# Undulate ray (*Raja undulata*) in divisions 7.d–e (English Channel)

## ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, landings in 2023 and 2024 should be no more than 4836 and 4675 tonnes respectively.

## Stock development over time

Fishing pressure on the stock is below $F_{MSY}$ and biomass is above MSY $B_{trigger}$ and $B_{lim}$.

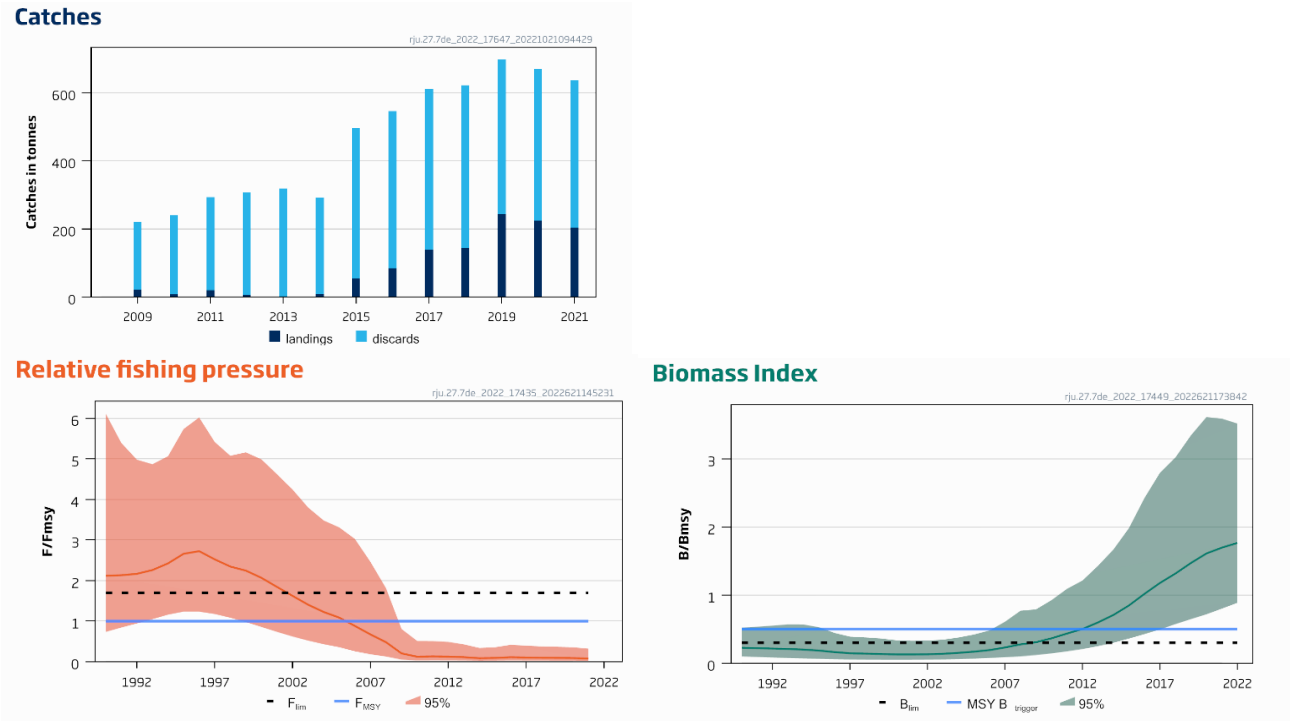


**Figure 1** Undulate ray in divisions 7.d–e. Summary of the stock assessment. Catches, relative fishing pressure, and relative biomass. Discards are the dead discards of individuals > 50 cm.

## Catch scenarios

**Table 1** Undulate ray in divisions 7.d–e. The basis for the catch scenarios.

| Variable | Value | Notes |
|---|---|---|
| $F(2022)/F_{MSY}$ | 0.077 | *Status quo* $F/F_{MSY}$. |
| $B(2023)/B_{MSY}$ | 1.806 | Short-term forecast (STF) |
| Projected catch (2022) | 649 | STF; all catches are assumed to be landed (in tonnes) |

**Table 2a** Undulate ray in divisions 7.d–e. Annual catch scenarios for 2023. All weights are in tonnes.

| Basis | Total catch (2023) | Fishing mortality $F_{2023}/F_{MSY}$ | Stock size $B_{2024}/MSY_{MSY}$ | % biomass change^ | % advice change^^ |
|---|---|---|---|---|---|
| ICES advice basis | | | | | |
| MSY approach (15th percentile of predicted catch distribution under $F = F_{MSY}$) | 4836 | 0.58 | 1.74 | −3.6 | 89 |
| Other scenarios | | | | | |
| $F = F_{MSY}$ | 8175 | 1 | 1.66 | −8.0 | 220 |
| $F = F_{2021} = F_{sq}$ | 662 | 0.077 | 1.84 | 1.82 | −74 |
| F = 0 | 0 | 0 | 1.86 | 2.7 | −100 |
| $F = F_{MSY}$ fractile 10 | 4278 | 0.51 | 1.76 | −2.9 | 68 |
| $F = F_{MSY}$ fractile 20 | 5333 | 0.64 | 1.73 | −4.3 | 109 |
| $F = F_{MSY}$ fractile 35 | 6716 | 0.81 | 1.70 | −6.1 | 163 |

^ Biomass 2024 relative to biomass 2023.
^^ Advice value for 2023 relative to the advice value for each of the years 2021 and 2022 (2552 tonnes). Note that the previous advice included surviving discards.

**Table 2b** Undulate ray in divisions 7.d–e. Annual catch scenarios for 2024 assuming that catch in 2023 corresponds to the 15th percentile of the predicted catch distribution under $F_{2023} = F_{MSY}$. All weights are in tonnes.

| Basis | Total catch (2024) | Fishing mortality $F_{2024}/F_{MSY}$ | Stock size $B_{2025}/B_{MSY}$ | % biomass change^ | % advice change^^ |
|---|---|---|---|---|---|
| ICES advice basis | | | | | |
| MSY approach (15th percentile of predicted catch distribution under $F = F_{MSY}$) | 4675 | 0.58 | 1.69 | −2.9 | 83 |
| Other scenarios | | | | | |
| $F = F_{MSY}$ | 7571 | 1 | 1.55 | −10.9 | 197 |
| $F = F_{2021} = F_{sq}$ | 673 | 0.077 | 1.8 | 3.4 | −74 |
| F = 0 | 0 | 0 | 1.90 | 9.2 | −100 |
| $F = F_{MSY}$ fractile 10 | 4164 | 0.51 | 1.71 | −2.3 | 63 |
| $F = F_{MSY}$ fractile 20 | 5123 | 0.64 | 1.67 | −4.0 | 101 |
| $F = F_{MSY}$ fractile 35 | 6339 | 0.81 | 1.61 | −7.5 | 148 |

^ Biomass 2025 relative to biomass 2024.
^^ Advice value for 2024 relative to the advice value for each of the years 2021 and 2022 (2552 tonnes). Note that the previous advice included surviving discards.

## Basis of the advice

**Table 3** Undulate ray in divisions 7.d–e. The basis of the advice.

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

## Quality of the assessment

This stock was benchmarked in 2022 (ICES, 2022a).

Landings of undulate ray (2005–2008) were estimated based on the reduction in landings of unsorted 'skates and rays' following the landing ban on the species in 2009 and the trend in landings of 'skates and rays' (ICES, 2022a, 2022b). The uncertainty associated with this reconstructed series of undulate ray landings was accounted for by specifying a higher observation error for the estimated catches in the years 2005–2008.

Discards were estimated for relevant fishing nations and fleets (ICES, 2022a, 2022b). Where annual discard estimates were lacking for any combination of country, division, and gear, these were infilled based on the most relevant data available (ICES, 2022a, 2022b). The gear-specific survival rates of discards, based on the data available for undulate ray and thornback ray caught in the stock area (Van Bogaert *et al*., 2020), have been used to estimate quantities of dead discards.

The FR-CGFS-Q4 (G3425) and UK-Q1-SWBeam (B2732) surveys operate over the main parts of the stock area in divisions 7.d and 7.e, respectively. While shallow waters (where the species is also common) cannot be sampled, the surveys allow for a representative proportion of the adult stock range to be monitored.

Whereas total biomass was considered during the benchmark assessment, this assessment is based on exploitable biomass (individuals ≥ 50 cm total length).

Owing to reduced coverage of the sampling area in 2020, a higher observation error was specified for the FR-CGFS biomass index in the assessment. Data from the UK-Q1-SWBeam in 2020 were excluded, as there had been a delay in the timing of the survey, and this seasonal shift in timing may have influenced the catch rates.

## Issues relevant for the advice

ICES catch advice is based on the 15th percentile of predicted catch distribution, which was considered more precautionary than the 35th percentile. The advice is substantially larger than the previous advice, and it cannot be quantified how this increase will impact discard rates for this species.

Small fish (less than 50 cm) are not included in the assessment or in the advice. Any catch of small fish would continue to be discarded with a high survival rate. The recent discard rate was very high due to very restrictive landings opportunity. The higher advised TAC is not expected to generate discards of undulate ray in the exploitable fraction of the stock. Therefore, the advice (on removals) given this year can be considered as a landing advice since the discards of fish greater than 50 cm are expected to be negligible.

## Reference points

**Table 4** Undulate ray in divisions 7.d and 7.e. Reference points, values, and their technical basis.

| Framework | Reference point* | Value | Technical basis | Source |
|---|---|---|---|---|
| MSY approach | MSY $B_{trigger}$ | 0.5 × $B_{MSY}$ = 0.25 x K* | Relative value ($B/B_{MSY}$) from the SPiCT assessment model. $B_{MSY}$ is estimated directly from the SPiCT model and changes when the assessment is updated. | ICES (2022a) |
| | $F_{MSY}$ | 1* | Relative value ($F/F_{MSY}$) from the SPiCT assessment model. $F_{MSY}$ is estimated directly from the SPiCT model and changes when the assessment is updated. | ICES (2022a) |
| Precautionary approach | $B_{lim}$ | 0.3 × $B_{MSY}$ | Relative value (equilibrium yield at this biomass is 50% of MSY). | ICES (2022a) |
| | $B_{pa}$** | Not defined | | |
| | $F_{lim}$ | 1.7 × $F_{MSY}$ | Relative value (the F that drives the stock to $B_{lim}$). | ICES (2022a) |
| | $F_{pa}$** | Not defined | | |
| Management plan | $SSB_{mgt}$ | Not defined | | |
| | $F_{mgt}$ | Not defined | | |

* No reference points are defined for this stock in terms of absolute values. The SPiCT-estimated values of the ratios $F/F_{MSY}$ and $B/B_{MSY}$ are used to estimate stock status relative to the MSY reference points.
** $B_{pa}$ and $F_{pa}$ are not defined. The assessment provides probability distributions for B and F, so it is possible to directly estimate the probabilities of $B < B_{lim}$ and of $F > F_{lim}$.

## Basis of the assessment

**Table 5** Undulate ray in divisions 7.d–e. Basis of assessment and advice.

| | |
|---|---|
| ICES stock data category | 2 (ICES, 2022c) |
| Assessment type | Surplus Production Model in Continuous Time ([SPiCT] ICES, 2022a, 2022b). |
| Input data | Commercial landings and estimates of discards; FR-CGFS-Q4 [G3425] and UK-Q1-SWBeam [B2732] surveys |
| Discards and bycatch | DCmap on-board observation programmes, discards (> 50 cm) used in the model |
| Indicators | None |
| Other information | BTS-ENG-Q3 [B2453] survey |
| Working group | Working Group on Elasmobranch Fishes (WGEF) |

## History of the advice, catch, and management

**Table 6** Undulate ray in divisions 7.d–e (English Channel). History of ICES advice and ICES estimates of landings and discards. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Predicted landings corresp. to advice | TAC in 7.d*** | TAC in 7.e*** | ICES total discards** | ICES landings* |
|---|---|---|---|---|---|---|---|
| 2009 | No targeted fishery | | 0 | | | 1246 | 21 |
| 2010 | No new advice, same as 2009 | | 0 | | | 1611 | 9 |
| 2011 | No targeted fishery | | 0 | | | 2045 | 20 |
| 2012 | No new advice, same as 2011 | | 0 | | | 2339 | 6 |
| 2013 | No targeted fishery, minimize bycatch | | 0 | | | 2514 | 3 |
| 2014 | No targeted fishery, minimize bycatch | | 0 | | | 2181 | 10 |
| 2015 | No targeted fishery, management plan for bycatch | | 0 | 11 | 100 | 2869 | 55 |
| 2016 | No targeted fishery, management plan for bycatch | | 0 | 12 | 100 | 3128 | 84 |
| 2017 | Precautionary approach | | ≤ 65 | 19 | 161 | 3256 | 139 |
| 2018 | Precautionary approach | | ≤ 115 ^ | 19 | 161 | 3338 | 143 |
| 2019 | Precautionary approach | ≤ 2127 | ≤ 115 | | 234*** | 3082 | 244 |
| 2020 | Precautionary approach | ≤ 2127 | ≤ 115 | | 234*** | 2920 | 225 |
| 2021 | Precautionary approach | ≤ 2552 | ≤ 183 | | 234*** | 2754 | 205 |

| Year | ICES advice | Catch corresponding to advice | Predicted landings corresp. to advice | TAC in 7.d*** | TAC in 7.e*** | ICES total discards** | ICES landings* |
|---|---|---|---|---|---|---|---|
| 2022 | Precautionary approach | ≤ 2552 | ≤ 183 | 234*** | | | |
| 2023 | MSY approach | | ≤ 4836 | | | | |
| 2024 | MSY approach | | ≤ 4675 | | | | |

* Fishing opportunities are managed through a TAC for each part of the stock within the relevant TAC for divisions 7.d–e by management unit, which includes all species of skates and rays. Since 2016, there has been a specified TAC for this species in the management unit.
** Discard estimates revised (ICES, 2022a).
*** From 2019 the previously distinct TACs for divisions 7.d and 7.e were merged into a single TAC.
^ Updated in 2018; the original advice value was 65 tonnes (ICES, 2016).
^^ From 2023, catch corresponding to advice does not include discards expected to survive.

## History of the catch and landings

The distribution of this stock does not extend into the NEAFC Regulatory Area.

**Table 7** Undulate ray in divisions 7.d–e. Catch distribution by fleet in 2021 as estimated by ICES.

| Catch | Landings | | | | | Total discards |
|---|---|---|---|---|---|---|
| 2959 tonnes | Beam trawl 6% | Bottom trawls 56% | Nets 28% | Lines 1% | Other gears 9% | 2754 tonnes |
| | 205 tonnes | | | | | |

**Table 8** Undulate ray in divisions 7.d–e History of landings. ICES estimates of landings by country (in tonnes). Blank cell = no data reported; 0 = value less than 0.5.

| Year | Belgium | UK | France | Total |
|---|---|---|---|---|
| 2009 | | 2 | 19 | 21 |
| 2010 | | | 9 | 9 |
| 2011 | | | 20 | 20 |
| 2012 | | 0 | 6 | 6 |
| 2013 | | | 3 | 3 |
| 2014 | | | 10 | 10 |
| 2015 | | 5 | 50 | 55 |
| 2016 | 5 | 22 | 58 | 84 |
| 2017 | 24 | 36 | 79 | 139 |
| 2018 | 15 | 43 | 86 | 143 |
| 2019 | 0 | 63 | 181 | 244 |
| 2020 | 0 | 66 | 159 | 225 |
| 2021 | | 52 | 152 | 205 |

**Table 9** Undulate ray in divisions 7.d–e History of discards. ICES estimates of discards (in tonnes). Data were revised during the 2022 benchmark assessment (ICES, 2022a).

| Year | Total discards | Total exploitable discards | Dead exploitable discards |
|---|---|---|---|
| 2009 | 1246 | 770 | 200 |
| 2010 | 1611 | 951 | 231 |
| 2011 | 2045 | 1093 | 274 |
| 2012 | 2339 | 1211 | 302 |
| 2013 | 2514 | 1291 | 317 |
| 2014 | 2181 | 1149 | 283 |
| 2015 | 2869 | 1891 | 442 |
| 2016 | 3128 | 1992 | 463 |
| 2017 | 3256 | 2037 | 473 |
| 2018 | 3338 | 2062 | 480 |
| 2019 | 3082 | 1985 | 456 |
| 2020 | 2920 | 1904 | 446 |
| 2021 | 2754 | 1824 | 433 |

## Summary of the assessment

**Table 10** Undulate ray in divisions 7.d–e. Assessment summary. Biomass is relative to $B_{MSY}$ at the beginning of the year and fishing mortality relative to $F_{MSY}$. High and low values are 95% probability intervals of the posterior distribution. Catches are model estimates of dead removals (landings + dead discards) from individuals > 50 cm, in tonnes.

| Year | Relative biomass | | | Catches (tonnes) | Relative fishing pressure | | |
|---|---|---|---|---|---|---|---|
| | Relative B | High | Low | | Relative F | High | Low |
| 1990 | 0.23 | 0.52 | 0.099 | 2252 | 2.1 | 6.1 | 0.73 |
| 1991 | 0.22 | 0.54 | 0.092 | 2215 | 2.1 | 5.4 | 0.84 |
| 1992 | 0.22 | 0.55 | 0.084 | 2217 | 2.2 | 5.0 | 0.94 |
| 1993 | 0.21 | 0.57 | 0.077 | 2264 | 2.3 | 4.9 | 1.05 |
| 1994 | 0.20 | 0.57 | 0.071 | 2329 | 2.4 | 5.1 | 1.16 |
| 1995 | 0.186 | 0.53 | 0.065 | 2245 | 2.7 | 5.7 | 1.23 |
| 1996 | 0.164 | 0.45 | 0.060 | 1932 | 2.7 | 6.0 | 1.23 |
| 1997 | 0.147 | 0.39 | 0.055 | 1653 | 2.5 | 5.4 | 1.18 |
| 1998 | 0.141 | 0.38 | 0.053 | 1507 | 2.3 | 5.1 | 1.08 |
| 1999 | 0.136 | 0.36 | 0.051 | 1362 | 2.2 | 5.2 | 0.98 |
| 2000 | 0.130 | 0.34 | 0.050 | 1201 | 2.1 | 5.0 | 0.86 |
| 2001 | 0.130 | 0.33 | 0.051 | 1074 | 1.84 | 4.6 | 0.74 |
| 2002 | 0.133 | 0.33 | 0.053 | 969 | 1.62 | 4.2 | 0.62 |
| 2003 | 0.139 | 0.35 | 0.056 | 901 | 1.41 | 3.8 | 0.52 |
| 2004 | 0.152 | 0.38 | 0.061 | 874 | 1.23 | 3.5 | 0.43 |
| 2005 | 0.170 | 0.42 | 0.069 | 853 | 1.09 | 3.3 | 0.36 |
| 2006 | 0.193 | 0.48 | 0.078 | 770 | 0.88 | 3.0 | 0.26 |
| 2007 | 0.23 | 0.61 | 0.088 | 695 | 0.67 | 2.5 | 0.184 |
| 2008 | 0.28 | 0.77 | 0.100 | 485 | 0.48 | 1.82 | 0.128 |
| 2009 | 0.31 | 0.79 | 0.120 | 233 | 0.21 | 0.81 | 0.052 |
| 2010 | 0.37 | 0.93 | 0.145 | 240 | 0.125 | 0.51 | 0.031 |
| 2011 | 0.44 | 1.09 | 0.174 | 292 | 0.133 | 0.51 | 0.034 |
| 2012 | 0.50 | 1.21 | 0.21 | 309 | 0.128 | 0.49 | 0.033 |
| 2013 | 0.60 | 1.43 | 0.25 | 316 | 0.113 | 0.43 | 0.030 |
| 2014 | 0.71 | 1.67 | 0.30 | 304 | 0.087 | 0.34 | 0.022 |
| 2015 | 0.85 | 1.98 | 0.36 | 483 | 0.095 | 0.36 | 0.025 |
| 2016 | 1.02 | 2.4 | 0.43 | 551 | 0.113 | 0.42 | 0.030 |
| 2017 | 1.18 | 2.8 | 0.50 | 608 | 0.105 | 0.40 | 0.028 |
| 2018 | 1.32 | 3.0 | 0.57 | 628 | 0.099 | 0.38 | 0.026 |
| 2019 | 1.47 | 3.3 | 0.65 | 694 | 0.096 | 0.37 | 0.025 |
| 2020 | 1.61 | 3.6 | 0.72 | 672 | 0.092 | 0.36 | 0.023 |
| 2021 | 1.70 | 3.6 | 0.80 | 641 | 0.081 | 0.32 | 0.020 |
| 2022 | 1.77 | 3.5 | 0.89 | | | | |

## Sources and references

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Download the stock assessment data and figures.

*Recommended citation*: ICES. 2022. Undulate ray (*Raja undulata*) in divisions 7.d and 7.e (English Channel). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, rju.27.7de. https://doi.org/10.17895/ices.advice.19754482