | 1 | 85 | - | 71 | - | - | 2 | 576 | 569 |
| 2007 | 306 | 1 | 115 | - | 70 | - | - | 4 | 492 | 492 |
| 2008 | 216 | 1 | 66 | - | 37 | - | - | - | 320 | 332 |
| 2009 | 257 | - | 47 | - | 20 | 1 | - | 1 | 325 | 325 |
| 2010 | 217 | -- | 47 | - | 12 | - | - | - | 277 | 277 |
| 2011 | 250 | < 1 | 49 | - | 31 | - | - | - | 330 | 330 |
| 2012 | 222 | < 1 | 51 | - | 23 | - | - | - | 297 | 298 |
| 2013 | 96 | < 1 | 40 | - | 12 | - | - | - | 148 | 148 |
| 2014 | 43 | - | 43 | - | 10 | - | - | - | 96 | 99 |
| 2015 | 36 | < 1 | 32 | - | 7 | - | - | - | 75 | 76 |
| 2016 | 14 | - | 15 | - | 6 | - | - | - | 35 | 35 |
| 2017 | 14 | < 1 | 14 | - | 4 | 2 | - | - | 34 | 34 |
| 2018 | 14 | - | 16 | - | 6 | < 1 | - | - | 36 | 36 |
| 2019 | 329 | < 1 | † | - | 15 | < 1 | - | - | 345† | 400 |
| 2020** | 284 | < 1 | 48 | - | 65 | < 1 | - | - | 398 | 404 |
| 2021** | 477 | < 1 | 81 | - | 74 | < 1 | - | - | 633 | 629 |

* 1989 onwards: N. Ireland included with England & Wales.

** Preliminary.

† Incomplete/missing due to part of the data being unavailable under data confidentiality clauses.

Summary of the assessment

Table 9 Sole in Division 7.a. Assessment summary. Weights are in tonnes and recruitment in thousands.

| Year | Recruitment age 2 | SSB | Landings | Fishing mortality ages 4–7 |
|------|----------------------|------|----------|-------------------------------|
| 1970 | 3695 | 6436 | 1785 | 0.39 |
| 1971 | 10177 | 6222 | 1882 | 0.44 |
| 1972 | 3186 | 5011 | 1450 | 0.45 |
| 1973 | 13133 | 5123 | 1428 | 0.43 |
| 1974 | 5870 | 5068 | 1307 | 0.44 |
| 1975 | 6679 | 5359 | 1441 | 0.40 |
| 1976 | 3857 | 4889 | 1463 | 0.43 |
| 1977 | 15772 | 4490 | 1147 | 0.37 |
| 1978 | 9040 | 5092 | 1106 | 0.36 |
| 1979 | 8847 | 5684 | 1614 | 0.48 |
| 1980 | 5070 | 5513 | 1941 | 0.64 |
| 1981 | 4496 | 5165 | 1667 | 0.48 |
| 1982 | 2460 | 4330 | 1338 | 0.44 |
| 1983 | 5556 | 4095 | 1169 | 0.44 |
| 1984 | 15457 | 4601 | 1058 | 0.35 |
| 1985 | 16223 | 5635 | 1146 | 0.34 |
| 1986 | 23690 | 6944 | 1995 | 0.44 |
| 1987 | 3454 | 7148 | 2808 | 0.86 |
| 1988 | 3490 | 5498 | 1999 | 0.70 |
| 1989 | 4366 | 4609 | 1833 | 0.58 |
| 1990 | 5547 | 3603 | 1583 | 0.66 |
| 1991 | 12650 | 3165 | 1212 | 0.51 |
| 1992 | 4943 | 3430 | 1259 | 0.53 |
| 1993 | 6174 | 3212 | 1023 | 0.56 |
| 1994 | 5230 | 4023 | 1374 | 0.50 |
| 1995 | 2004 | 3493 | 1266 | 0.51 |
| 1996 | 2493 | 2689 | 1002 | 0.53 |
| 1997 | 8338 | 2480 | 1003 | 0.60 |
| 1998 | 6849 | 2998 | 911 | 0.50 |
| 1999 | 5230 | 3288 | 863 | 0.47 |
| 2000 | 6943 | 3097 | 818 | 0.46 |
| 2001 | 4543 | 3531 | 1053 | 0.35 |
| 2002 | 2328 | 3539 | 1090 | 0.39 |
| 2003 | 3052 | 3174 | 1014 | 0.36 |
| 2004 | 3632 | 2274 | 709 | 0.32 |
| 2005 | 2945 | 2055 | 855 | 0.56 |
| 2006 | 1318 | 1623 | 569 | 0.47 |
| 2007 | 1863 | 1383 | 492 | 0.34 |
| 2008 | 1949 | 1320 | 332 | 0.32 |
| 2009 | 2263 | 1069 | 325 | 0.39 |
| 2010 | 1602 | 1190 | 277 | 0.29 |

| Year | Recruitment age 2 | SSB | Landings | Fishing mortality ages 4–7 |
|------|----------------------|------|----------|-------------------------------|
| 2011 | 633 | 1091 | 330 | 0.35 |
| 2012 | 872 | 1150 | 298 | 0.30 |
| 2013 | 639 | 1081 | 148 | 0.168 |
| 2014 | 775 | 866 | 99 | 0.120 |
| 2015 | 1714 | 1284 | 76 | 0.076 |
| 2016 | 3931 | 1189 | 35 | 0.037 |
| 2017 | 1755 | 1794 | 34 | 0.020 |
| 2018 | 3596 | 2494 | 36 | 0.0150 |
| 2019 | 2964 | 2703 | 400 | 0.156 |
| 2020 | 7051 | 3298 | 404 | 0.149 |
| 2021 | 1405 | 3385 | 629 | 0.26 |
| 2022 | 1937* | 3588 | | |

* Geometric mean (2012–2020).

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Sole (*Solea solea*) in Division 7.a (Irish Sea). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sol.27.7a. <https://doi.org/10.17895/ices.advice.19453817>.

Sole (*Solea solea*) in Division 7.d (eastern English Channel)

ICES advice on fishing opportunities

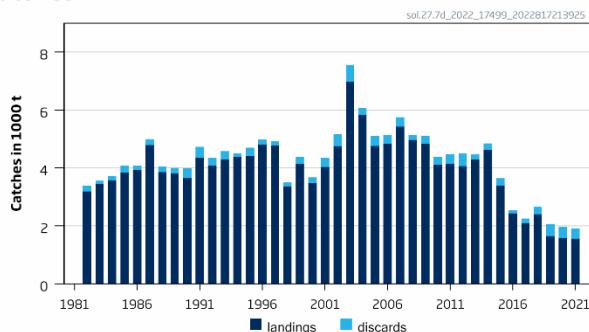
ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 1747 tonnes.

ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

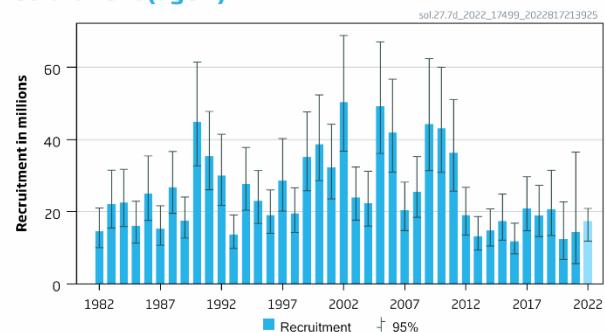
Stock development over time

Fishing pressure on the stock is below F_{MSY} ; spawning-stock size is below MSY $B_{trigger}$ and between B_{pa} and B_{lim} .

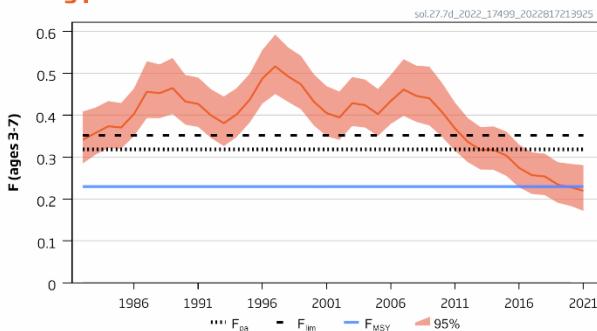
Catches



Recruitment (age 1)



Fishing pressure



Spawning Stock Biomass

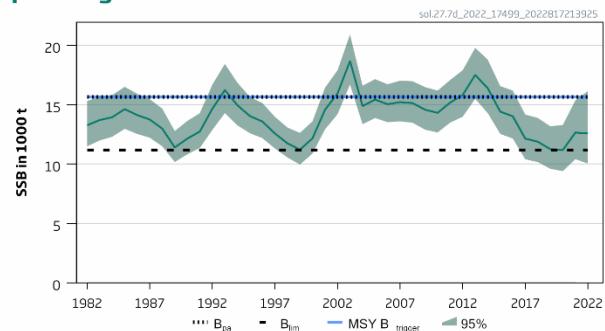


Figure 1 Sole in Division 7.d. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. Discards are reconstructed prior to 2004 and include BMS (below minimum size) landings.

Catch scenarios

Table 1 Sole in Division 7.d. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|---------------------------|-------|---|
| $F_{ages\ 3-7}(2022)$ | 0.22 | Average exploitation pattern (2017–2021), scaled to average $F_{ages\ 3-7}$ in 2021 |
| SSB (2023) | 12682 | Short-term forecast (STF); tonnes |
| R_{age1} (2022, 2023) | 17337 | Median recruitment, resampled from the years 2012–2020; thousands |
| Catch (2022) | 2005 | STF; tonnes |
| Projected landings (2022) | 1763 | STF; assuming average landings ratio by age 2017–2021; tonnes |
| Projected discards (2022) | 242 | STF; assuming average discard ratio by age 2017–2021; tonnes. |

Table 2 Sole in Division 7.d. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | Projected landings [^] (2023) | Projected discards ^{^^} (2023) | F _{total} (ages 3–7) (2023) | F _{projected landings} (ages 3–7) (2023) | F _{projected discards} (ages 3–7) (2023) | SSB (2024) | % SSB change* | % TAC change** | % advice change** |
|---|-----------------------|--|---|--|---|---|---------------|------------------|-------------------|----------------------|
| ICES advice basis | | | | | | | | | | |
| MSY approach: $F_{MSY} \times SSB(2023)/MSY B_{trigger}$ | 1747 | 1529 | 218 | 0.186 | 0.156 | 0.030 | 13162 | 3.8 | -27 | -27 |
| Other scenarios | | | | | | | | | | |
| $F = F_{MSY} \times SSB(2023)/MSY B_{trigger}$ | 1221 | 1067 | 154 | 0.126 | 0.106 | 0.021 | 13789 | 8.7 | -49 | -49 |
| $F = 0$ | 0 | 0 | 0 | 0 | 0 | 0 | 15237 | 20 | -100 | -100 |
| F_{pa} | 2821 | 2468 | 353 | 0.318 | 0.27 | 0.052 | 11933 | -5.9 | 18.5 | 18.5 |
| F_{lim} | 3070 | 2689 | 381 | 0.352 | 0.29 | 0.057 | 11641 | -8.2 | 29 | 29 |
| $SSB(2024) = B_{lim}$ | 3463 | 3032 | 431 | 0.41 | 0.34 | 0.066 | 11181 | -11.8 | 46 | 46 |
| $SSB(2024) = B_{pa} = MSY B_{trigger}$ [#] | | | | | | | | | | |
| $F = F_{2022}$ | 2032 | 1777 | 255 | 0.22 | 0.184 | 0.036 | 12836 | 1.21 | -14.6 | -14.6 |
| $F = F_{MSY} \text{ lower}$ | 1487 | 1300 | 187 | 0.156 | 0.131 | 0.025 | 13484 | 6.3 | -38 | -38 |
| $F = F_{MSY}$ | 2116 | 1851 | 265 | 0.230 | 0.193 | 0.037 | 12737 | 0.43 | -11.1 | -11.1 |

[^] Marketable landings.

^{^^} Including BMS landings, assuming recent discard rate.

* SSB 2024 relative to SSB 2023 (12 682 tonnes).

** Total catch in 2023 relative to the advice value 2022 and TAC (2380 tonnes).

B_{pa} and MSY $B_{trigger}$ cannot be achieved in 2024, even with zero catches.

The 27% decrease in advice is the result of a revision of the assessment during the 2022 interbenchmark, which led to a large downward revision of recent recruitment and the recalculation of the reference points (ICES, 2022a).

Basis of the advice

Table 3 Sole in Division 7.d. The basis of the advice.

| Advice basis | MSY approach |
|-----------------|---|
| Management plan | ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2019) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F_{MSY} ranges are provided. |

Quality of the assessment

This stock was interbenchmarked in 2022 (ICES, 2022a) because of 1) a trend in the survey catchability of the UK beam trawl survey (UK BTS) likely related to the smaller size of sole in more recent years and 2) a poor fit of the state-space assessment model (SAM) to the observed catches.

During the interbenchmark, changes were made to the configuration of the model to improve the fit to the catch data. Poorer tracking of the cohorts in the most recent part of the time-series (from 2010 onwards) led to the exclusion of ages 1–3 from the UK BTS index from 2010–2021. As a result, recruitment in 2019 was revised downward about 52% compared to the previous estimate, and reference points were recalculated.

The discard sampling coverage in 2020 was lower due to the COVID-19 pandemic (54% versus 71% in 2019 and 75% in 2021).

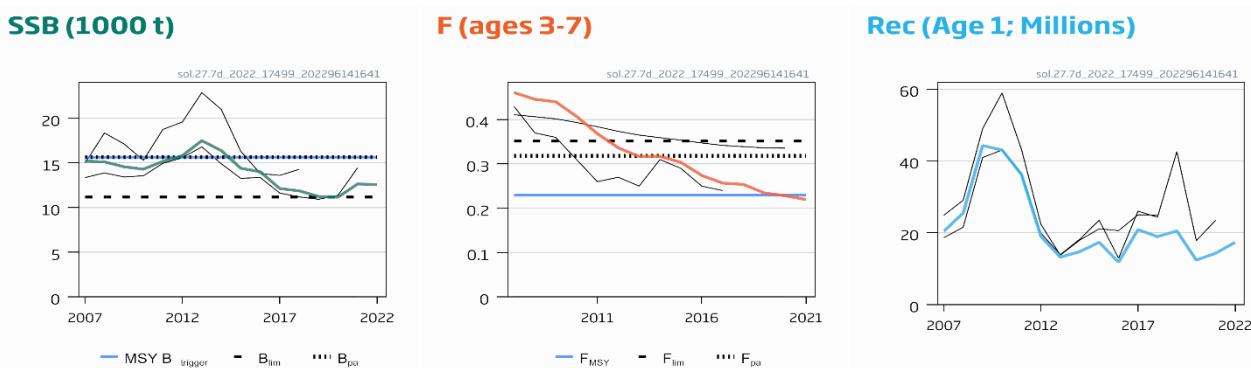


Figure 2 Sole in Division 7.d. Historical assessment results (final-year recruitment included for each line, corresponding to the forecast recruitment in the interim year). The reference points were revised in 2022 following the interbenchmark protocol (ICES, 2022a), and only assessment results from the last year should be compared to the reference points indicated. The 2019 and 2020 assessment results are missing because category 3 advice was provided.

Issues relevant for the advice

Technical measures applicable to the mixed demersal beam trawl fishery affect both sole and plaice. The minimum mesh size of 80 mm for the sole fishery generates high discards of plaice, which have a larger minimum landing size than sole. The use of larger mesh sizes would reduce the catch of undersized plaice and sole but would also result in a loss of marketable sole in the short term.

From 2011, catches have been lower than the TAC. The advised catch for 2023 is similar to the catch in recent years.

Reference points

Table 4 Sole in Division 7.d. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------|-------------|---|--------------|
| MSY approach | MSY $B_{trigger}$ | 15654 | B_{pa} ; in tonnes | ICES (2022a) |
| | F_{MSY} | 0.230 | Stochastic simulations (EqSim) with segmented regression fixed at B_{lim} based on recruitment period 1982–2020 | ICES (2022a) |
| Precautionary approach | B_{lim} | 11181 | B_{loss} , lowest observed SSB (2020) with 2021 as the last year of catch data; in tonnes | ICES (2022a) |
| | B_{pa} | 15654 | $B_{lim} \times 1.4$; in tonnes | ICES (2022a) |
| | F_{lim} | 0.352 | The F that on average leads to B_{lim} from EqSim | ICES (2022a) |
| | F_{pa} | 0.318 | The F that provides a 95% probability for SSB to be above B_{lim} (F_{P95} with advice rule [AR]) | ICES (2022a) |
| Management plan * | MAP MSY $B_{trigger}$ | 15654 | MSY $B_{trigger}$; in tonnes | ICES (2022a) |
| | MAP B_{lim} | 11181 | B_{lim} ; in tonnes | ICES (2022a) |
| | MAP F_{MSY} | 0.230 | F_{MSY} | ICES (2022a) |
| | MAP range F_{lower} | 0.156–0.230 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with F_{MSY} | ICES (2022a) |
| | MAP range F_{upper} | 0.230–0.287 | Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with F_{MSY} | ICES (2022a) |

* EU multiannual plan (MAP) for the Western Waters (EU, 2019).

Basis of the assessment

Table 5 Sole in Division 7.d. Basis of the assessment and advice.

| | |
|-------------------------------------|--|
| ICES stock data category | 1 (ICES, 2022b) |
| Assessment type | Age-based analytical assessment (SAM; Nielsen and Berg, 2014; ICES, 2022c) that uses catches in the model and in the forecast |
| Input data | Commercial catches: international landings and discards, age compositions from catch data; three survey indices: UK(E&W)-BTS [B2453], UK(E&W)-YFS [B6805] and FR-YFS [B5507]; three commercial indices: BE-CBT, FR-COTB, and UK(E&W)-CBT; natural mortality and maturity-at-age are assumed to be time invariant (ICES, 2017, 2021, 2022a) |
| Discards, BMS landings, and bycatch | Discards are reconstructed from 1982–2003. Discards (including ICES estimated BMS) are combined with the landings as input in the model. In 2021, 82% of the landings had associated discarding information, and 75% of the discards were sampled. |
| Indicators | None |
| Other information | This stock was benchmarked in 2021 (ICES, 2021) and interbenchmarked in 2022 (ICES, 2022a) |
| Working group | Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) |

History of the advice, catch, and management

Table 6 Sole in Division 7.d. ICES advice, TAC, official landings, and ICES catch estimates. All weights are in tonnes.

| Year | ICES advice | Landings corresponding to advice | Catch corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards |
|------|-----------------------------------|----------------------------------|-------------------------------|------------|-------------------|---------------|---------------|
| 1987 | Precautionary TAC | 3100 | | 3850 | 3841 | 4791 | 197 |
| 1988 | <i>Status quo (shot)</i> TAC | 3400 | | 3850 | 3302 | 3853 | 198 |
| 1989 | <i>Status quo (shot)</i> TAC | 3800 | | 3850 | 2945 | 3805 | 192 |
| 1990 | No effort increase; TAC | 3700 | | 3850 | 3036 | 3647 | 342 |
| 1991 | <i>Status quo F</i> ; TAC | 3400 | | 3850 | 3784 | 4351 | 368 |
| 1992 | TAC | 2700 | | 3500 | 3794 | 4072 | 275 |
| 1993 | 70% of F(91)~ 2800 tonnes | 2800 | | 3200 | 3862 | 4299 | 273 |
| 1994 | Reduce F | < 3800 | | 3800 | 4038 | 4383 | 122 |
| 1995 | No increase in F | 3800 | | 3800 | 3743 | 4420 | 282 |
| 1996 | No long-term gain in increasing F | 4700 | | 3500 | 4098 | 4797 | 174 |
| 1997 | No advice | - | | 5230 | 3941 | 4764 | 147 |
| 1998 | No increase in effort | 4500 | | 5230 | 3047 | 3363 | 127 |
| 1999 | Reduce F to F_{pa} | 3800 | | 4700 | 3900 | 4135 | 247 |
| 2000 | $F < F_{pa}$ | < 3900 | | 4100 | 3832 | 3476 | 201 |
| 2001 | $F < F_{pa}$ | < 4700 | | 4600 | 4617 | 4025 | 317 |
| 2002 | $F < F_{pa}$ | < 5200 | | 5200 | 5399 | 4733 | 444 |
| 2003 | $F < F_{pa}$ | < 5400 | | 5400 | 6247 | 6977 | 584 |
| 2004 | $F < F_{pa}$ | < 5900 | | 5900 | 5667 | 5819 | 258 |
| 2005 | $F < F_{pa}$ | < 5700 | | 5700 | 4620 | 4748 | 344 |
| 2006 | $F < F_{pa}$ | < 5700 | | 5720 | 4832 | 4830 | 315 |
| 2007 | $F < F_{pa}$ | < 6440 | | 6220 | 5313 | 5421 | 332 |
| 2008 | $F < F_{pa}$ | < 6590 | | 6590 | 4972 | 4963 | 183 |
| 2009 | $F < F_{pa}$ | < 4380 | | 5274 | 5282 | 4828 | 287 |
| 2010 | $F < F_{pa}$ | < 3190 | | 4219 | 4449 | 4108 | 273 |
| 2011 | See scenarios | < 4840 | | 4852 | 4203 | 4136 | 342 |
| 2012 | MSY transition | < 5600 | | 5580 | 4043 | 4058 | 445 |
| 2013 | MSY transition | < 5900 | | 5900 | 4442 | 4295 | 180 |
| 2014 | MSY transition | < 3251 | | 4838 | 4651 | 4626 | 216 |
| 2015 | MSY approach | < 1931 | | 3483 | 3411 | 3385 | 263 |
| 2016 | MSY approach | | ≤ 2685 | 3258 | 2529 | 2433 | 106 |
| 2017 | MSY approach | | ≤ 2487 | 2724 | 2223 | 2090 | 156 |
| 2018 | MSY approach | | ≤ 3866 | 3405 | 2312 | 2395 | 263 |
| 2019 | MSY approach | | ≤ 2571 | 2515 | 1773 | 1648 | 404 |
| 2020 | Precautionary approach | | < 2846 | 2797 | 1706 | 1562 | 409* |
| 2021 | Precautionary approach | | < 3248 | 3248 | 1664 | 1561 | 348* |
| 2022 | MSY approach | | ≤ 2380 | 2380 | | | |
| 2023 | MSY approach | | ≤ 1747 | | | | |

* Including BMS reported to ICES

History of the catch and landings

Table 7 Sole in Division 7.d. Catch distribution by fleet in 2021 as estimated by and reported to ICES.

| Catch 1909 tonnes | Landings | | | | Discards* 348 tonnes |
|----------------------|--------------------------|--------------------|----------------------|---------------------|-------------------------|
| | Trammel-/gillnets 32% | Beam trawls 35% | Bottom trawls 31% | Other gears 2.7% | |
| | 1561 tonnes | | | | |

* Discards include BMS landings.

Table 8 Sole in Division 7.d. History of commercial catch and landings; both the official and ICES estimated values are presented by country. All weights are in tonnes.

| Year | Official landings | | | | | | ICES estimates | |
|------|-------------------|--------|------------|--------|--------------|-------|----------------|----------|
| | Belgium | France | UK (E + W) | Others | BMS landings | Total | Landings | Discards |
| 1974 | 159 | 383 | 309 | 3 | | 854 | 884 | |
| 1975 | 132 | 464 | 244 | 1 | | 841 | 882 | |
| 1976 | 203 | 599 | 404 | - | | 1206 | 1305 | |
| 1977 | 225 | 737 | 315 | - | | 1277 | 1335 | |
| 1978 | 241 | 782 | 366 | - | | 1389 | 1589 | |
| 1979 | 311 | 1129 | 402 | - | | 1842 | 2215 | |
| 1980 | 302 | 1075 | 159 | - | | 1536 | 1923 | |
| 1981 | 464 | 1513 | 160 | - | | 2137 | 2477 | |
| 1982 | 525 | 1828 | 317 | 4 | | 2674 | 3190 | 196 |
| 1983 | 502 | 1120 | 419 | - | | 2041 | 3458 | 101 |
| 1984 | 592 | 1309 | 505 | - | | 2406 | 3575 | 141 |
| 1985 | 568 | 2545 | 520 | - | | 3633 | 3837 | 242 |
| 1986 | 858 | 1528 | 551 | - | | 2937 | 3932 | 145 |
| 1987 | 1100 | 2086 | 655 | - | | 3841 | 4791 | 197 |
| 1988 | 667 | 2057 | 578 | - | | 3302 | 3853 | 198 |
| 1989 | 646 | 1610 | 689 | - | | 2945 | 3805 | 192 |
| 1990 | 996 | 1255 | 785 | - | | 3036 | 3647 | 342 |
| 1991 | 904 | 2054 | 826 | - | | 3784 | 4351 | 368 |
| 1992 | 891 | 2187 | 706 | 10 | | 3794 | 4072 | 275 |
| 1993 | 917 | 2322 | 610 | 13 | | 3862 | 4299 | 273 |
| 1994 | 940 | 2382 | 701 | 15 | | 4038 | 4383 | 122 |
| 1995 | 817 | 2248 | 669 | 9 | | 3743 | 4420 | 282 |
| 1996 | 899 | 2322 | 877 | - | | 4098 | 4797 | 174 |
| 1997 | 1306 | 1702 | 933 | - | | 3941 | 4764 | 147 |
| 1998 | 541 | 1703 | 803 | - | | 3047 | 3363 | 127 |
| 1999 | 880 | 2251 | 769 | - | | 3900 | 4135 | 247 |
| 2000 | 1021 | 2190 | 621 | - | | 3832 | 3476 | 201 |
| 2001 | 1313 | 2482 | 822 | - | | 4617 | 4025 | 317 |
| 2002 | 1643 | 2780 | 976 | - | | 5399 | 4733 | 444 |
| 2003 | 1657 | 3475 | 1114 | 1 | | 6247 | 6977 | 584 |
| 2004 | 1485 | 3070 | 1112 | - | | 5667 | 5819 | 258 |
| 2005 | 1221 | 2832 | 567 | - | | 4620 | 4748 | 344 |
| 2006 | 1547 | 2627 | 658 | 0 | | 4832 | 4830 | 315 |
| 2007 | 1530 | 2981 | 801 | 1 | | 5313 | 5421 | 332 |
| 2008 | 1368 | 2880 | 724 | 0 | | 4972 | 4963 | 183 |
| 2009 | 1475 | 3047 | 760 | 0 | | 5282 | 4828 | 287 |
| 2010 | 1294 | 2476 | 679 | 0 | | 4449 | 4108 | 273 |
| 2011 | 1222 | 2281 | 700 | 0 | | 4203 | 4136 | 342 |
| 2012 | 941 | 2475 | 627 | < 1 | | 4043 | 4058 | 445 |

| Year | Official landings | | | | | | ICES estimates | |
|-------|-------------------|--------|------------|--------|--------------|-------|----------------|----------|
| | Belgium | France | UK (E + W) | Others | BMS landings | Total | Landings | Discards |
| 2013 | 952 | 2884 | 605 | 0 | | 4442 | 4295 | 180 |
| 2014 | 1496 | 2507 | 648 | < 1 | | 4651 | 4626 | 216 |
| 2015 | 1048 | 1895 | 468 | 0 | | 3411 | 3385 | 263 |
| 2016 | 799 | 1337 | 392 | < 1 | | 2529 | 2433 | 106 |
| 2017 | 697 | 1178 | 349 | < 1 | | 2223 | 2090 | 156 |
| 2018 | 653 | 1265 | 394 | < 1 | | 2312 | 2395 | 263 |
| 2019 | 603 | 925 | 245 | < 1 | < 1 | 1773 | 1648 | 404 |
| 2020* | 686 | 827 | 193 | < 1 | < 1 | 1706 | 1562 | 409** |
| 2021* | 620 | 806 | 233 | 1 | 4 | 1664 | 1561 | 348** |

* Preliminary.

** Including BMS reported to ICES

Summary of the assessment

Table 9 Sole in Division 7.d. Assessment summary. Weights are in tonnes and recruitment in thousands. High and low refer to 95% confidence intervals.

| Year | Recruitment (age 1) | | | Spawning-stock biomass | | | Landings | Discards* | Fishing pressure (ages 3–7) | | |
|------|---------------------|-----------|-------|------------------------|--------|-------|----------|-----------|-----------------------------|------|------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | | thousands | | | tonnes | | | | | | |
| 1982 | 14483 | 20990 | 9993 | 13269 | 15314 | 11497 | 3190 | 196 | 0.34 | 0.41 | 0.28 |
| 1983 | 22072 | 31478 | 15477 | 13706 | 15669 | 11988 | 3458 | 101 | 0.36 | 0.42 | 0.31 |
| 1984 | 22416 | 31739 | 15831 | 13943 | 15809 | 12297 | 3575 | 141 | 0.37 | 0.43 | 0.32 |
| 1985 | 16039 | 22855 | 11255 | 14629 | 16508 | 12963 | 3837 | 242 | 0.37 | 0.43 | 0.32 |
| 1986 | 24937 | 35428 | 17553 | 14127 | 15917 | 12537 | 3932 | 145 | 0.40 | 0.46 | 0.35 |
| 1987 | 15187 | 21600 | 10678 | 13751 | 15472 | 12222 | 4791 | 197 | 0.46 | 0.53 | 0.39 |
| 1988 | 26733 | 36668 | 19489 | 12984 | 14669 | 11493 | 3853 | 198 | 0.45 | 0.52 | 0.39 |
| 1989 | 17459 | 24056 | 12671 | 11402 | 12784 | 10169 | 3805 | 192 | 0.46 | 0.54 | 0.40 |
| 1990 | 44835 | 61464 | 32705 | 12143 | 13632 | 10816 | 3647 | 342 | 0.43 | 0.50 | 0.38 |
| 1991 | 35274 | 47767 | 26049 | 12740 | 14286 | 11361 | 4351 | 368 | 0.43 | 0.49 | 0.37 |
| 1992 | 30010 | 41449 | 21728 | 14653 | 16686 | 12868 | 4072 | 275 | 0.40 | 0.46 | 0.35 |
| 1993 | 13662 | 19036 | 9805 | 16233 | 18438 | 14292 | 4299 | 273 | 0.38 | 0.44 | 0.33 |
| 1994 | 27762 | 37784 | 20398 | 14954 | 16861 | 13262 | 4383 | 122 | 0.40 | 0.46 | 0.35 |
| 1995 | 22904 | 31381 | 16716 | 14045 | 15657 | 12599 | 4420 | 282 | 0.44 | 0.50 | 0.38 |
| 1996 | 19035 | 26009 | 13932 | 13581 | 15141 | 12181 | 4797 | 174 | 0.49 | 0.56 | 0.43 |
| 1997 | 28490 | 40269 | 20157 | 12576 | 13980 | 11312 | 4764 | 147 | 0.52 | 0.59 | 0.45 |
| 1998 | 19472 | 26627 | 14240 | 11749 | 13079 | 10554 | 3363 | 127 | 0.49 | 0.56 | 0.43 |
| 1999 | 35029 | 47624 | 25766 | 11212 | 12628 | 9955 | 4135 | 247 | 0.47 | 0.54 | 0.41 |
| 2000 | 38689 | 52362 | 28587 | 12165 | 13598 | 10882 | 3476 | 201 | 0.43 | 0.50 | 0.38 |
| 2001 | 32247 | 44218 | 23516 | 14571 | 16431 | 12922 | 4025 | 317 | 0.41 | 0.47 | 0.35 |
| 2002 | 50278 | 68808 | 36738 | 15939 | 17898 | 14195 | 4733 | 444 | 0.39 | 0.46 | 0.34 |
| 2003 | 23873 | 32336 | 17625 | 18685 | 20912 | 16696 | 6977 | 584 | 0.43 | 0.49 | 0.37 |
| 2004 | 22334 | 31182 | 15997 | 14889 | 16599 | 13354 | 5819 | 258 | 0.42 | 0.49 | 0.37 |
| 2005 | 49199 | 67037 | 36108 | 15428 | 17154 | 13876 | 4748 | 344 | 0.40 | 0.46 | 0.35 |
| 2006 | 41896 | 56716 | 30949 | 15042 | 16725 | 13529 | 4830 | 315 | 0.43 | 0.50 | 0.38 |
| 2007 | 20393 | 28167 | 14764 | 15213 | 17022 | 13596 | 5421 | 332 | 0.46 | 0.53 | 0.40 |
| 2008 | 25481 | 35232 | 18429 | 15130 | 16978 | 13484 | 4963 | 183 | 0.45 | 0.52 | 0.38 |
| 2009 | 44239 | 62394 | 31367 | 14578 | 16483 | 12894 | 4828 | 287 | 0.44 | 0.52 | 0.38 |
| 2010 | 43045 | 60012 | 30876 | 14315 | 16189 | 12658 | 4108 | 273 | 0.41 | 0.48 | 0.35 |
| 2011 | 36225 | 51071 | 25694 | 15184 | 17086 | 13493 | 4136 | 342 | 0.37 | 0.43 | 0.32 |
| 2012 | 18977 | 26718 | 13478 | 15823 | 17903 | 13985 | 4058 | 445 | 0.34 | 0.39 | 0.29 |
| 2013 | 13213 | 18630 | 9371 | 17510 | 19791 | 15491 | 4295 | 180 | 0.32 | 0.37 | 0.27 |
| 2014 | 14721 | 20741 | 10449 | 16391 | 18798 | 14293 | 4626 | 216 | 0.32 | 0.37 | 0.27 |

| Year | Recruitment (age 1) | | | Spawning-stock biomass | | | Landings | Discards* | Fishing pressure (ages 3–7) | | |
|------|---------------------|-------|-------|------------------------|-------|-------|----------|-----------|-----------------------------|------|-------|
| | R | High | Low | SSB | High | Low | | | F | High | Low |
| | thousands | | | tonnes | | | tonnes | tonnes | | | |
| 2015 | 17337 | 24854 | 12093 | 14414 | 16566 | 12542 | 3385 | 263 | 0.30 | 0.36 | 0.26 |
| 2016 | 11805 | 16802 | 8294 | 14028 | 16194 | 12151 | 2433 | 106 | 0.27 | 0.33 | 0.23 |
| 2017 | 20880 | 29652 | 14704 | 12142 | 14175 | 10401 | 2090 | 156 | 0.26 | 0.31 | 0.21 |
| 2018 | 18904 | 27271 | 13105 | 11883 | 13886 | 10170 | 2395 | 263 | 0.25 | 0.31 | 0.21 |
| 2019 | 20508 | 31461 | 13369 | 11252 | 13185 | 9603 | 1648 | 404 | 0.23 | 0.29 | 0.191 |
| 2020 | 12387 | 22724 | 6752 | 11181 | 13295 | 9404 | 1562 | 409 | 0.23 | 0.28 | 0.184 |
| 2021 | 14305 | 36517 | 5604 | 12650 | 15367 | 10413 | 1561 | 348 | 0.22 | 0.28 | 0.172 |
| 2022 | 17337** | 20880 | 11805 | 12582 | 16154 | 10044 | | | | | |

* Discard estimates prior to 2004 assume the average discard proportion by age for 2004–2008 (WKNSEA; ICES, 2021).

** Median recruitment resampled from the years 2012–2020.

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[Download the stock assessment data and figures.](#)

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Sole (*Solea solea*) in Division 7.e (western English Channel)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 1394 tonnes.

ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

Stock development over time

Fishing pressure on the stock is at F_{MSY} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

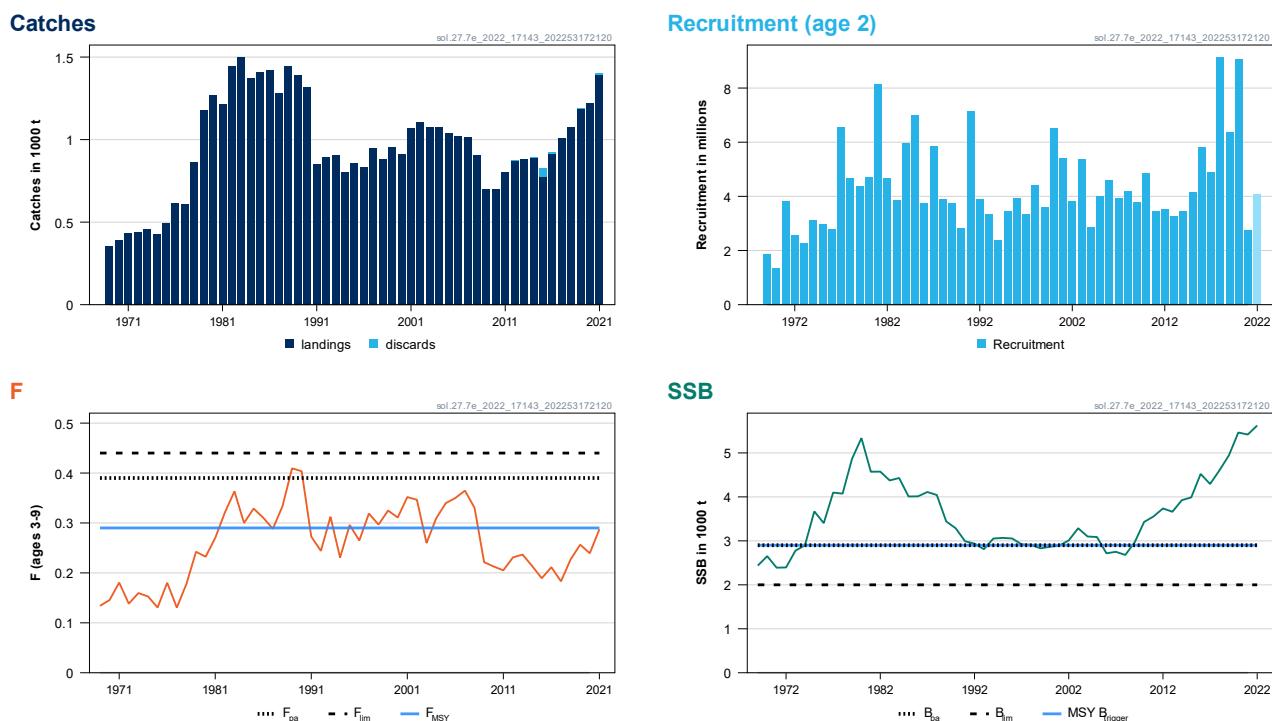


Figure 1 Sole in Division 7.e. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. Discard estimates are only available from 2012 onwards.

Catch scenarios

Table 1 Sole in Division 7.e. Assumptions made for the interim year and in the forecast.

| Variable | Value | Notes |
|---------------------------|-------|---|
| $F_{ages\ 3-9}\ (2022)$ | 0.29 | F_{sg} ; rescaled to F_{2021} |
| SSB_{2023} | 5052 | Short-term forecast; in tonnes |
| $R_{age\ 2}\ (2022-2023)$ | 4077 | Geometric mean (1969–2021); in thousands |
| Catch (2022) | 1507 | Short-term forecast; in tonnes |
| Projected landings (2022) | 1500 | Short-term forecast; in tonnes |
| Projected discards (2022) | 7 | Average discard rate of 2019–2021 (0.44%); in tonnes. Not used in the assessment. |

Table 2 Sole in Division 7.e. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch* (2023) | Projected landings (2023) | Projected discards (2023) | $F_{\text{projected landings}}$ (2023) | SSB (2024) | % SSB change** | % TAC change*** | % advice change^ |
|--|------------------------|------------------------------|------------------------------|---|------------|----------------|-----------------|------------------|
| ICES advice basis | | | | | | | | |
| MSY approach: $F = F_{\text{MSY}}$ | 1394 | 1388 | 6 | 0.29 | 4541 | -10.1 | -23 | -23 |
| Other scenarios | | | | | | | | |
| EU MAP^^: F_{MSY} | 1394 | 1388 | 6 | 0.29 | 4541 | -10.1 | -23 | -23 |
| EU MAP^^ F_{MSY} lower | 820 | 816 | 4 | 0.160 | 5103 | 1.01 | -55 | -55 |
| EU MAP^^ F_{MSY} upper | 1596 | 1589 | 7 | 0.34 | 4344 | -14.0 | -11.8 | -11.8 |
| $F = 0$ | 0 | 0 | 0 | 0 | 5909 | 17.0 | -100 | -100 |
| $F = F_{\text{pa}}$ | 1788 | 1781 | 8 | 0.39 | 4156 | -17.7 | -1.19 | -1.19 |
| $F = F_{\text{lim}}$ | 1971 | 1962 | 9 | 0.44 | 3979 | -21 | 8.9 | 8.9 |
| $\text{SSB}_{2024} = B_{\text{lim}}$ | 4036 | 4018 | 18 | 1.29 | 2000 | -60 | 123 | 123 |
| Rollover TAC | 1810 | 1802 | 8 | 0.40 | 4135 | -18.1 | 0 | 0 |
| $\text{SSB}_{2024} = B_{\text{pa}} = \text{MSY } B_{\text{trigger}}$ | 3088 | 3074 | 14 | 0.81 | 2900 | -43 | 71 | 71 |
| $\text{SSB}_{2024} = \text{SSB}_{2023}$ | 872 | 868 | 4 | 0.171 | 5052 | 0 | -52 | -52 |
| $F = F_{2022}$ | 1384 | 1378 | 6 | 0.29 | 4551 | -9.9 | -24 | -24 |

* Total catch derived from the projected landings and the assumed discard rate.

** SSB 2024 relative to SSB 2023.

*** Total catch in 2023 relative to TAC 2022 (1810 tonnes).

^ Advice value for 2023 relative to the advice value for 2022 (1810 tonnes).

^^ EU multiannual plan (MAP) for the Western Waters (EU, 2019).

The reduction in catch advice is mainly caused by the downward revision in recent SSB and low incoming recruitment.

Basis of the advice

Table 3 Sole in Division 7.e. The basis of the advice.

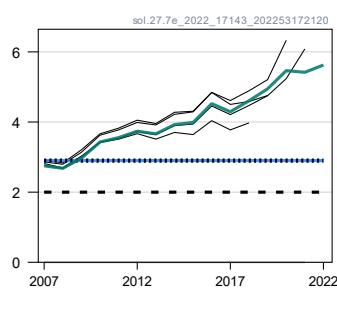
| Advice basis | MSY approach |
|-----------------|--|
| Management plan | ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2019) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F_{MSY} ranges are provided. |

Quality of the assessment

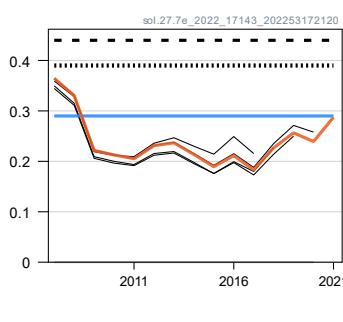
The assessment this year has reduced recruitment estimates for 2020 and 2021 with the addition of new data.

Last year's advice was derived using a shorter time series for the recruitment assumption. In this year's assessment, the full time series was used to compute the geometric mean used for the assumed incoming recruitment (R2022) instead of a shorter period last year due to high variability in the recent recruitments'.

SSB (1000 t)



F (ages 3-9)



Rec (age 2; Millions)

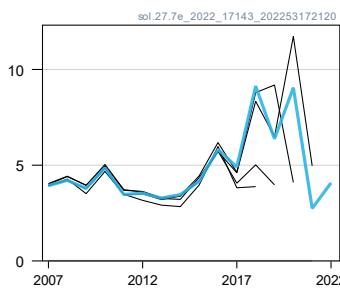


Figure 2 Sole in Division 7.e. Historical assessment results (final-year SSB estimate and recruitment assumption included).

Issues relevant for the advice

There is no information to present for this stock.

Reference points

Table 4 Sole in Division 7.e. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------|-------|---|------------------------|
| MSY approach | MSY $B_{trigger}$ | 2900 | B_{pa} ; tonnes | ICES (2017) |
| | F_{MSY} | 0.29 | Median point estimate of EqSim simulations | ICES (2017) |
| Precautionary approach | B_{lim} | 2000 | Rounded $B_{pa}/1.4$; tonnes | ICES (2017) |
| | B_{pa} | 2900 | Rounded B_{loss} (SSB in 1999). Lowest SSB with high recruitment; tonnes. | ICES (2017) |
| | F_{lim} | 0.44 | Segmented regression simulation of stock–recruitment, with B_{lim} as the breakpoint and no error | ICES (2017) |
| | F_{pa} | 0.39 | F_{pos} ; the F that leads to SSB $\geq B_{lim}$ with 95% probability | ICES (2017, 2021a) |
| Management plan | MAP MSY $B_{trigger}$ | 2900 | MSY $B_{trigger}$; tonnes | EU (2019), ICES (2017) |
| | MAP B_{pa} | 2900 | B_{pa} ; tonnes | EU (2019), ICES (2017) |
| | MAP B_{lim} | 2000 | B_{lim} ; tonnes | EU (2019), ICES (2017) |
| | MAP F_{MSY} | 0.29 | F_{MSY} | EU (2019), ICES (2017) |
| | MAP range F_{lower} | 0.16 | Minimum F which produces at least 95% of maximum yield | EU (2019), ICES (2017) |
| | MAP range F_{upper} | 0.34 | Maximum F which produces at least 95% of maximum yield | EU (2019), ICES (2017) |

Basis of the assessment

Table 5 Sole in Division 7.e. Basis of the assessment and advice.

| | |
|--------------------------|--|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical assessment (FLXSA; ICES, 2022b) |
| Input data | Commercial landings-at-age data; two survey indices: UK-FSP (B4381) and UK-Q1SWBeam (B2732) and two commercial tuning fleets (UK-CBT-late and UK-COT); natural mortality is assumed constant over ages and years at 0.1; fixed maturity ogive from divisions 7.f and 7.g |
| Discards and bycatch | Not included in the assessment, but used to provide catch advice |
| Indicators | None |
| Other information | Last interbenchmark in 2015 (IBPWCFlat2; ICES, 2015) |
| Working group | Working Group for the Celtic Seas Ecoregion (WGCSE) |

History of the advice, catch, and management

Table 6 Sole in Division 7.e. History of ICES advice, agreed TAC, official landings, and ICES estimates for landings and discards. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards |
|------|-------------------------|-------------------------------|----------------------------------|------------|-------------------|---------------|---------------|
| 1987 | No increase in F | | 1150 | 1150 | 1110 | 1280 | |
| 1988 | No decrease in SSB; TAC | | 1300 | 1300 | 950 | 1444 | |
| 1989 | No decrease in SSB; TAC | | 1000 | 1000 | 800 | 1390 | |
| 1990 | SSB = 3000 tonnes; TAC | | 900 | 900 | 750 | 1315 | |
| 1991 | TAC | | 540 | 800 | 840 | 852 | |
| 1992 | 70% of F_{1990} | | 770 | 800 | 770 | 895 | |
| 1993 | 35% reduction in F | | 700 | 900 | 790 | 904 | |
| 1994 | No increase in F | | 1000 | 1000 | 840 | 800 | |
| 1995 | No increase in F | | 860 | 950 | 880 | 856 | |
| 1996 | $F_{1996} < F_{1994}$ | | 680 | 700 | 740 | 833 | |
| 1997 | No increase in F | | 690 | 750 | 860 | 949 | |
| 1998 | No increase in F | | 670 | 670 | 770 | 880 | |
| 1999 | Reduce F below F_{pa} | | 670 | 700 | 660 | 957 | |

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards |
|------|-------------------------------------|-------------------------------|----------------------------------|------------|-------------------|---------------|---------------|
| 2000 | Reduce F below F_{pa} | | < 640 | 660 | 660 | 914 | |
| 2001 | Reduce F below F_{pa} | | < 580 | 600 | 650 | 1069 | |
| 2002 | Reduce F below F_{pa} | | < 450 | 525 | 540 | 1106 | |
| 2003 | Rebuilding plan or F = 0 | | - | 394 | 620 | 1078 | |
| 2004 | F = 0 or recovery plan 1 | | 0 | 300 | 490 | 1075 | |
| 2005 | 80% reduction in F or recovery plan | | < 230 | 865 | 960 | 1039 | |
| 2006 | 80% reduction in F or recovery plan | | < 240 | 940 | 964 | 1022 | |
| 2007 | 68% reduction in F or recovery plan | | < 350 | 900 | 953 | 1015 | |
| 2008 | 75% reduction in F | | < 260 | 765 | 815 | 908 | |
| 2009 | 70% reduction in F | | < 320 | 650 | 785 | 701 | |
| 2010 | Reduce fishing effort and catches | | - | 618 | 761 | 698 | |
| 2011 | MSY framework | | < 660 | 710 | 877 | 801 | |
| 2012 | MSY framework | | < 740 | 777 | 871 | 872 | 2 |
| 2013 | MSY framework | | < 960 | 894 | 889 | 883 | 1 |
| 2014 | MSY approach | | < 832 | 832 | 886 | 885 | 10 |
| 2015 | MSY approach | | < 851 | 851 | 777 | 774 | 54 |
| 2016 | MSY approach | | ≤ 1226 | 979 | 915 | 913 | 10 |
| 2017 | MSY approach | ≤ 1198 | | 1178 | 1000 | 1007 | 4 |
| 2018 | MSY approach | ≤ 1239 | | 1202 | 1086 | 1075 | 3 |
| 2019 | MSY approach | ≤ 1272 | | 1242 | 1182 | 1185 | 4 |
| 2020 | Management plan | 1478 (range 878–1685) | | 1478 | 1218* | 1219 | < 1 |
| 2021 | Management plan | 1925 (range 1141–2197) | | 1925 | 1395* | 1392 | 13 |
| 2022 | MSY approach | ≤ 1810 | | 1810 | | | |
| 2023 | MSY approach | ≤ 1394 | | | | | |

* Preliminary official landings.

History of the catch and landings

Table 7 Sole in Division 7.e. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch | Landings | | | | Discards | | | | |
|-------------|-------------------|----------------------|-------------------|---------------------|--------------------|----------------------|----------------|-------------------|--|
| | Beam trawl 64% | Otter trawl 18.3% | Gillnets 10.0% | Other gears 7.7% | Beam trawl 4.5% | Otter trawl 95.5% | Gillnets 0% | Other gears 0% | |
| 1405 tonnes | | | | | 1392 tonnes | | | | |

Table 8 Sole in Division 7.e. History of official landings and ICES estimates. All weights are in tonnes.

| Year | Belgium | France | Netherlands | Ireland | UK and Channel Islands | Official total | ICES landings | ICES discards |
|------|---------|--------|-------------|---------|------------------------|----------------|---------------|---------------|
| 1974 | | 323 | | | | 323 | 427 | |
| 1975 | 3 | 271 | | | 217 | 491 | 491 | |
| 1976 | 4 | 352 | | | 260 | 616 | 616 | |
| 1977 | 3 | 331 | | | 272 | 606 | 606 | |
| 1978 | 4 | 384 | | | 453 | 841 | 861 | |
| 1979 | 1 | 515 | | | 665 | 1181 | 1181 | |
| 1980 | 45 | 447 | | 13 | 764 | 1269 | 1269 | |
| 1981 | 16 | 415 | 1 | | 788 | 1220 | 1215 | |
| 1982 | 98 | 321 | | | 1028 | 1447 | 1446 | |
| 1983 | 47 | 405 | 3 | | 1043 | 1498 | 1498 | |
| 1984 | 48 | 421 | | | 901 | 1370 | 1370 | |
| 1985 | 58 | 130 | | | 911 | 1099 | 1409 | |

| Year | Belgium | France | Netherlands | Ireland | UK and Channel Islands | Official total | ICES landings | ICES discards |
|-------|---------|--------|-------------|---------|------------------------|----------------|---------------|---------------|
| 1986 | 62 | 467 | | | 840 | 1369 | 1419 | |
| 1987 | 48 | 432 | | | 632 | 1112 | 1280 | |
| 1988 | 67 | 98 | | | 784 | 949 | 1444 | |
| 1989 | 69 | 112 | 6 | | 613 | 800 | 1390 | |
| 1990 | 41 | 81 | | | 636 | 758 | 1315 | |
| 1991 | 35 | 325 | | | 477 | 837 | 852 | |
| 1992 | 41 | 267 | | | 468 | 776 | 895 | |
| 1993 | 59 | 236 | | | 498 | 793 | 904 | |
| 1994 | 33 | 257 | | | 546 | 836 | 800 | |
| 1995 | 21 | 294 | | | 565 | 880 | 856 | |
| 1996 | 8 | 297 | | | 428 | 733 | 833 | |
| 1997 | 13 | 348 | | 1 | 496 | 858 | 949 | |
| 1998 | 40 | 343 | | | 389 | 772 | 880 | |
| 1999 | 13 | | | | 396 | 409 | 957 | |
| 2000 | 4 | 241 | | | 413 | 658 | 914 | |
| 2001 | 19 | 224 | | | 407 | 650 | 1069 | |
| 2002 | 33 | 198 | | | 309 | 540 | 1106 | |
| 2003 | 1 | 363 | | 1 | 255 | 620 | 1078 | |
| 2004 | 7 | 302 | | | 185 | 494 | 1075 | |
| 2005 | 26 | 406 | | | 527 | 959 | 1039 | |
| 2006 | 32 | 357 | | | 575 | 964 | 1022 | |
| 2007 | 34 | 384 | | | 536 | 953 | 1015 | |
| 2008 | 28 | 312 | | < 1 | 474 | 815 | 908 | |
| 2009 | 17 | 386 | | | 382 | 785 | 701 | |
| 2010 | 17 | 375 | | | 369 | 761 | 698 | |
| 2011 | 22 | 424 | | | 431 | 877 | 801 | |
| 2012 | 39 | 325 | | < 1 | 506 | 871 | 872 | 2 |
| 2013 | 30 | 319 | | | 540 | 889 | 883 | 1 |
| 2014 | 25 | 351 | | < 1 | 510 | 886 | 885 | 10 |
| 2015 | 42 | 245 | | < 1 | 490 | 777 | 774 | 54 |
| 2016 | 46 | 245 | | | 624 | 915 | 913 | 10 |
| 2017 | 56 | 198 | | < 1 | 746 | 1000 | 1007 | 4 |
| 2018 | 68 | 217 | < 1 | < 1 | 801 | 1086 | 1075 | 3 |
| 2019 | 47 | 208 | < 1 | < 1 | 925 | 1182 | 1185 | 4 |
| 2020* | 58 | 194 | < 1 | | 966 | 1218 | 1219 | < 1 |
| 2021* | 104 | 243 | < 1 | < 1 | 1048 | 1395 | 1392 | 13 |

* Preliminary official landings.

Summary of the assessment

Table 9 Sole in Division 7.e. Assessment summary. Weights are in tonnes, numbers in thousands.

| Year | Recruitment (age 2) | Stock size SSB | Landings | Discards** | Fishing mortality (ages 3–9) |
|------|---------------------|----------------|----------|------------|------------------------------|
| 1969 | 1874 | 2437 | 353 | | 0.134 |
| 1970 | 1343 | 2652 | 391 | | 0.146 |
| 1971 | 3826 | 2390 | 432 | | 0.181 |
| 1972 | 2568 | 2395 | 437 | | 0.138 |
| 1973 | 2264 | 2778 | 459 | | 0.160 |
| 1974 | 3107 | 2896 | 427 | | 0.153 |
| 1975 | 2967 | 3670 | 491 | | 0.131 |
| 1976 | 2791 | 3403 | 616 | | 0.180 |
| 1977 | 6556 | 4098 | 606 | | 0.130 |
| 1978 | 4657 | 4074 | 861 | | 0.178 |
| 1979 | 4389 | 4865 | 1181 | | 0.24 |
| 1980 | 4702 | 5338 | 1269 | | 0.23 |
| 1981 | 8130 | 4572 | 1215 | | 0.27 |
| 1982 | 4679 | 4575 | 1446 | | 0.32 |

| Year | Recruitment (age 2) | Stock size SSB | Landings | Discards** | Fishing mortality (ages 3–9) |
|------|------------------------|-------------------|----------|------------|---------------------------------|
| 1983 | 3866 | 4374 | 1498 | | 0.36 |
| 1984 | 5968 | 4430 | 1370 | | 0.30 |
| 1985 | 6982 | 4009 | 1409 | | 0.33 |
| 1986 | 3765 | 4013 | 1419 | | 0.31 |
| 1987 | 5847 | 4111 | 1280 | | 0.29 |
| 1988 | 3878 | 4043 | 1444 | | 0.33 |
| 1989 | 3735 | 3442 | 1390 | | 0.41 |
| 1990 | 2817 | 3287 | 1315 | | 0.40 |
| 1991 | 7161 | 2991 | 852 | | 0.27 |
| 1992 | 3902 | 2937 | 895 | | 0.24 |
| 1993 | 3350 | 2810 | 904 | | 0.31 |
| 1994 | 2378 | 3053 | 800 | | 0.23 |
| 1995 | 3452 | 3067 | 856 | | 0.30 |
| 1996 | 3940 | 3054 | 833 | | 0.26 |
| 1997 | 3331 | 2920 | 949 | | 0.32 |
| 1998 | 4398 | 2910 | 880 | | 0.30 |
| 1999 | 3585 | 2830 | 957 | | 0.32 |
| 2000 | 6522 | 2865 | 914 | | 0.31 |
| 2001 | 5423 | 2894 | 1069 | | 0.35 |
| 2002 | 3815 | 3009 | 1106 | | 0.35 |
| 2003 | 5381 | 3287 | 1078 | | 0.26 |
| 2004 | 2870 | 3099 | 1075 | | 0.31 |
| 2005 | 3994 | 3087 | 1039 | | 0.34 |
| 2006 | 4612 | 2717 | 1023 | | 0.35 |
| 2007 | 3934 | 2751 | 1015 | | 0.36 |
| 2008 | 4209 | 2679 | 908 | | 0.33 |
| 2009 | 3788 | 2967 | 701 | | 0.22 |
| 2010 | 4864 | 3430 | 698 | | 0.21 |
| 2011 | 3471 | 3555 | 801 | | 0.21 |
| 2012 | 3540 | 3738 | 872 | 2 | 0.23 |
| 2013 | 3282 | 3662 | 883 | 1 | 0.24 |
| 2014 | 3464 | 3925 | 885 | 10 | 0.21 |
| 2015 | 4160 | 3988 | 774 | 54 | 0.189 |
| 2016 | 5817 | 4523 | 913 | 10 | 0.21 |
| 2017 | 4908 | 4293 | 1007 | 4 | 0.183 |
| 2018 | 9132 | 4605 | 1075 | 3 | 0.23 |
| 2019 | 6378 | 4946 | 1185 | 4 | 0.26 |
| 2020 | 9050 | 5464 | 1219 | 0 | 0.24 |
| 2021 | 2745 | 5418 | 1392 | 13 | 0.29 |
| 2022 | 4077* | 5624 | | | |

* Geometric mean (1969–2021).

** Discards are not included in the assessment.

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[Download the stock assessment data and figures.](#)

Recommended citation: ICES. 2022. Sole (*Solea solea*) in Division 7.e (Irish Sea). *In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sol.27.7e.* <https://doi.org/10.17895/ices.advice.19453826>.

Sole (*Solea solea*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 1338 tonnes.

ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

Stock development over time

Fishing pressure on the stock is at F_{MSY} ; spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

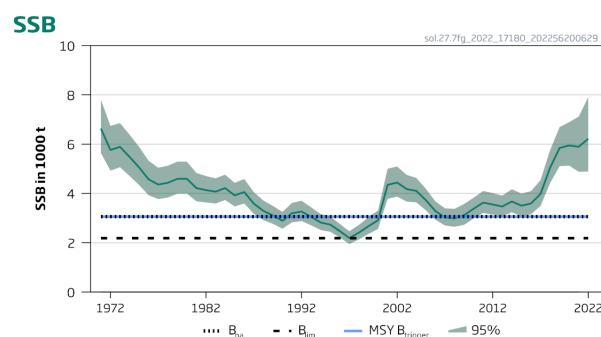
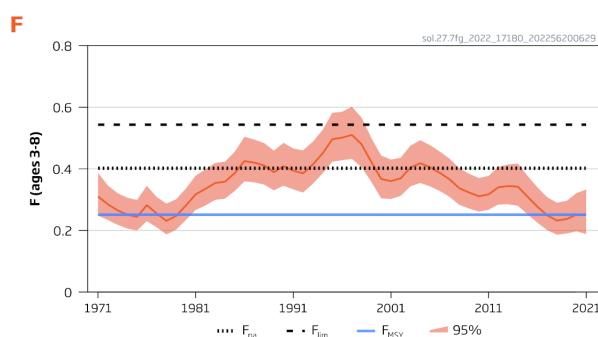
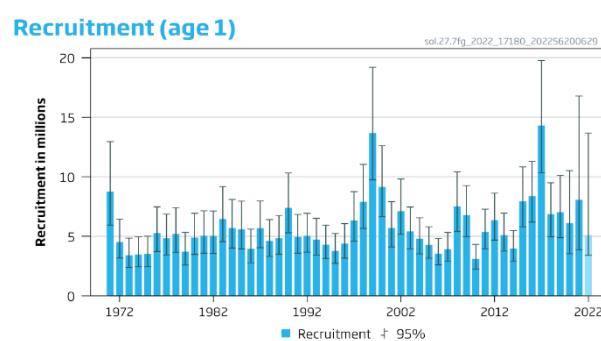
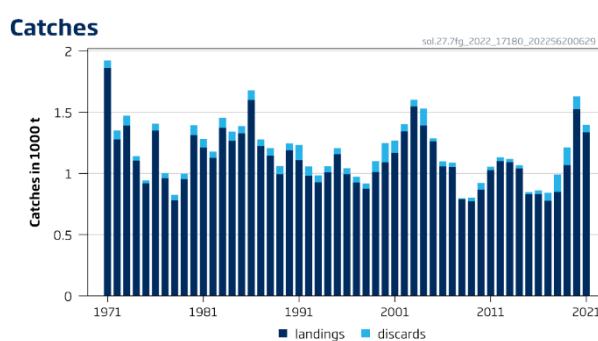


Figure 1 Sole in divisions 7.f and 7.g. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Sole in divisions 7.f and 7.g. Assumptions made for the interim year and in the forecast.

| Variable | Value | Notes |
|---------------------------|-------|---|
| $F_{ages\ 3-8}\ (2022)$ | 0.246 | Based on a catch of 1337 tonnes for 2022 |
| SSB_{2023} | 6120 | Short-term forecast; in tonnes. |
| $Rage_1(2022-2023)$ | 5111 | Median recruitment, resampled from the years 1971–2019; in thousands. |
| Catch (2022) | 1337 | TAC for 2022; in tonnes. |
| Projected landings (2022) | 1258 | Assuming average landings ratio by age 2019-2021; in tonnes. |
| Projected discards (2022) | 79 | Assuming average discard ratio by age 2019-2021; in tonnes. |

Table 2 Sole in divisions 7.f and 7.g. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch (2023) | Projected landings* (2023) | Projected discards** (2023) | F _{total} (2023) | F _{projected} landings (2023) | F _{projected} discards (2023) | SSB (2024) | % SSB change *** | % TAC change ^ | % advice change ^^ |
|--|--------------------|----------------------------|-----------------------------|---------------------------|--|--|------------|------------------|----------------|--------------------|
| ICES advice basis | | | | | | | | | | |
| MSY approach: F = F _{MSY} | 1338 | 1258 | 80 | 0.251 | 0.23 | 0.0180 | 5903 | -3.5 | 0.075 | 0.075 |
| Other scenarios | | | | | | | | | | |
| EU MAP ^{^^^} : F _{MSY} | 1338 | 1258 | 80 | 0.251 | 0.23 | 0.0180 | 5903 | -3.5 | 0.075 | 0.075 |
| EU MAP ^{^^^} : F _{MSY} lower | 765 | 720 | 45 | 0.136 | 0.126 | 0.0097 | 6504 | 6.3 | -43 | -43 |
| EU MAP ^{^^^} : F _{MSY} upper | 2232 | 2097 | 135 | 0.462 | 0.43 | 0.033 | 4963 | -18.9 | 67 | 67 |
| F = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7307 | 19.4 | -100 | -100 |
| F = F _{pa} | 1996 | 1877 | 119 | 0.402 | 0.37 | 0.029 | 5212 | -14.8 | 49 | 49 |
| F = F _{lim} | 2531 | 2377 | 154 | 0.543 | 0.50 | 0.039 | 4647 | -24 | 89 | 89 |
| SSB ₂₀₂₄ = B _{lim} | 4919 | 4572 | 347 | 1.59 | 1.48 | 0.114 | 2184 | -64 | 268 | 268 |
| SSB ₂₀₂₄ = B _{pa} = MSY B _{trigger} | 4063 | 3797 | 266 | 1.10 | 1.02 | 0.078 | 3057 | -50 | 204 | 204 |
| F = F ₂₀₂₂ | 1312 | 1234 | 78 | 0.246 | 0.23 | 0.0175 | 5930 | -3.1 | -1.87 | -1.87 |
| SSB ₂₀₂₄ = SSB ₂₀₂₃ | 1130 | 1064 | 66 | 0.21 | 0.193 | 0.0148 | 6120 | 0 | -15.5 | -15.5 |

* Marketable landings, assuming recent discard rate.

** Including BMS landings (EU stocks), assuming recent discard rate.

*** SSB 2024 relative to SSB 2023.

^ Total catch in 2023 relative to TAC 2022 (1337 tonnes).

^^ Advice value for 2023 relative to the advice value for 2022 (1337 tonnes).

^^^ EU multiannual plan (MAP) for the Western Waters and adjacent waters (EU, 2019).

Basis of the advice

Table 3 Sole in divisions 7.f and 7.g. The basis of the advice.

| Advice basis | MSY approach |
|-----------------|--|
| Management plan | ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2019) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F _{MSY} ranges are provided. |

Quality of the assessment

Discard estimates are based on incomplete sampling of the fisheries in recent years. However, the main fleet is considered to be represented and therefore this is considered to have minimal impact on the assessment.

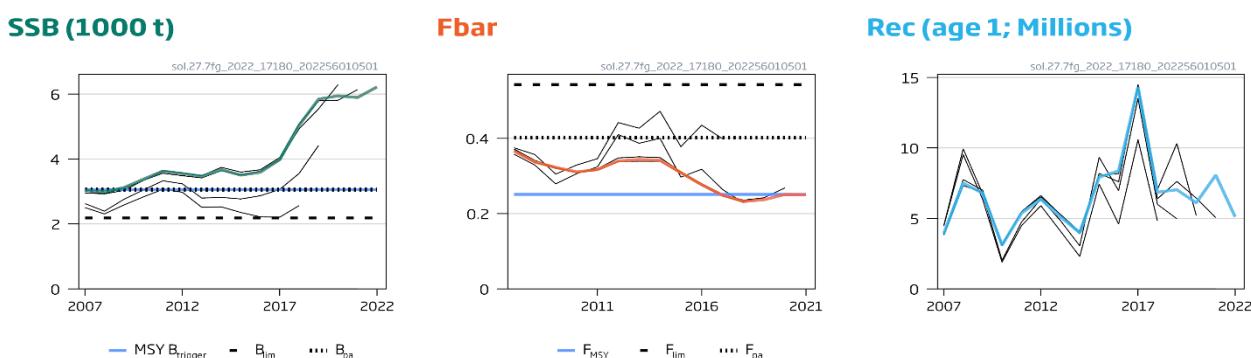


Figure 2 Sole in divisions 7.f and 7.g. Historical assessment results (final-year SSB estimate and recruitment assumption included for each line). This stock was benchmarked in 2020 (ICES, 2020a) the reference points were revised and at which point the F_{bar} was changed from F₄₋₈ to F₃₋₈. Therefore, only assessment results from the last three years should be compared to the reference points indicated.

Issues relevant for the advice

There is no information to present for this stock.

Reference points

Table 4 Sole in divisions 7.f and 7.g. Reference points, values, and their technical basis.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------|-------------|--|-------------------------|
| MSY approach | MSY $B_{trigger}$ | 3057 | B_{pa} ; in tonnes. | ICES (2020b) |
| | F_{MSY} | 0.251 | Eqsim analysis based on the recruitment period 1971–2018. | ICES (2020b) |
| Precautionary approach | B_{lim} | 2184 | B_{loss} estimated in 2020, corresponding to SSB in 1997; in tonnes. | ICES (2020b) |
| | B_{pa} | 3057 | $B_{lim} \times 1.4$; in tonnes | ICES (2020b) |
| | F_{lim} | 0.543 | Eqsim analysis, based on the recruitment period 1971–2018 | ICES (2020b) |
| | F_{pa} | 0.402 | F_{P05} ; F that leads to $SSB \geq B_{lim}$ with 95% probability | ICES (2020b) |
| Management plan* | MAP MSY $B_{trigger}$ | 3057 | MSY $B_{trigger}$; in tonnes | EU (2019), ICES (2020b) |
| | MAP B_{pa} | 3057 | B_{pa} ; in tonnes | EU (2019), ICES (2020b) |
| | MAP B_{lim} | 2184 | B_{lim} ; in tonnes | EU (2019), ICES (2020b) |
| | MAP F_{MSY} | 0.251 | F_{MSY} | EU (2019), ICES (2020b) |
| | MAP range F_{lower} | 0.136–0.251 | Consistent with ranges provided by ICES (2020b), resulting in no more than 5% reduction in long-term yield compared with MSY | EU (2019), ICES (2020b) |
| | MAP range F_{upper} | 0.251–0.462 | Consistent with ranges provided by ICES (2020b), resulting in no more than 5% reduction in long-term yield compared with MSY | EU (2019), ICES (2020b) |

* EU multiannual plan (MAP) for the Western Waters and adjacent waters (EU, 2019).

Basis of the assessment

Table 5 Sole in divisions 7.f and 7.g. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical assessment (SAM; Nielsen and Berg, 2014; ICES, 2022b) that uses landings and discards in the model and in the forecast |
| Input data | Total international landings, ages and length frequencies from catch sampling by métier; one survey index (UK[E&W]-BTS-Q3 (B6596) 1988–2021); five commercial biomass indices (BE-CBT [1971–1983 and 1984–1996], BE-CBT3 [2006–2021], and UK(E & W)-CBT [1984–2005 and 2006–2021]); maturity data (ICES, 2020a); natural mortality is assumed to be constant. Catch numbers for age 1 and 2 prior to 2004 are not used in the assessment model. |
| Discards and bycatch | Discard numbers available from 2004 onwards. Discards prior to 2004 are calculated using a constant ratio of discards to landings by age based on data from 2004–2018 (ICES, 2020a). |
| Indicators | None |
| Other information | Last benchmark in 2020 (ICES, 2020a) |
| Working group | Working Group for the Celtic Seas Ecoregion (WGCSE) |

History of the advice, catch, and management

Table 6 Sole in divisions 7.f and 7.g. History of ICES advice, agreed TAC, official landings, and ICES estimates for landings and discards. All weights are in tonnes.

| Year | ICES advice | Catches corresponding to advice | Landings corresponding to advice | Agreed TAC | Official landings | ICES landings | ICES discards |
|------|------------------------------------|---------------------------------|----------------------------------|------------|-------------------|---------------|---------------|
| 1987 | <i>Status quo F; TAC</i> | | 1600 | 1600 | 1264 | 1222 | |
| 1988 | F = F (pre-86); TAC | | 900 | 1100 | 1204 | 1146 | |
| 1989 | F at F (81–85); TAC | | 1000 | 1000 | 992 | 992 | |
| 1990 | No increase in F | | 1200 | 1200 | 1239 | 1189 | |
| 1991 | No increase in F | | 1100 | 1200 | 1496 | 1107 | |
| 1992 | No long-term gains in increasing F | | 1100 | 1200 | 1060 | 981 | |
| 1993 | No long-term gains in increasing F | | - | 1100 | 1030 | 928 | |
| 1994 | No long-term gains in increasing F | | - | 1100 | 1018 | 1009 | |
| 1995 | No increase in F | | 1000 | 1100 | 1165 | 1157 | |
| 1996 | 20% reduction in F | | 800 | 1000 | 1081 | 995 | |
| 1997 | 20% reduction in F | | 800 | 900 | 1038 | 927 | |
| 1998 | 20% reduction in F | | 700 | 850 | 1013 | 875 | |
| 1999 | Reduce F below F_{pa} | | 810 | 960 | 947 | 1012 | |
| 2000 | Reduce F below F_{pa} | | < 1160 | 1160 | 1040 | 1091 | |
| 2001 | Reduce F below F_{pa} | | < 810 | 1020 | 1120 | 1168 | |
| 2002 | Reduce F below F_{pa} | | < 1000 | 1070 | 1118 | 1345 | |
| 2003 | Reduce F below F_{pa} | | < 1240 | 1240 | 1207 | 1547 | |
| 2004 | Reduce F below F_{pa} | | < 1000 | 1050 | 1130 | 1391 | 140 |
| 2005 | Reduce F below F_{pa} | | < 840 | 1000 | 997 | 1263 | 23 |
| 2006 | Reduce F below F_{pa} | | < 880 | 950 | 921 | 1058 | 41 |
| 2007 | Reduce F below F_{pa} | | < 840 | 893 | 943 | 1052 | 36 |
| 2008 | Keep F below F_{pa} | | < 1000 | 964 | 781 | 790 | 8 |
| 2009 | No long-term gains in increasing F | | < 940 | 993 | 806 | 772 | 30 |
| 2010 | No long-term gains in increasing F | | < 920 | 993 | 871 | 867 | 56 |
| 2011 | See scenarios | | - | 1241 | 1027 | 1027 | 28 |
| 2012 | MSY approach | | < 1060 | 1060 | 1099 | 1101 | 32 |
| 2013 | MSY approach | | < 1100 | 1100 | 1085 | 1093 | 26 |
| 2014 | MSY approach | | < 920 | 1001 | 1042 | 1041 | 27 |
| 2015 | MSY approach | | < 652 | 851 | 830 | 831 | 17 |
| 2016 | MSY approach | ≤ 760 | ≤ 745 | 779 | 830 | 832 | 31 |
| 2017 | MSY approach | ≤ 806 | | 845 | 777 | 778 | 65 |
| 2018 | MSY approach | ≤ 931 | | 920 | 850 | 850 | 141 |
| 2019 | MSY approach | ≤ 864 | | 1009 | 1068 | 1068 | 145 |
| 2020 | Management plan | 1686 (range 993–2597) | | 1652 | 1507* | 1524 | 106 |
| 2021 | Management plan | 1413 (range 811–2364) | | 1413 | 1365* | 1336 | 62 |
| 2022 | MSY approach | ≤ 1337 | | 1337 | | | |
| 2023 | MSY approach | ≤ 1338 | | | | | |

* Preliminary.

History of the catch and landings

Table 7 Sole in divisions 7.f and 7.g. Catch distribution by fleet in 2021 as estimated by ICES.

| Total catch | Landings | | | Discards | | |
|-------------|----------------------|-----------------------|---------------------|----------------------|-----------------------|---------------------|
| | Beam trawlers 87% | Otter trawlers 13% | Other gears < 1% | Beam trawlers 87% | Otter trawlers 13% | Other gears < 1% |
| 1398 tonnes | 1336 tonnes | | | 62 tonnes | | |
| | | | | | | |

Table 8 Sole in divisions 7.f and 7.g. History of official and ICES estimated landings (tonnes).

| Year | Belgium | Denmark | France | Ireland | UK (E. and W., N.I.) | UK (Scotland) | Other | Total official | ICES landings |
|--------|---------|---------|--------|---------|----------------------------|------------------|-------|-------------------|------------------|
| 1986 | 1039* | 2 | 146 | 188 | 611 | - | 3 | 1989 | 1600 |
| 1987 | 701* | - | 117 | 9 | 437 | - | - | 1264 | 1222 |
| 1988 | 705* | - | 110 | 72 | 317 | - | - | 1204 | 1146 |
| 1989 | 684* | - | 87 | 18 | 203 | - | - | 992 | 992 |
| 1990 | 716* | - | 130 | 40 | 353 | 0 | - | 1239 | 1189 |
| 1991 | 982* | - | 80 | 32 | 402 | 0 | - | 1496 | 1107 |
| 1992 | 543* | - | 141 | 45 | 325 | 6 | - | 1060 | 981 |
| 1993 | 575* | - | 108 | 51 | 285 | 11 | - | 1030 | 928 |
| 1994 | 619* | - | 90 | 37 | 264 | 8 | - | 1018 | 1009 |
| 1995 | 763* | - | 88 | 20 | 294 | - | - | 1165 | 1157 |
| 1996 | 695* | - | 102 | 19 | 265 | 0 | - | 1081 | 995 |
| 1997 | 660* | - | 99 | 28 | 251 | 0 | - | 1038 | 927 |
| 1998 | 675* | - | 98 | 42 | 198 | - | - | 1013 | 875 |
| 1999 | 604 | - | 61 | 51 | 231 | 0 | - | 947 | 1012 |
| 2000 | 694 | - | 74 | 29 | 243 | - | - | 1040 | 1091 |
| 2001 | 720 | - | 77 | 35 | 288 | - | - | 1120 | 1168 |
| 2002 | 703 | - | 65 | 32 | 318 | - | - | 1118 | 1345 |
| 2003 | 715 | - | 124 | 26 | 342 | - | - | 1207 | 1547 |
| 2004 | 735 | - | 79 | 33 | 283 | - | - | 1130 | 1391 |
| 2005 | 645 | - | 101 | 34 | 217 | - | - | 997 | 1263 |
| 2006 | 576 | - | 75 | 38 | 232 | - | - | 921 | 1058 |
| 2007 | 582 | - | 85 | 32 | 245 | - | - | 943 | 1052 |
| 2008 | 466 | - | 68 | 28 | 218 | - | - | 781 | 790 |
| 2009 | 513 | - | 73 | 26 | 195 | - | - | 806 | 772 |
| 2010 | 620 | - | 44 | 27 | 180 | - | - | 871 | 867 |
| 2011 | 775 | - | 54 | 30 | 168 | - | - | 1027 | 1027 |
| 2012 | 843 | - | 48 | 33 | 175 | - | - | 1099 | 1101 |
| 2013 | 789 | - | 49 | 42 | 205 | - | - | 1085 | 1093 |
| 2014 | 703 | - | 58 | 28 | 252 | - | - | 1042 | 1041 |
| 2015 | 674 | - | 24 | 27 | 105 | - | - | 830 | 831 |
| 2016 | 563 | - | 72 | 21 | 174 | - | - | 830 | 832 |
| 2017 | 551 | - | 49 | 28 | 149 | - | - | 777 | 778 |
| 2018 | 607 | - | 44 | 27 | 171 | - | - | 850 | 850 |
| 2019 | 800 | - | 42 | 33 | 193 | - | < 1 | 1068 | 1068 |
| 2020** | 1121 | - | 44 | 51 | 291 | - | < 1 | 1507 | 1524 |
| 2021** | 859 | - | 61 | 48 | 395 | - | 2 | 1365 | 1336 |

* Including divisions 7.g–k.

**Preliminary official landings.

Summary of the assessment

Table 9 Sole in divisions 7.f and 7.g. Assessment summary. Weights are in tonnes and recruitment in thousands. ‘High’ and ‘Low’ refer to 95% confidence intervals.

| Year | Recruitment age 1 | | | SSB | | | Landings** | Discards*** | Fishing mortality ages 3-8 | | |
|------|-------------------|-------|-------|------|-------|------|------------|-------------|----------------------------|-------|-------|
| | Low | Value | High | Low | Value | High | | | Low | Value | High |
| | | | | | | | | | | | |
| 1971 | 5929 | 8764 | 12954 | 5642 | 6636 | 7805 | 1861 | 62 | 0.25 | 0.31 | 0.39 |
| 1972 | 3178 | 4526 | 6445 | 4926 | 5762 | 6741 | 1278 | 74 | 0.23 | 0.28 | 0.35 |
| 1973 | 2392 | 3408 | 4855 | 5062 | 5891 | 6855 | 1391 | 81 | 0.22 | 0.27 | 0.32 |
| 1974 | 2439 | 3476 | 4953 | 4709 | 5484 | 6387 | 1105 | 36 | 0.21 | 0.25 | 0.31 |
| 1975 | 2452 | 3507 | 5015 | 4338 | 5055 | 5891 | 919 | 26 | 0.20 | 0.24 | 0.30 |
| 1976 | 3726 | 5278 | 7475 | 3925 | 4571 | 5323 | 1350 | 57 | 0.23 | 0.28 | 0.35 |
| 1977 | 3432 | 4852 | 6859 | 3770 | 4361 | 5045 | 961 | 41 | 0.21 | 0.26 | 0.31 |
| 1978 | 3660 | 5208 | 7409 | 3833 | 4431 | 5123 | 780 | 45 | 0.187 | 0.23 | 0.29 |
| 1979 | 2589 | 3715 | 5331 | 3986 | 4593 | 5292 | 954 | 45 | 0.20 | 0.25 | 0.30 |
| 1980 | 3470 | 4903 | 6928 | 3990 | 4594 | 5288 | 1314 | 81 | 0.23 | 0.28 | 0.34 |
| 1981 | 3577 | 5055 | 7143 | 3681 | 4217 | 4832 | 1212 | 70 | 0.27 | 0.32 | 0.38 |
| 1982 | 3561 | 5038 | 7127 | 3633 | 4134 | 4704 | 1128 | 51 | 0.28 | 0.34 | 0.40 |
| 1983 | 4556 | 6467 | 9178 | 3589 | 4070 | 4616 | 1373 | 81 | 0.30 | 0.35 | 0.42 |
| 1984 | 4010 | 5698 | 8097 | 3737 | 4219 | 4762 | 1266 | 77 | 0.30 | 0.36 | 0.42 |
| 1985 | 3941 | 5600 | 7957 | 3468 | 3920 | 4431 | 1328 | 59 | 0.33 | 0.39 | 0.46 |
| 1986 | 2778 | 3947 | 5608 | 3591 | 4058 | 4585 | 1600 | 80 | 0.36 | 0.43 | 0.50 |
| 1987 | 4043 | 5677 | 7971 | 3173 | 3587 | 4055 | 1222 | 56 | 0.36 | 0.42 | 0.50 |
| 1988 | 3312 | 4605 | 6404 | 2919 | 3293 | 3715 | 1146 | 61 | 0.35 | 0.41 | 0.48 |
| 1989 | 3494 | 4856 | 6748 | 2765 | 3108 | 3493 | 992 | 70 | 0.33 | 0.39 | 0.46 |
| 1990 | 5296 | 7394 | 10324 | 2570 | 2890 | 3250 | 1189 | 57 | 0.35 | 0.41 | 0.48 |
| 1991 | 3583 | 4950 | 6837 | 2826 | 3198 | 3619 | 1107 | 126 | 0.33 | 0.39 | 0.47 |
| 1992 | 3671 | 5045 | 6933 | 2877 | 3264 | 3703 | 981 | 77 | 0.32 | 0.39 | 0.46 |
| 1993 | 3429 | 4728 | 6518 | 2709 | 3053 | 3439 | 928 | 56 | 0.35 | 0.41 | 0.49 |
| 1994 | 3137 | 4313 | 5931 | 2512 | 2820 | 3167 | 1009 | 52 | 0.39 | 0.45 | 0.53 |
| 1995 | 2731 | 3781 | 5236 | 2443 | 2736 | 3065 | 1157 | 50 | 0.42 | 0.50 | 0.58 |
| 1996 | 3166 | 4383 | 6068 | 2207 | 2472 | 2768 | 995 | 47 | 0.43 | 0.50 | 0.59 |
| 1997 | 4588 | 6338 | 8754 | 1948 | 2191 | 2465 | 927 | 46 | 0.43 | 0.51 | 0.60 |
| 1998 | 5663 | 7907 | 11041 | 2131 | 2409 | 2723 | 875 | 43 | 0.41 | 0.48 | 0.57 |
| 1999 | 9744 | 13679 | 19202 | 2352 | 2672 | 3037 | 1012 | 89 | 0.36 | 0.42 | 0.50 |
| 2000 | 6648 | 9156 | 12610 | 2558 | 2909 | 3309 | 1091 | 158 | 0.30 | 0.37 | 0.44 |
| 2001 | 4109 | 5702 | 7914 | 3780 | 4349 | 5003 | 1168 | 101 | 0.30 | 0.36 | 0.43 |
| 2002 | 5166 | 7121 | 9816 | 3871 | 4441 | 5094 | 1345 | 58 | 0.31 | 0.37 | 0.44 |
| 2003 | 3954 | 5429 | 7453 | 3668 | 4176 | 4753 | 1547 | 54 | 0.34 | 0.40 | 0.48 |
| 2004 | 3525 | 4806 | 6553 | 3636 | 4104 | 4632 | 1391 | 140 | 0.35 | 0.42 | 0.49 |
| 2005 | 3160 | 4283 | 5804 | 3318 | 3729 | 4191 | 1263 | 23 | 0.34 | 0.41 | 0.48 |
| 2006 | 2607 | 3544 | 4818 | 2936 | 3286 | 3678 | 1058 | 41 | 0.33 | 0.39 | 0.46 |
| 2007 | 2886 | 3924 | 5336 | 2700 | 3028 | 3397 | 1052 | 36 | 0.31 | 0.37 | 0.43 |
| 2008 | 5411 | 7507 | 10415 | 2645 | 2987 | 3373 | 790 | 8 | 0.28 | 0.34 | 0.40 |
| 2009 | 4982 | 6791 | 9256 | 2724 | 3119 | 3572 | 772 | 30 | 0.27 | 0.32 | 0.38 |
| 2010 | 2236 | 3110 | 4326 | 2982 | 3378 | 3827 | 867 | 56 | 0.26 | 0.31 | 0.37 |
| 2011 | 3953 | 5364 | 7280 | 3211 | 3627 | 4098 | 1027 | 28 | 0.27 | 0.32 | 0.38 |
| 2012 | 4690 | 6362 | 8630 | 3139 | 3551 | 4017 | 1101 | 32 | 0.28 | 0.34 | 0.41 |
| 2013 | 3759 | 5111 | 6950 | 3078 | 3470 | 3912 | 1093 | 26 | 0.28 | 0.34 | 0.41 |
| 2014 | 2898 | 3987 | 5486 | 3236 | 3674 | 4171 | 1041 | 27 | 0.28 | 0.34 | 0.42 |
| 2015 | 5799 | 7926 | 10833 | 3070 | 3503 | 3998 | 831 | 17 | 0.25 | 0.31 | 0.38 |
| 2016 | 6197 | 8365 | 11292 | 3152 | 3591 | 4092 | 832 | 31 | 0.23 | 0.28 | 0.34 |
| 2017 | 10348 | 14305 | 19774 | 3489 | 3979 | 4539 | 778 | 65 | 0.20 | 0.25 | 0.31 |
| 2018 | 4956 | 6861 | 9498 | 4415 | 5040 | 5754 | 850 | 141 | 0.186 | 0.23 | 0.29 |
| 2019 | 4886 | 7032 | 10120 | 5107 | 5846 | 6692 | 1068 | 145 | 0.190 | 0.24 | 0.30 |
| 2020 | 3542 | 6104 | 10519 | 5126 | 5945 | 6894 | 1524 | 106 | 0.197 | 0.25 | 0.32 |
| 2021 | 3880 | 8071 | 16786 | 4879 | 5894 | 7119 | 1336 | 62 | 0.188 | 0.250 | 0.333 |
| 2022 | 3408 | 5111* | 13679 | 4886 | 6221 | 7915 | | | | | |

* Median resampled recruitment (1971–2019) as estimated by a stochastic projection.

** Landings are ICES estimates.

*** ICES discard estimates only available from 2004 to 2021. Discards prior to 2004 are calculated using a discard rate-at-age based on 2004–2018 discard data.

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Recommended citation: ICES. 2022. Sole (*Solea solea*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sol.27.7fg. <https://doi.org/10.17895/ices.advice.19453829>.

Sole (*Solea solea*) in subdivisions 20–24 (Skagerrak and Kattegat, western Baltic Sea)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for the North Sea and adjacent waters is applied, catches in 2023 that correspond to the F ranges in the plan are between 380 tonnes and 504 tonnes.

Stock development over time

Fishing pressure on the stock is below F_{MSY} and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

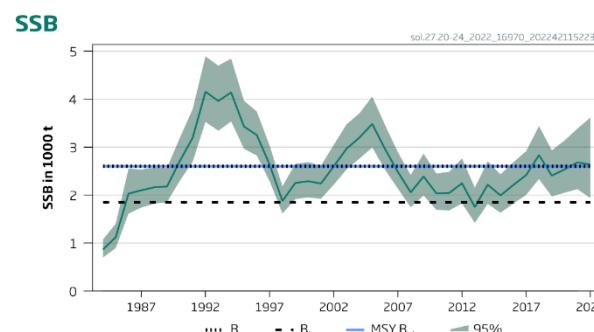
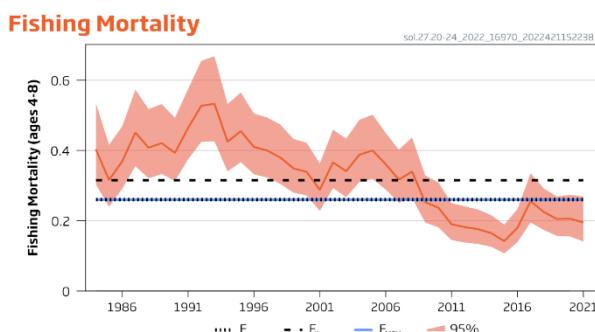
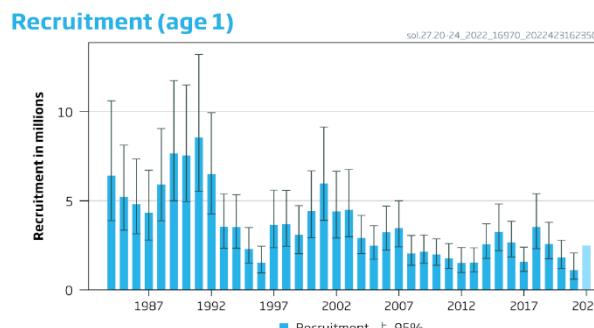
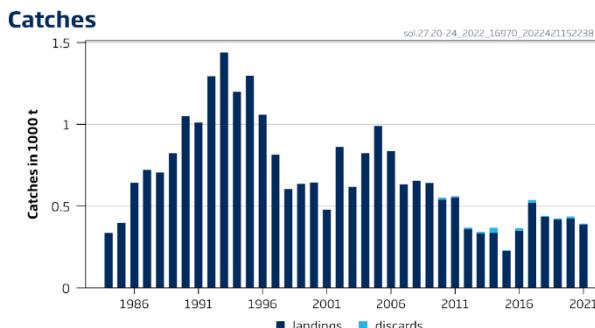


Figure 1 Sole in subdivisions 20–24. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Sole in subdivisions 20–24. Values in the forecast and for the interim year.

| Variable | Value | Notes |
|---------------------------|-------|--|
| $F_{ages\ 4-8}\ (2022)$ | 0.195 | $F_{sq} = F_{2021}$ |
| SSB (2023) | 2 441 | Short-term forecast (STF); tonnes |
| $R_{age\ 1}\ (2022-23)$ | 2 485 | Median recruitment, resampled from 2004–2021; thousands |
| Projected landings (2022) | 409 | Based on fishing at F_{sq} and mean discard rate; tonnes |
| Projected discards (2022) | 9 | Mean discard rate in weight (2017–2021) of 2.3%; tonnes |
| Total catch (2022) | 418 | STF; tonnes |

Table 2 Sole in subdivisions 20–24. Annual catch scenarios. All weights are in tonnes.

| Basis | Total catch* (2023) | Projected landings (2023) | Projected discards (2023) | F projected landings (4–8) (2023) | SSB (2024) | % SSB change** | % TAC change^ | % advice change^^ |
|-------------------|------------------------|------------------------------|------------------------------|--------------------------------------|------------|----------------|---------------|-------------------|
| ICES advice basis | | | | | | | | |

| Basis | Total catch* (2023) | Projected landings (2023) | Projected discards (2023) | F projected landings (4–8) (2023) | SSB (2024) | % SSB change** | % TAC change^ | % advice change^^ |
|--|------------------------|------------------------------|------------------------------|--------------------------------------|------------|----------------|---------------|-------------------|
| EU MAP#: F_{MSY} * $SSB_{2023}/MSY B_{trigger}$ | 504 | 493 | 11 | 0.244 | 2 403 | -1.6 | -29.5 | -30.3 |
| EU MAP#: F_{lower} * $SSB_{2023}/MSY B_{trigger}$ | 380 | 372 | 8 | 0.178 | 2 527 | 3.5 | -43.5 | -25.7§ |
| Other scenarios | | | | | | | | |
| $F = 0$ | 0 | 0 | 0 | 0 | 2 920 | 19.6 | -100.0 | -100.0 |
| F_{pa}, F_{MSY} | 534 | 522 | 12 | 0.26 | 2 373 | -2.8 | -25.3 | -26.2 |
| F_{lim} | 628 | 614 | 14 | 0.315 | 2 271 | -7.0 | -12.2 | -13.1 |
| $SSB(2024) = B_{lim}$ | 1 031 | 1 008 | 23 | 0.585 | 1 850 | -24.2 | 44.2 | 42.6 |
| $SSB(2024) = B_{pa}$ | 306 | 299 | 7 | 0.14 | 2 600 | 6.5 | -57.2 | -57.7 |
| $SSB(2024) =$ $MSY B_{trigger}$ | 306 | 299 | 7 | 0.14 | 2 600 | 6.5 | -57.2 | -57.7 |
| $F = F_{2022}$ | 413 | 404 | 9 | 0.195 | 2 633 | 7.9 | -42.2 | -42.9 |

EU multiannual plan (MAP) for the North Sea (EU, 2018).

* Total catch is calculated based on projected landings and assuming 2.3% discard ratio (in weight).

** SSB 2024 relative to SSB 2023.

^ Total catch in 2023 relative to the TAC in 2022 (715 tonnes in 2022).

^^ Advice value 2023 relative to the advice value 2022 (723 tonnes).

§ ICES advice for F_{lower} in 2023 relative to ICES advice F_{lower} in 2022 (544 tonnes).

The advised catch for 2023 represents a decrease from previous advice because of a lower SSB estimated for 2020–2021 than estimated last year and due to low incoming recruitment. In addition, since the expected SSB in 2023 is below MSY $B_{trigger}$ the advised F_{MSY} is reduced accordingly ($SSB_{2023}/MSY B_{trigger}$).

Basis of the advice

Table 3 Sole in subdivisions 20–24. The basis of the advice.

| Advice basis | EU multiannual plan (MAP) for stocks in the North Sea (EU, 2018) |
|-----------------|--|
| Management plan | <p>The EU multiannual plan (MAP) for stocks in the North Sea and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock.</p> <p>In accordance with the MAP, catches higher than those corresponding to F_{MSY} can only be taken providing SSB is greater than MSY $B_{trigger}$, and one of the following conditions is met:</p> <ul style="list-style-type: none"> • if taking the higher catches is necessary for the achievement of mixed fisheries objectives; • if it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; • or in order to limit variations in fishing opportunities between consecutive years to no more than 20%. <p>ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary.</p> |

Quality of the assessment

A revision in the estimation of survey indices for the recent 3 years has resulted in lower numbers of the younger fish in the survey series. The revised index led to a downscaling of recruitment since 2018 and thereby a lower estimated SSB in 2020 (16%) and 2021 (20%) compared to last year's assessment.

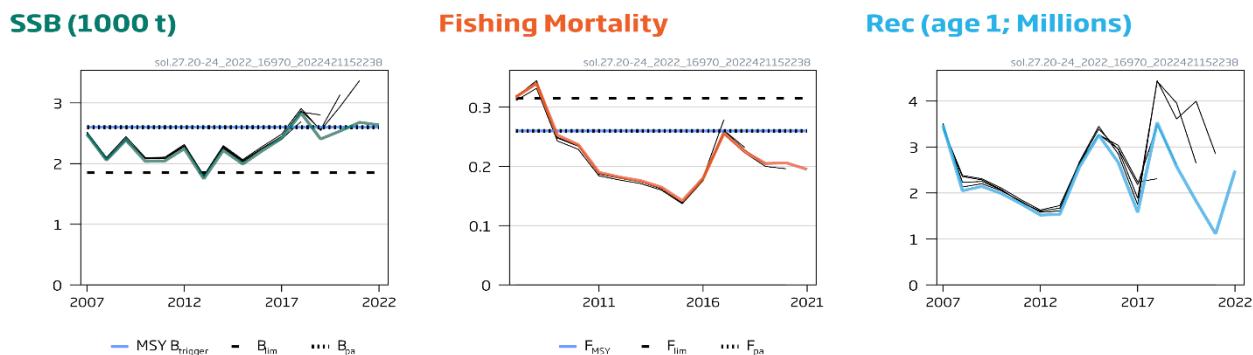


Figure 2 Sole in subdivisions 20–24. Historical assessment results (final-year assumed recruitment estimate included).

Issues relevant for the advice

There are no specific issues relevant for this stock.

Reference points

Table 4 Sole in subdivisions 20–24. Reference points, values, and their technical basis. Weights are in tonnes.

| Framework | Reference point | Value | Technical basis | Source |
|------------------------|-----------------------|-------|---|--------------------|
| MSY approach | MSY $B_{trigger}$ | 2 600 | B_{pa} | ICES (2015a) |
| | F_{MSY} | 0.26 | Equilibrium scenarios, stochastic recruitment, short time-series 1992–2014, previously capped by F_{pa} at 0.23, which is currently estimated at 0.26 | ICES (2015a, 2021) |
| Precautionary approach | B_{lim} | 1 850 | B_{loss} from 1992 (low productivity regime) | ICES (2015a) |
| | B_{pa} | 2 600 | $B_{lim} \times e^{1.645\sigma}$, $\sigma = 0.20$. | ICES (2015a) |
| | F_{lim} | 0.315 | Equilibrium scenarios prob(SSB < B_{lim}) = 50% with stochastic recruitment | ICES (2015a) |
| | F_{pa} | 0.26 | F_{P05} . The F that leads to SSB $\geq B_{lim}$ with 95% probability | ICES (2015a, 2021) |
| Management plan* | MAP B_{MGT} | 2 600 | MSY $B_{trigger}$ | ICES (2015a) |
| | MAP B_{lim} | 1 850 | B_{lim} | ICES (2015a) |
| | MAP F_{MSY} | 0.26 | F_{MSY} | ICES (2015a, 2021) |
| | MAP range F_{lower} | 0.19 | F_{MSY} lower without advice rule (AR) from equilibrium scenarios | ICES (2015b) |
| | MAP range F_{upper} | 0.26 | F_{P05} with AR from equilibrium scenarios | ICES (2015b) |

* EU multiannual plan (MAP) for the North Sea (EU, 2018).

Basis of the assessment

Table 5 Sole in subdivisions 20–24. Basis of the assessment and advice.

| | |
|--------------------------|---|
| ICES stock data category | 1 (ICES, 2022a) |
| Assessment type | Age-based analytical stochastic assessment (SAM) that uses landings only in the model. Discards are included in the forecast (ICES, 2022b). |
| Input data | Commercial catches (international landings, ages and length frequencies from catch sampling), one survey index (Fishermen–DTU Aqua sole survey, 2004–2021, [G4052]), two commercial indices: (private logbook gillnetters (1994–2007), private logbook trawlers (1987–2008)); fixed maturity and fixed natural mortality (0.1) for all age groups |
| Discards and bycatch | Used to provide advice, but not included in the assessment. Discard information available since 2000, average discard ratio by weight in 2017–2021 is 2.3%. |
| Indicators | None |
| Other information | Stock inter-benchmarked in 2015 (ICES, 2015a) |
| Working group | Baltic Fisheries Assessment Working Group (WGBFAS) |

History of the advice, catch, and management

Table 6 Sole in subdivisions 20–24. History of ICES advice, agreed TAC, and ICES estimates of landings and discards. Weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC* | ICES landings** | ICES discards*** |
|------|---|-------------------------------|----------------------------------|-------------|-----------------|------------------|
| 1987 | - | - | - | 850 | 722 | - |
| 1988 | - | - | - | 950 | 706 | - |
| 1989 | TAC | - | < 800 | 800 | 824 | - |
| 1990 | Precautionary TAC | - | 600 | 500 | 1 050 | - |
| 1991 | TAC | - | 1 000 | 1 000 | -^ | - |
| 1992 | TAC | - | 1 000 | 1 400 | -^ | - |
| 1993 | TAC at recent catch levels | - | 1 000 | 1 600 | -^ | - |
| 1994 | No advice due to uncertain catches | - | - | 2 100 | 1 198 | - |
| 1995 | No advice | - | - | 2 250 | 1 297 | - |
| 1996 | No advice | - | - | 2 250 | 1 059 | - |
| 1997 | No advice | - | - | 2 250 | 814 | - |
| 1998 | No advice | - | - | 1 800 | 605 | - |
| 1999 | No increase in F | - | 800 | 1 350 | 637 | - |
| 2000 | No increase in F | - | 650 | 950 | 645 | 169 |
| 2001 | No increase in F | - | 700 | 700 | 478 | - |
| 2002 | F below F_{pa} | - | 500 | 500 | 862 | 10 |
| 2003 | F below F_{pa} | - | 300 | 350 | 618 | 43 |
| 2004 | F below F_{pa} | - | 500 | 520 | 824 | - |
| 2005 | No increase in F | - | 850 | 900 | 990 | - |
| 2006 | F below F_{pa} | - | 820 | 900 | 836 | - |
| 2007 | Limit catches to 2002–2005 average | - | 740 | 900 | 633 | - |
| 2008 | F below F_{pa} | - | 970 | 940 | 655 | - |
| 2009 | F below F_{pa} | - | 800 | 800 | 641 | - |
| 2010 | F below F_{pa} | - | 620 | 700 | 538 | 14 |
| 2011 | See scenarios | - | - | 840 | 552 | 8 |
| 2012 | MSY framework | - | 610 | 610^^ | 358 | 11 |
| 2013 | MSY framework | - | 560 | 590 | 332 | 10 |
| 2014 | MSY approach | 353 | 353^^ | 350 | 335 | 32 |
| 2015 | MSY approach | 211 | 205 | 205 | 224 | 6 |
| 2016 | MSY approach | ≤ 394 | 379 | 391 | 348 | 17 |
| 2017 | MSY approach | ≤ 555 | - | 555 | 520 | 17 |
| 2018 | MSY approach | ≤ 453 | - | 448 | 434 | 7 |
| 2019 | Proposed MAP F ranges, F_{lower} to F_{upper} | 422–562 | - | 502 | 419 | 8 |

| Year | ICES advice | Catch corresponding to advice | Landings corresponding to advice | Agreed TAC* | ICES landings** | ICES discards*** |
|------|---|---|----------------------------------|-------------|-----------------|------------------|
| 2020 | MAP target F ranges: F_{lower} to F_{upper} , but F higher than F_{MSY} only under conditions specified in MAP | 452–600, but catch higher than 539 only under conditions specified in MAP | | 533 | 424 | 12 |
| 2021 | Management plan | 596 (range 502–665) | | 596 | 387 | 6 |
| 2022 | Management plan | 723 (range 544–723) | | 715 | | |
| 2023 | Management plan | 504 (range –380 – 504) | | | | |

* TAC applies to subdivisions 20–21 and the EC waters of subdivisions 22–32.

** Landings include subdivisions 20–21 and subdivisions 22–24.

*** Discard estimates are not available for all years.

^ Uncertain.

^^ No more than 461 tonnes in subdivisions 20–21.

^^^ Discarding is assumed to be negligible.

History of the catch and landings

Table 7 Sole in subdivisions 20–24. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch | | Landings | | | Discards |
|------------|--|-------------------|--|--------------------|----------|
| 393 tonnes | | Active gears 54 % | | Passive gears 46 % | 6 tonnes |
| | | 387 tonnes | | | |

Table 8 Sole in subdivisions 20–24. History of landings by country and area. Weights are in tonnes.

| Year | Denmark | | | Sweden | Germany | Belgium | Netherlands | Norway | Total official landings | ICES estimated landings |
|------|----------|-----------|-------|--------|---------|---------|-------------|--------|-------------------------|-------------------------|
| | Kattegat | Skagerrak | Belts | | | | | | | |
| 1952 | 156 | | | 51 | 59 | | | | 266 | 266 |
| 1953 | 159 | | | 48 | 42 | | | | 249 | 249 |
| 1954 | 177 | | | 43 | 34 | | | | 254 | 254 |
| 1955 | 152 | | | 36 | 35 | | | | 223 | 223 |
| 1956 | 168 | | | 30 | 57 | | | | 255 | 255 |
| 1957 | 265 | | | 29 | 53 | | | | 347 | 347 |
| 1958 | 226 | | | 35 | 56 | | | | 317 | 317 |
| 1959 | 222 | | | 30 | 44 | | | | 296 | 296 |
| 1960 | 294 | | | 24 | 83 | | | | 401 | 401 |
| 1961 | 339 | | | 30 | 61 | | | | 430 | 430 |
| 1962 | 356 | | | | 58 | | | | 414 | 414 |
| 1963 | 338 | | | | 27 | | | | 365 | 365 |
| 1964 | 376 | | | | 45 | | | | 421 | 421 |
| 1965 | 324 | | | | 50 | | | | 374 | 374 |
| 1966 | 312 | | | | 20 | | | | 332 | 332 |
| 1967 | 429 | | | | 26 | | | | 455 | 455 |