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22 Plaice (*Pleuronectes platessa*) in Division 27.7.a (Irish Sea)

22.1 Introduction

Type of assessment in 2024

WKIrish3 (ICES, 2017) benchmarked this assessment and choose the SAM model, including estimates of discards-at-age into the catch matrix. A baseline run of the model was performed using discards since 1981 reconstructed according to the medium discard scenario (ICES, 2017).

ICES advice applicable to 2023

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.

Advice for 2023 is available at:

https://ices-library.figshare.com/articles/report/Plaice_Pleuronectes_platessa_in_Division_7_a_Irish_Sea_/19453592?backTo=/collections/ICES_Advice_2022/5796935?backTo=/collections/ICES_Advice_2022/5796935?backTo=/collections/ICES_Advice_2022/5796935?backTo=/collections/ICES_Advice_2022/5796935

ICES advice applicable to 2024

ICES advises that when the MSY approach is applied catches in 2024 should be no more than 1902 tonnes.

Advice for 2024 is available at:

https://ices-library.figshare.com/articles/report/Plaice_Pleuronectes_platessa_in_Division_7_a_Irish_Sea_/21840978?backTo=/collections/ICES_Advice_2023/6398177

22.2 General

Stock description and management units

The stock assessment area and the management unit are both Division 27.7.a (Irish Sea).

Management applicable in 2022 and 2023

Management of plaice in Division 27.7.a is by TAC and there is a Minimum Conservation Reference Size (MCRS) of 27 cm in force. The agreed TACs and associated implications for plaice in Division 27.7.a are detailed in the tables below.

2023

Species:	Plaice *Pleuronectes platessa*	Zone:	7a (PLE/07A.)
Belgium	44	Analytical TAC Article 7(2) of this Regulation applies	
France	19		
Ireland	767		
Netherlands	13		
Union	843		
United Kingdom	1 042		
TAC	2 039		

(Source: Council Regulation (EU) 2023/194, ANNEX IA)

2024

Species:	Plaice *Pleuronectes platessa*	Zone:	7a (PLE/07A.)
Belgium	33	Analytical TAC	
France	14	Article 7(2) of this Regulation applies	
Ireland	570		
Netherlands	10		
Union	627		
United Kingdom	972		
TAC	1 902		

(Source: Council Regulation (EU) 2024/257, ANNEX IA)

The fishery in 2023

National landings data reported to ICES* and Working Group estimates of total landings are given in Table 22.1. A summary by gear is given below.

Catch (2023)		Landings			Discards		
72% dead	28% surviving	Beam trawl	Otter trawl	Other gear types	Beam trawl	Otter trawl	Other gear types
		77%	29%	3%	63%	34%	2%
539 tonnes		156 tonnes			383 tonnes		
					60% dead	40% surviving	

*** 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.**

The TAC for 2023 was 2039 tonnes and the working group estimate of landings in 2023 was 156 tonnes. The poor uptake of the quota is not a consequence of an inability to catch sufficient quantities of plaice greater than the MCRS but rather is most likely due to the limited market demand and poor value of the catch.

Landings (based on working group estimates) by the Irish, NI, UK and Belgian fleets comprised of 12%, 2%, 14% and 72% respectively of total landings in 2023. The landings of plaice are mainly split between beam trawlers (79%; primarily Belgian vessels then Irish vessels) targeting sole, and otter trawlers (21%; primarily UK and Irish vessels). Historically, otter trawling was dominated by UK vessels fishing for whitefish, but in recent years, many vessels have switched to target *Nephrops* (Figure 22.1). Otter trawlers from Ireland and N. Ireland typically target *Nephrops* in the western Irish Sea.

High levels of discarding are known to occur in all fisheries that catch plaice in the Irish Sea (see Figures 22.4 and 22.5).

A general description of the fishery can be found in the stock annex and also in 'Other Relevant Data' section below.

22.3 Data

Landings

National landings data reported to ICES and Working Group estimates of total landings are given in Table 22.1. The working group procedures used to determine the total international landings numbers- and weights-at-age are documented in the stock annex. As a result of increased rates of discarding, landed numbers-at-age for the younger ages (ages 2 to 4) have declined more rapidly over the last two decades than landings of older fish (Figure 24.2a). Age compositions of landed fish are available for Belgian beam trawl, Irish beam and otter trawl and English otter trawl (Figure 22.5).

Discards

Discard sampling has been conducted by the UK(E&W) since 2002 and by Ireland since 1993; Northern Ireland has collected data from 1996 (but not between 2003 and 2005), and Belgium since 2003. Age compositions of discarded fish are available for Belgian beam trawl and Irish otter trawl, discard estimates are also available for Northern Irish otter trawl. Discard rates for unsampled fleets are taken from the sampled fleets separately for fisheries targeting demersal fish and *Nephrops* (Figure 22.4 and Figure 22.5). Age compositions of discarded fish are available for Belgian beam trawl (used for gears targeting demersal fish) and Irish otter trawl (used for gears targeting *Nephrops*) (Figure 22.5).

WKFLAT (ICES, 2011) first estimated total international discards-at-age and introduced them to the assessment of the stock for the first time. Due to limitations in the data available by gear type, discards for Ireland, France and Northern Ireland, for the years 2004–2011 were raised using UK estimates on the basis of equivalent gear types. A raising factor based on tonnages landed for these countries was calculated and applied to the UK(E&W) estimates of discard numbers. Finally, these estimates were added to those calculated for Belgium to give estimates of total international discard numbers-at-age.

There is a considerable historic time period (1981–2003) for which no international raised discard estimates are available. The method for reconstructing discards prior to 2004 is based on size-varying discard rates and is documented in Annex 4 of the WKIrish3 report (ICES, 2017).

Since 2012, catch data (landings and discards) are available from InterCatch disaggregated by country and fleet. Total international discards are raised from available discards data.

The total discard estimates (Table 22.1, Figure 22.2b) confirm the significant proportion of discarding that occurs in the fishery, which has increased in time. Since 2004, the majority of the catch has been discarded (61% and 82% average discard in weight and in numbers respectively).

Biological

Landings numbers-at-age are given in Table 22.5 and plotted in Figure 22.2a. Weights-at-age in the landings are given in Table 22.6. Discard weights-at-age are given in Table 22.7 and weights-at-age in the stock in Table 22.8. The history of the derivation of the landings weights and stock weights used in this assessment is described in the stock annex.

Mean weight-at-age in the landings and survey data indicate declines in both sexes throughout the Irish Sea since 1993 so that plaice at ages ≤4 are typically below MCRS.

Surveys

All available tuning data are shown in Tables 22.2, 22.3 (a and b) and 22.4. Due to inconsistencies in the available commercial tuning fleets, Irish Sea plaice assessments since 2004 have only included the UK (E&W) beam trawl survey (UK (E&W)-BTS-Q3) (B6596) and the two NIGFS-WIBTS spawning biomass indices based on ground fish surveys (NIGFS-WIBTS-Q1 (G7144) and NIGFS-WIBTS-Q4 (G7655)). For more information see WGNSDS (ICES, 2004). The UK (E&W)-BTS-Q3 index was revised by WKFLAT 2011 to include stations in the western Irish Sea and in St George's Channel. A second revision was conducted in 2017 to correct for some inconsistency in the index calculation This revision did not substantially change the trend of the biomass index (see WD Cambiè and Earl, 2017 in the WGCSE 2017 report).

Reviews of the UK (E&W)-BTS-Q3 mean standardised CPUE trends have indicated that the survey has good internal consistency in monitoring trends across the stock area. For the entire Irish Sea, the biomass index calculated from the UK (E&W)-BTS-Q3 (Figure 22.3, right) indicates two periods of upwards trend, 1993–2003 and from 2007–2015. It is however, detected to have dropped from 2016. An increase of numbers in older ages is observed until around 2015, followed by a steep decline (Figure 22.3, left). The NIGFS-WIBTS surveys show similar increases in biomass between 1993 and 2003, reaching the highest level in 2016, then a subsequently decrease until most recent years.

In 2022, an error was discovered in the calculation of the tuning index from the NIGFS-WIBTS (Autumn and Spring), going back four years for the Autumn series and three years for the Spring series. The most recent datapoints were not calculated in the same units as previously, and so had to be corrected. The revision increased these data points by a factor of 3. An update of the 2021 assessment using the corrected data led to the SSB at the start of the interim year being revised up by 13% and a minor improvement to the model fit. In 2023 part of the NIGFS-WIBTS-Q4 survey was not conducted. As a consequence, the survey was included in the model with the missing stations' values being replaced by a 3-year average (2020-2022). Sensitivity analyses has indicated that this has produced a minimal impact on the perception of the stock status.

The NIGFS-WIBTS survey strata can be disaggregated into western (Strata 1–3) and eastern (Strata 4–7) subareas, where the subareas are divided by the deep trench that runs roughly north–south to the west of the Isle of Man (Figure 22.6, Tables 22.3a and b).

The SSB of plaice in the Irish Sea was also independently estimated using the Annual Egg Production Method (AEPM), according to Armstrong *et al.*, 2001 methodology.

Year	SSB (tonnes)	Catch/SSB harvest rate
1995	9081	
2000	13 303	
2006	14 417	15.16
2008	14 352	12.77
2010	15 071	19.5

Catch (discards available from 2004) to egg survey biomass ratios indicate historically that the plaice in the Irish Sea has been lightly exploited. Splitting the SSB estimates from the AEPM into eastern and western Irish Sea areas (Figure 22.7) also indicates that the perceived increase in plaice biomass is due to increased production in the eastern Irish Sea only (for more details see stock annex).

In summary, the UK (E&W)-BTS-Q3 in September, the NIGFS-WIBTS-Q4 index in October (but not NIGFS-WIBTS-Q1 March), and the AEPM indicate a sustained increasing trend in biomass in the eastern Irish Sea, but this rise does not appear to extend across the deep channel to plaice in the western Irish Sea (Figure 22.7).

Commercial CPUE

Age-based tuning data available for this assessment, comprise three commercial fleets: the UK(E&W) otter trawl fleet (UK(E&W) OTB, from 2008), the UK(E&W) beam trawl fleet (UK(E&W) BT, from 1989) and the Irish otter trawl fleet (IR-OTB, from 1995). Due to inconsistencies in the available tuning fleets, Irish Sea plaice assessments since 2004 have omitted these indices. For more information, see WGNSDS 2004. The effort and catch by these commercial fleets have been very low in recent years and the CPUE data are no longer considered informative.

Other relevant data

Table 22.2 and Figure 22.1 show that effort levels have decreased since 2002 for the majority of fleets. Both the UK otter and beam trawl fleets are close to their lowest recorded effort levels in time-series extending back to 1972 and 1983 respectively. Effort by UK *Nephrops* trawlers has greatly increased in the years 2006–2014 but has decreased in the last years. However, this fleet is now the dominant UK fleet in terms of hours fished in 27.7.a. Belgian vessels operating in Division 7 typically move in and out of the Irish Sea, depending on the season, from specifically the Bristol Channel and Celtic Sea, the Bay of Biscay and the southern North Sea.

Since 2013, a problem with the gear effort information (000s hours fished) reported for the UK (E&W) commercial beam trawl fleet has been registered. Effort information from this fleet is largely missing as a result of a larger component of the fleet using the EU electronic logbook system to report its activities. Gear effort information reporting has not been mandatory with this system to date. As a result, few trips reported their gear effort information rendering the overall effort reported and resulting LPUE unusable. However, an initial inspection of an alternate effort indicator for this gear (days fished) suggests that UK beam trawl effort in 2013, 2014, 2015, 2016, and 2017 is at the level observed in 2012. The otter trawl fleet effort reporting was unaffected by this as these vessels were not reporting their landings via this method in these years.

22.4 Historical stock development

Model: Age-based analytical assessment (State–space Assessment Model, SAM) that uses landings and discards (Nielsen and Berg, 2014).

Software: R version 4.0.2 with additional packages (version in parenthesis):

stockassessment (0.12.0); Pander (0.6.5); knitr (1.39); captioner (2.2.3); rmarkdown (2.14); icesAdvice (2.1.1); reshape (0.8.8); cowplot (1.1.1); ggplot2 (3.4.4); icesTAF (4.2.0).

Model options chosen

The AP model (Aarts and Poos, 2009) was replaced by SAM. WGCSE (ICES, 2016) agreed that the AP model was not the definitive assessment tool for Irish Sea plaice but a temporary solution to the fitting of datasets which included recent discards estimates but for which historic discard information was not available. Reconstructed values of historic discards (prior 2004) were provided in the WKIrish3 (ICES, 2017). The SAM model incorporates the estimated historic discards and is used to run the assessment since 2017.

The model runs were performed using the R package 'stockassessment'. Settings for this update stock assessment are given in the table below. The update assessment follows the same procedure as in the stock annex (ICES, 2017). A baseline run of the model was performed using discards since 1981 reconstructed according to the medium discard scenario (ICES, 2017). Discard survival was set at 40%, and natural mortality followed a Lorenzen curve, scaled to 0.12.

Input data types and characteristics

Commercial catch-at-age data. Discards values available from 2004. Estimates of discards reconstructed for 1981–2003 (ICES, 2017). Only the dead fraction of discards (0.6) is accounted for in the model. Three survey indices (UK (E&W)-BTS-Q3, NIGFS-WIBTS-Q1, and NIGFS-WIBTS-Q4); fixed maturity ogive; natural mortality constant over years and different across ages.

Final update assessment

WKIrish3 (ICES, 2017) benchmarked this assessment and included estimates of discards-at-age into the catch matrix.

The assessment settings are shown in the following table. Historic settings are given in the stock annex.

Assessment year		2020	2021	2022	2022	2023
Assessment model		SAM	SAM	SAM	SAM	SAM
Tuning fleets	UK (E&W)-BTS-Q3	Survey omitted	Survey omitted	Survey omitted	Survey omitted	Survey omitted
	Extended UK (E&W)-BTS-Q3	1993–2019, ages 1–7	1993–2019, ages 1–7	1993–2021, ages 1–7	1993–2022, ages 1–7	1993–2023, ages 1–7
	UK(E&W) BTS Mar	Survey omitted	Survey omitted	Survey omitted	Survey omitted	Survey omitted
	UK(E&W) OTB	Series omitted	Series omitted	Survey omitted	Survey omitted	Survey omitted
	UK(E&W) BT	Series omitted	Series omitted	Survey omitted	Survey omitted	Survey omitted
	IR-OTB	Series omitted	Series omitted	Survey omitted	Survey omitted	Survey omitted
	NIGFS-WIBTS-Q1	1992–2019	1992–2020	1992–2021	1992–2022	1992–2023
	NIGFS-WIBTS-Q4	1992–2019	1992–2020	1992–2021	1992–2022	1992–2023
Selectivity model		Correlated random walk	Correlated random walk	Correlated random walk	Correlated random walk	Correlated random walk
Discard fraction		Estimated by WKIrish3	Estimated by WKIrish3	Estimated by WKIrish3	Estimated by WKIrish3	Estimated by WKIrish3
Landings N at age		1981–2019, ages 1–8+	1981–2020, ages 1–8+	1981–2021, ages 1–8+	1981–2022, ages 1–8+	1981–2023, ages 1–8+
Discards N at age		1981–2019, ages 1–8+	1981–2020, ages 1–8+	1981–2021, ages 1–8+	1981–2022, ages 1–8+	1981–2023, ages 1–8+

The estimated selectivity patterns split into the landed and discarded components are shown in Figure 24.8. Until early 1990s, the landings selectivity had the highest values for fish aged 4 (indicating that four-year aged fish were selected). This selectivity shifted to age 5 in late the 1990s and early 2000s, due to the increase of the MCRS in 1998 (from 250 mm to 270 mm). Since late 2000s landings gradually fell over time to very low values relative to the discard pattern, which became dominant and expanded to the older aged fish during the most recent years.

The catchability of the UK(E&W)-BTS-Q3 survey is elevated for ages 1 and 2 and reflects the nature of the survey, which was designed as a recruit index (Figure 22.9).

Diagnostic output from the SAM model is shown in Figure 24.10. In the catch residuals, negative values are apparent in ages 8+ from 1998. A year effect in 2004 is present in the UK(E&W)–BTS-Q3 residuals (which is the first year for which discard data are available). A pattern of negative residuals between 2004 and 2009 is present in the residuals of the NIGFS-WIBTS due to large fluctuations in the SSB indices, which are due potentially to variable catchability of the survey.

Recruitment is estimated to be fluctuating without an overall trend until 2015, and then estimated at its lowest values in 2017–2022. The standardised values of the recruitment estimated by the SAM model and the standardised value of age 1 from the UK-BTS survey are characterised by similar pattern, demonstrating consistency in the model estimates (Figure 22.11).

The estimated SSB from the SAM model shows an increasing trend from 1995 until 2004–2005, followed by a drop in 2006 and 2007. This change in SSB trend from 2004 is probably due to the inclusion of more reliable discards values since 2004, when international raised discard estimates became available. Since 2012, SSB has increased reaching the highest value of the whole time-series in 2016, followed by a decrease in estimated SSB since then. The SSB trends are largely in agreement with independent SSB estimates from the Annual Egg Production Method (AEPM), up to the most recent estimate in 2010, as well as showing a similar trend to the survey data used in the assessment (NIGFS-WIBTS-Q1 and -Q4; UK(E&W)-BTS-Q3, Figure 22.12).

Estimates of numbers-at-age in the landings, discards and population, and fishing mortality numbers-at-age are given in Tables 22.9–22.12. A summary plot for the SAM assessment is shown in Figure 22.13 and the time-series estimates for F_{bar}, SSB and recruitment are given in Table 22.13.

Comparison with previous assessments

In 2017, the Aarts and Poos model was replaced by the state–space assessment model (SAM). The assessment used the Lorenzen M scaled to 0.12, and the most recent maturity ogive for the survey.

The methodology provided is as robust as possible and does not currently appear to suffer from a serious retrospective pattern (Figures 22.14 and 22.15). The ten assessment model configurations compared in WKIrish3 (ICES, 2017) perform similarly in terms of temporal trends in SSB, recruitment, catch and F_{bar}. Small retrospective bias in SSB in 2004 likely resulted from the introduction of discards estimates based on samples collected from that year (prior to 2004, discards estimates are reconstructed values based on size-varying discard rates). A Mohn's rho analysis for a five-year peel resulted in values of -1.3% for recruitment, 12.7% for SSB and -12% for F_{bar}.

State of the stock

Trends in F_{bar} SSB, recruitment and catch, for the full time-series, are shown in Table 24.13 and Figure 24.13. The assessment consistently estimates that fishing mortality declined from high levels in the 1980s and early 1990s to very low levels, having been <0.1 since 2013. Since 2012, SSB has increased reaching the highest value of the whole time-series in 2016, whereas it has slightly decreased in 2017 and in the most recent years. Estimated recruitments are highly variable. An increasing trend was present until 2015 although it seems to have dropped to the lowest values in 2017–2020. A gradual slightly increase has been seen in the last two years. Catch has decreased to low levels and, since 2006, the majority of the catch has been discarded (61% in weight and 82% in number respectively, averaged since 2004).

22.5 Short-term projections

Forecasting takes the form of short-term stochastic projections. A total of 1000 samples are generated from the estimated distribution of survivors. These replicates are then simulated forward according to model and forecast assumptions (see table below), using the usual exponential decay equations, but also incorporating the stochastic survival process (using the estimated survival standard deviation) and subject to different catch-options scenarios. Recruitment in the intermediate year (2024) was taken as the median from a distribution about the assessment

estimate. Estimates of recruitment for intermediate year and subsequent years were resampled from the 2015–2023 year classes, reflecting recent low levels of recruitment. These re-sampled recruitments are used in SAM forecasts in order to evaluate future stock dynamics.

Initial stock size	Starting populations are simulated from the estimated distribution at the start of the intermediate year (including covariances)
Maturity	Average of final three years of assessment data
Natural mortality	Average of final three years of assessment data
F and M before spawning	Both taken as zero
Weight-at-age in the catch	Average of final three years of assessment data
Weight-at-age in the stock	Assumed to be the same as weight-at-age in the catch
Exploitation pattern	Fishing mortalities taken as a three-year average
Stock–recruitment model used	Recruitment for the intermediate year onwards is sampled, from 2015 to the final year of catch data
Procedures used for splitting projected catches	An average of final three years of landing fractions are used in the forecast period, Discard values are raised to include the live portion. Discard numbers multiplied by 5/3 to account for discard survival. Total catch is sum of three components: landings, discards assumed to die, and discards assumed to survive

F estimates 2017–2019 has fluctuated around similar values, with a slightly increase in recent years (2021 and 2022). F *status quo*, Fsq, has been estimated by averaging the F over 2021–2023 (0.086).

A full management options table is provided in Table 22.15, based on the intermediate year assumption in Table 22.14. Note that the values that appear in the catch scenarios are medians from the distributions that result from the stochastic forecast. Implementing the management plan for this stock with F_{MSY}=0.196 leads to a total catch of 1504 t (485 t of landings and 1019 t of discards including dead and survivors) in 2024 and SSB of 8237 t in 2026.

22.6 Medium-term projections

There are no medium-term projections for this stock.

22.7 MSY explorations

The reference points for this stock were estimated in 2018 (ICES, 2018) as ICES request for EU western waters stocks and are presented in the table below. In 2021, ICES changed the basis for F_{pa} to $F_{p.05}$, and the updated F_{pa} value is shown in the table below.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	8757 tonnes	Lower 5th percentile of B F_{MSY}	ICES (2018)
	F_{MSY}	0.196	Stochastic simulations with segmented regression from the entire time-series (1981–2017)	ICES (2018)
	$F_{MSY\ lower}$	0.133	F at 95% MSY (below FMSY), based on simulation using a segmented regression stock–recruitment relationship (EqSim)	ICES (2018)
	$F_{MSY\ upper}$	0.293	F at 95% MSY (above FMSY), based on simulation using a segmented regression stock–recruitment relationship (EqSim)	ICES (2018)
Precautionary approach	B_{lim}	3958 tonnes	B_{loss} = minimum SSB observed	ICES (2018))
	B_{pa}	5294 tonnes	$B_{lim} \times \exp(1.645 \times \sigma)$; $\sigma = 0.177$	ICES (2018)
	F_{lim}	0. 50	F with 50% probability of SSB < B_{lim}	ICES (2018)
	F_{pa}	0.403	$F_{p.05}$; the F that leads to SSB ≥ B_{lim} with 95% probability	ICES (2018)
Management plan	SSB_{mgt}	Not applicable		
	F_{mgt}	Not applicable		

Yield per Recruit analysis

There are no yield per recruit analyses for this stock.

22.8 Management plans

There are no management plans for this stock.

22.9 Uncertainties and bias in assessment and forecast

The assessment was benchmarked in 2017 (WKIrish3), which resulted in the SAM model being fitted using catches based on reconstructed estimates of discards prior to 2004. This discard reconstruction introduces additional uncertainty in the model. The model estimates of stock development since 2004 are more reliable as based on direct discard estimates. The SAM model considered only the dead portion of the discards (60%), but in the forecast the estimates are raised to include the surviving discards. The Mohn's rho measure of retrospective bias for this assessment is low (Section 22.3).

The assessment indicates that recruitment and F have both been falling in recent years, and as a result the average age of catches has been increasing. An increasing amount of the stock is contained within the modelled plus group (47% in the last five years is age 8+). Consequently, the

assessment and forecast have increased uncertainty and a pattern of retrospective adjustment of terminal year SSB downwards is seen in the recent history of the assessment.

22.10 Recommendations for next benchmark

There is evidence of substantial substock structure and incorporating information about the differences in growth and maturity between the east and west sides of the Irish Sea, as well as by sex should be explored.

Incorporating data on changes in maturity and natural mortality over time, linked to the decreasing in weights-at-age observed in survey data, should also be considered. There is evidence of a decline in weight-at-age from the commercial landings data and survey data. The UK(E&W)-BTS-Q3 survey data also indicate declines in length-at-age and maturity-at-age.

Creating age-based indices for the NI groundfish surveys would improve the assessment.

Ecosystem information ought to be explored.

Type	Problem/Aim	Work required	Data required	Expertise required
Sampling	The split between OTB and BTT has changed, and sample raising may not adequately reflect the changed split	Review consistency of sample raising to ensure the change of OTB/BTT is accurately and consistently reflected in the raised samples	Data already available in InterCatch	Catch sampling expertise
Assessment method	The assessment indicates that recruitment and F have both been falling in recent years, and as a result the average age of catches has been increasing. An increasing amount of the stock is contained within the modelled plus group (47% in the last five years is age 8+). Consequently, the assessment and forecast have increased uncertainty and a pattern of retrospective adjustment of terminal year SSB downwards is seen in the recent history of the assessment.	Recompile age distributions with a higher plus group, test effect of different Catchability assumptions in this age group. Consider whether F_{bar} age range needs changing. Possible recalculation of reference points	Landings data by age, as disaggregated as possible. Should be available post-2004 in InterCatch, but historic data availability unknown	Historic catch age composition raising
Other issues	Fits to NIGFS indices use SSB indices, assuming constant selectivity for all age/length	Explore whether age/length compositions can inform the selectivity of the survey and whether this can be included in the assessment	Survey age/length compositions	Survey index compilation experts
Biological parameters	Natural mortality and maturity may be connected with size which has varied substantially over time and between parts of the stock.	Investigate whether time varying biological parameters can be derived and used in this stock	stock size data, relationships between M and stock size, relationships between maturity and stock size. Has the catch split changed between East and West of the area, and does this affect average M and maturity?	

22.11 Management considerations

The high level of discarding in this fishery indicates a mismatch between the minimum landing size and the mesh size of the gear being used. Any measures that effect a reduction in discards will result in increased future yield. However, the market demand for plaice is poor and small plaice are particularly undesirable. Strong year effects are seen in the discard data and these are likely due to spatial structure in the stock. Spatial management of fleets in the Irish Sea may reduce the discarding of plaice.

The overall state of the stock is consistently estimated to have low fishing mortality and high spawning biomass. Therefore, the stock is considered to be within safe biological limits.

Discarding has increased throughout the period in which data are available, while landings of plaice have decreased, even though the TAC is not restrictive. Effort has decreased in fisheries targeting plaice (including UK(E&W) and Belgian beam-trawl fisheries, and UK(E&W) and Irish otter trawl fisheries targeting demersal fish). In contrast, effort by the UK(E&W) *Nephrops* fleet has increased, however, this is still small in comparison to effort by the Irish *Nephrops* fleet. The main *Nephrops* grounds are located in the western Irish Sea, where relatively small plaice are found. Technical measures to mitigate discarding by all *Nephrops* fleets could include the use of sorting grids: gear selectivity trials and monitoring from four Irish *Nephrops* trawlers using grids since 2009 indicate a potential reduction in fish discarding by 75% (BIM, 2009).

22.12 References

Aarts, G., and Poos, J.J. 2009. Comprehensive discard reconstruction and abundance estimation using flexible selectivity functions. ICES Journal of Marine Science, 66: 763–771.

Armstrong M. J., Connolly P., Nash R. D. M., Pawson M. G., Alesworth E., Coulahan P. J., Dickey-Collas M., Milligan S. P., O'Neill M., Witthames P. R. and Woolner L. 2001. An application of the annual egg production method to estimate spawning biomass of cod (*Gadus morhua* L.), plaice (*Pleuronectes platessa* L.) and sole (*Solea solea* L.) in the Irish Sea. ICES Journal of Marine Science, 58, 183–203.

BIM. 2009. Summary report of Gear Trials to Support Ireland's Submission under Articles 11 & 13 of Reg. 1342/2008. *Nephrops* Fisheries VIIa & VIIb–k. Project 09.SM. T1.01. Bord Iascaigh Mhara (BIM) May 2009.

Cambiè and Earl. 2017. Review of the UK (E&W)-BTS-Q3 abundance index for Irish Sea plaice (ple-iris, plaice 7a) Working Document for Working Group on Celtic Seas Ecoregion (WGCSE), 9–18 May, Copenhagen, Denmark. ICES CM 2017/ACOM:13.

ICES. 2004. Report of the Working Group on the assessment of Northern Shelf Demersal Stocks (WGNSDS). ICES Document CM 2005/ACFM: 01. 722 pp.

ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1–8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39.

ICES. 2016. Report of the Working Group on Celtic Seas Ecoregion (WGCSE). 4–13 May, Copenhagen, Denmark ICES CM 2016/ACOM:13.

ICES. 2017. Report of the Benchmark Workshop on the Irish Sea Ecosystem (WKIrish3), 30 January–3 February, Galway, Ireland. ICES CM 2017/BSG:01.

ICES. 2018. ICES Special Request Advice Celtic Seas Ecoregion. EU request to ICES to provide plausible and updated FMSY ranges for the stocks of species inhabiting western EU waters. https://doi.org/10.17895/ices.pub.4149.

Nielsen, A., and Berg, C.W. 2014. Estimation of time-varying selectivity in stock assessments using state–space models. Fisheries Research, 158: 96–101.

Table 22.1. Plaice in Division 7.a. History of official landings and ICES estimates of discards. Weights are in tonnes.

Year	Belgium	France	Ireland	Netherlands	UK (NI, Eng.&Wales)	UK (Isle of Man)	UK (Scotland)	Total official landings	Discards
1994	332	13	547	-	1082	14	63	2051	
1995	327	10	557	-	1050	20	60	2024	
1996	344	11	538	69	878	16	18	1874	
1997	459	8	543	110	798	11	25	1954	
1998	327	8	730	27	679	14	18	1803	
1999	275	5	541	30	687	5	23	1566	
2000	325	14	420	47	610	6	21	1443	
2001	482	9	378	-	607	1	11	1488	
2002	636	8	370	-	569	1	7	1591	
2003	628	7	490	-	409	1	9	1544	
2004	431	2	328	-	369	0	4	1134	1031
2005	566	9	272	-	422	0	1	1270	1210
2006	343	2	179	0	413	0	0	937	1254
2007	194	2	194	0	412	0	-	802	1744
2008	157	2	102	0	300	1	1	563	1268
2009	197	0	73	0	184	1	2	457	1132
2010	138	0	89	0	147	0	3	377	2561
2011	332	0	118	0	146	0	0	596	603
2012	236	0	107	0	164	0	0	507	1010
2013	144	0	103	0	92	0	0	339	725
2014	100	0	123	0	59	0	0	282	943
2015	115	0	244	0	80	0	0	439	572
2016	82	0	541	-	56	-	-	679	437
2017	77	0	446	-	62	1	-	585	852
2018	53	0	316	-	66	-	-	435	395
2019	168	0	[c]	-	57	0	-	255[c]	537
2020	84	-	177	-	70	1	-	332	271
2021	103	0	107	-	70	1	-	279	392
2022*	101	0	43	-	35	0	0	179	484
2023*	109	0	22	-	25	0	0	156	383

*** Preliminary.**

[c] Incomplete/missing due to part of the data being unavailable under national GDPR clauses.

Table 22.2. Irish Sea plaice: English standardised LPUE and effort, Belgian beam trawl LPUE and effort and Irish otter trawl LPUE and effort series.

Year	CPUE			LPUE							Effort							
	UK(E&W) Beam trawl survey[1]			UK (E&W)[2]				Belgian[5]	Irish[7]		UK (E&W)					Belgian	Irish[9]	
	March	September Prime only	September Extended	Otter[3] Trawl	Otter[4] Trawl	Beam[3] Trawl	Beam[4] Trawl	Beam Trawl	Otter Trawl	Beam Trawl	Otter[3] Trawl	Otter[4] Trawl	Beam Trawl	Beam[4] Trawl	Nephrops[3] Trawl	Beam Trawl	Otter Trawl	Beam Trawl
1972				6.96				9.8			128.4					6.8		
1973				6.33				9.0			147.6					16.5		
1974				7.45				10.4			115.2					14.2		
1975				7.71				10.7			130.7					16.2		
1976				5.03				5.8			122.3					15.1		
1977				4.82				5.3			101.9					13.4		
1978				6.77		4.88		6.9			89.1		0.9			12.0		
1979				7.18		15.23		8.0			89.9		1.7			13.7		
1980				8.24		8.98		8.6			107.0		4.3			20.8		
1981				6.87		4.91		7.1			107.1		6.4			26.7		
1982				4.92		1.77		4.4			127.2		5.5			21.3		
1983				5.32	1021	3.08	0	7.8			88.1	1716.5	2.8	0		18.5		
1984				7.77	1472	6.98	810	6.8			103.1	7932.1	4.1	263		13.6		
1985				9.97	1946	25.70	5487	8.8			102.9	6930.8	7.4	428.1		21.9		
1986				9.27	1597	4.21	753	8.7			90.3	6693.2	17.0	1122.9		38.3		
1987				7.20	1479	3.57	963	8.2			130.6	9008.9	22.0	1178.5		43.2		
1988		392		5.02	1060	3.05	743	6.3			132.0	8292.4	18.6	1019.2		32.7		
1989		253		5.51	1109	13.59	2559	6.2			139.5	16161.4	25.3	1344.5		36.7		
1990		239		5.93	1074	12.02	3011	7.2			117.1	7724.5	31.0	1473.1		38.3		
1991		157		4.79	916	10.56	2807	7.5			107.3	7081.1	25.8	1211.3		15.4		
1992		188		4.20	719	9.99	2303	11.9			96.8	6671.8	23.4	908.1		23.0		
1993	91	235	149	3.97	667	9.50	2220	5.0			78.9	6013.1	21.5	826.9		24.4		
1994	128	225	132	4.90	770	7.79	1020	9.2			43.0	3060	20.1	1451.6	0	31.6		
1995	134	169	109	5.08	806	7.69	1001	9.5	3.2	17.3	43.1	3357	20.9	1429.4	0	27.1	80.1	8.5
1996	-[6]	210	111	5.37	732	12.96	2587	11.8	4.1	19.0	42.2	3085.1	13.3	894.3	0	22.2	64.7	6.2
1997	147	262	148	5.25	662	7.66	944	13.9	3.1	13.7	39.9	2903.3	10.8	784.4	0	29.3	92.0	9.9
1998	113	249	146	5.00	657	5.66	766	12.3	3.7	22.3	36.9	2620.6	10.4	696	0	23.8	93.5	11.5
1999	-[6]	264	151	5.38	632	7.76	895	7.1	2.3	23.2	22.9	1803.5	11.0	778.9	0	37.2	109.7	14.7
2000	-[6]	357	169	5.02	828	13.04	1773	7.8	2.0	13.8	27.0	2034.9	6.3	410.7	0	27.0	82.6	11.4
2001		281	147	3.35	539	8.33	1017	9.2	2.9	14.0	33.0	2352.9	12.5	767.4	0	41.9	77.4	13.1
2002		340	200	5.66	840	5.46	445	7.4	2.8	7.9	24.8	1774	8.0	535.1	0	52.5	77.4	17.7
2003		503	247	2.60	414	3.76	400	7.5	4.1	9.5	23.9	1728.3	14.0	863.7	0	48.7	73.8	18.6
2004		540	249	3.17	472	4.20	255	11.2	2.1	8.6	23.5	1727	7.4	419.9	0	36.1	72.5	14.2
2005		367	177	4.85	540	4.67	381	12.8	2.0	8.0	16.7	1313.6	11.6	627.8	1	42.1	69	14.7
2006		356	166	6.50	610	2.19	202	10.8	1.4	6.2	5.2	478.5	4.6	280.1	10.9	28.9	66.8	12.2
2007		432	190	17.94	756	4.22	550	6.9	1.3	6.1	4.4	397.2	3.2	193.5	12.6	23.8	75.9	14.2
2008		416	189	9.03	469	4.47	267	9.5	0.9	5.1	2.7	320.4	1.3	98	11.5	12.4	59.9	9.5
2009		467	199	6.46	338	1.21	169	10.1	1.1	3.8	1.5	157.7	0.46	24.9	10.0	14.7	42.8	7.6
2010		400	164	11.55	371	14.39	151	7.9	1.0	4.8	1.0	151	0.19	10.2	9.2	15.2	45.8	9.4
2011		417	140	4.35	183	11.95	701	17.3	1.2	6.8	0.69	72.7	1.56	91.2	8.6	16.4	54.5	8.1
2012		460	188	0.74	276	7.25	164	14.9	1.0	5.0	0.4	85	0.9	60.7	12.1	14.5	58.3	7.2
2013		550	207	7.41	236	-[8]	0	14.0	1.6	5.4	0.3	31.9	-[8]	1.3	10.6	8.9	42.6	5.0
2014		592	255	-	87	-[8]	0	13.9	1.5	8.3	-	16.1	-[8]	0.4	8.3	5.1	47.8	6.0
2015		564	230	-	0	-[8]	48	20.4	3.3	8.6	-	0	-[8]	0.9	4.5	4.6	39.8	8.3
2016		582	220	-	0	-[8]	0	26.4	4.6	32.8	-	0	-[8]	3.9	2.5	2.5	33.4	7.9
2017		525	170	-	244	-[8]	0	17.1	11.3	35.4	-	160.7	-[8]	0	0.3	4.2	12.1	7.5
2018		554	139	-	237	-[8]	0	14.6	8.4	19.5	-	238	-[8]	0	-	3.5	13.6	9.6
2020		-	-	-	1239	-[8]	277	5.9	4.5	10.6	-	73	-[8]	199	-	13.6	13.3	10.4
2021		265	-	-	852	-[8]	203	6.4	1.4	9.6	-	194	-[8]	223	-	14.8	13.2	8.9
2022		250	-	-	274	-[8]	104	5.0	0.8	5.3	-	133	-[8]	118	-	18.9	13.0	6.0
2023		197	-	-	150	-[8]	60	6.1	0.9	2.3	-	218	-[8]	128	-	17.0	9.3	5.5

[1] Kg/100km. Sept Prime: ISS/ISN Traditional Prime Stations Only. Sept Extended: ISS/ISN/ISW/SGC All Stations.

[2] Whole weight (kg) per corrected hour fished, weighted by area

[3] '000 hours fished (corrected for fishing power GRT)

[4] days fished

[5] Corrected for fishing power (HP) [data for 1999-2010, replaced at 2011WG following recalculation at WKFLAT 2011]

[6] Carhelmar survey, Kg/100km not available

[7] All years updated in 2007 due to slight historical differences

[8] Effort not reported in hours for this fleet, see Section 6.7.2 for more detail

[9] '000s hours

Fishing power corrections are detailed in Appendix 2 of the 2000 working group report

Table 22.3a. Irish Sea plaice: NIGFS-WIBTS-Q1 indices of relative biomass trends by region in spring.

NIGFS-WIBTS-Q1	ESTIMATED MEAN ABUNDANCE (kg/3 miles)			ESTIMATED STANDARD ERROR		
Mar (Spring)	Combined	West	East	Combined	West	East
Year	Str 1–7	Str 1–3	Str 4–7	Str 1–7	Str 1–3	Str 4–7
1992	8.35	5.47	9.20	3.45	1.96	4.44
1993	12.36	18.43	10.54	2.14	4.78	2.39
1994	9.65	4.47	11.09	2.43	1.46	3.12
1995	7.27	4.79	7.64	1.24	0.83	1.59
1996	7.29	12.60	5.70	1.64	5.71	1.28
1997	13.87	14.72	13.54	3.19	5.68	3.77
1998	10.40	13.32	9.00	2.73	7.10	2.84
1999	10.71	13.53	9.59	1.81	4.92	1.84
2000	12.92	26.29	8.88	4.11	17.00	1.66
2001	12.06	18.03	9.92	1.41	4.25	1.31
2002	15.27	27.95	11.17	2.53	8.39	2.14
2003	20.97	40.71	15.09	6.11	23.98	3.44
2004	8.55	5.69	9.40	1.74	1.21	2.24
2005	11.10	19.43	8.62	1.93	5.99	1.76
2006	7.85	12.14	6.39	1.39	4.62	1.16
2007	6.25	14.47	3.80	1.27	4.80	0.83
2008	4.46	5.11	4.57	0.76	1.23	0.91
2009	7.90	7.85	7.86	1.27	2.04	1.53
2010	19.40	8.77	17.30	1.86	2.70	2.28
2011	16.34	26.20	13.03	3.51	10.11	3.41
2012	14.22	21.47	11.05	2.37	7.48	2.13
2013	21.89	28.98	16.57	3.74	8.04	4.21
2014	11.43	10.96	9.65	2.04	4.82	2.22
2015	22.81	22.57	18.66	2.84	7.18	3.01
2016	34.52	30.29	35.77	7.17	9.95	8.82
2017	16.10	14.85	16.47	3.16	3.90	3.70
2018	19.26	22.86	18.18	4.11	10.19	4.39
2019	16.42	19.83	15.40	3.41	6.18	4.03
2020	17.69	12.84	19.13	3.47	3.79	4.36
2021	13.25	11.27	13.85	2.91	4.91	3.48
2022	13.17	16.61	12.15	2.90	8.39	2.81
2023	10.44	7.68	11.26	1.96	2.40	2.44

Table 22.3b. Irish Sea plaice: NIGFS-WIBTS-Q4 indices of relative biomass trends by region in autumn.

NIGFS-WIBTS-Q4	ESTIMATED MEAN ABUNDANCE (kg/3 miles)			ESTIMATED STANDARD ERROR		
Oct (Autumn)	Combined	West	East	Combined	West	East
Year	Str 1–7	Str 1–3	Str 4–7	Str 1–7	Str 1–3	Str 4–7
1992	4.81	2.31	5.55	0.92	1.10	1.15
1993	4.48	2.08	5.20	1.00	0.87	1.27
1994	8.73	5.49	9.69	2.30	2.83	2.86
1995	4.17	5.50	3.77	1.13	2.23	1.31
1996	8.68	8.85	8.63	2.25	5.94	2.33
1997	7.93	5.76	8.58	2.24	2.59	2.80
1998	5.33	3.68	5.82	1.46	2.48	1.74
1999	5.81	4.30	6.26	1.67	3.08	1.97
2000	9.75	2.20	12.00	5.76	1.13	7.47
2001	13.85	2.30	17.30	6.57	1.67	8.51
2002	9.80	5.90	10.97	3.91	3.61	4.97
2003	18.01	7.52	21.14	5.84	4.16	7.48
2004	7.79	1.64	9.63	1.80	0.81	2.33
2005	11.35	3.41	13.72	4.51	2.18	5.82
2006	6.61	2.56	7.82	1.53	1.42	1.94
2007	7.15	4.07	8.07	1.41	2.00	1.73
2008	8.68	3.28	10.27	2.20	2.09	2.78
2009	12.44	4.06	15.01	2.59	3.12	3.23
2010	15.58	5.83	18.53	5.26	5.21	6.65
2011	14.48	5.39	15.94	3.55	2.66	4.55
2012	16.05	17.89	15.65	4.43	11.16	4.68
2013	17.90	13.55	19.09	4.33	11.27	4.51
2014	22.18	27.67	20.35	7.61	24.88	6.52
2015	18.21	11.15	20.31	4.39	8.76	5.06
2016	17.57	0.95	22.53	4.52	0.43	5.86
2017	18.55	2.96	23.20	4.25	1.59	5.50
2018	21.62	20.66	21.90	5.57	18.24	4.77
2019	16.63	9.50	18.76	4.06	6.89	4.86
2020	18.07	3.39	22.45	4.09	1.98	5.29
2021	14.34	4.06	17.41	3.31	2.08	4.25
2022	8.42	2.20	10.28	1.90	0.97	2.46
2023	5.39	2.62	6.22	1.12	1.50	1.39

Table 22.4. Irish Sea plaice: UK (E&W)-BTS-Q3 biomass index (extended area). Ages in bold are those used in the assessment (ages 1–7).

Year	Distance towed (kms)	0	1	2	3	4	5	6	7	8	9+
1993	292.77	0.13	4.64	4.03	0.82	0.43	0.03	0.04	0.08	0.01	0.02
1994	218.65	0.33	4.13	2.48	1.42	0.28	0.10	0.03	0.02	0.03	0.04
1995	218.65	0.78	5.56	1.96	0.84	0.41	0.07	0.05	0.02	0.00	0.03
1996	222.36	0.26	5.79	2.17	0.53	0.19	0.20	0.05	0.02	0.00	0.02
1997	218.65	0.96	5.47	2.91	1.26	0.30	0.16	0.17	0.05	0.02	0.03
1998	218.65	0.56	4.50	4.26	1.09	0.38	0.21	0.08	0.06	0.01	0.04
1999	214.95	1.86	3.96	3.91	1.99	0.68	0.29	0.09	0.07	0.03	0.05
2000	218.65	1.22	8.74	2.80	1.47	1.11	0.47	0.12	0.09	0.03	0.04
2001	214.95	0.83	5.99	3.62	1.11	0.60	0.54	0.11	0.06	0.02	0.01
2002	214.95	0.23	6.46	4.94	2.27	0.88	0.53	0.48	0.10	0.04	0.04
2003	211.24	2.07	6.12	5.85	2.61	1.58	0.58	0.38	0.25	0.07	0.07
2004	214.95	1.09	8.07	5.36	3.94	1.88	1.15	0.21	0.19	0.13	0.10
2005	211.24	1.75	3.76	4.75	1.98	1.42	0.80	0.48	0.11	0.09	0.06
2006	214.95	3.56	5.01	3.45	2.46	1.10	0.79	0.36	0.20	0.02	0.07
2007	214.95	1.15	7.97	4.47	1.66	1.20	0.65	0.33	0.25	0.14	0.06
2008	200.12	1.22	4.68	5.71	2.03	1.15	0.82	0.31	0.12	0.08	0.05
2009	214.95	1.23	4.74	3.40	3.30	0.99	0.66	0.63	0.16	0.11	0.20
2010	211.24	2.01	6.22	4.31	2.05	1.44	0.66	0.54	0.36	0.20	0.19
2011	211.24	1.02	6.73	4.28	1.75	1.00	1.08	0.47	0.27	0.24	0.37
2012	214.95	1.40	6.52	6.37	1.71	1.03	0.47	0.53	0.30	0.14	0.42
2013	214.95	2.04	4.33	5.05	3.08	1.60	1.07	0.47	0.44	0.20	0.42
2014	214.95	1.56	7.82	6.85	3.13	2.16	0.99	0.77	0.44	0.20	0.28
2015	214.95	1.02	6.16	6.88	2.60	1.80	1.04	0.66	0.37	0.19	0.50
2016	211.24	0.18	2.91	5.97	3.95	2.45	1.61	0.96	0.74	0.45	0.58
2017	214.95	0.03	1.35	4.77	2.81	2.23	1.84	0.75	0.59	0.38	0.26
2018	214.95	0.36	1.97	2.75	2.28	1.51	1.37	1.24	0.75	0.56	0.27
2019	214.95	0.33	3.02	4.50	2.31	1.48	1.22	1.00	0.90	0.41	0.20
2020	0	-	-	-	-	-	-	-	-	-	-
2021	214.95	0.23	1.77	2.50	1.49	0.72	0.55	0.44	0.28	0.23	0.06
2022	174.18	0.36	3.86	2.66	1.09	0.97	0.35	0.38	0.22	0.14	0.27
2023	214.94	0.31	2.85	2.94	1.04	0.43	0.35	0.21	0.19	0.13	0.17
Year	Distance towed (kms)	0	1	2	3	4	5	6	7	8	9+

Table 22.5. Irish Sea plaice: Landings number-at-age 1 to 8+ (thousands), where rows are years 1981–2023 and columns are ages 1 to 8+.

IRISH SEA PLAICE
1 2
1981 2023
1 8
1

22	1742	5939	2984	837	222	105	236
27	715	3288	3082	1358	330	137	213
51	2924	2494	3211	1521	648	211	252
41	3159	5179	1182	1054	459	299	252
4	2357	6152	3301	614	429	262	340
31	1652	5280	2942	1287	344	371	308
62	3717	5317	5252	1341	1072	123	338
46	2923	5040	2552	1400	750	316	405
24	1735	5945	2671	854	436	214	364
15	1019	2715	2935	1132	465	259	223
180	2008	1506	1929	1205	465	182	226
151	1958	3209	1435	1358	903	388	294
28	910	1649	1357	474	556	377	302
97	1146	2173	1309	644	318	245	263
21	961	1703	1936	764	318	138	157
37	856	1345	1196	943	370	128	135
28	830	1590	1513	1003	482	285	257
6	691	1739	1025	612	476	403	385
68	803	1505	1294	696	280	196	242
0	450	1174	1284	686	212	219	203
14	374	1138	1083	767	409	179	166
1	206	940	1482	842	539	318	170
0	286	1031	1314	707	415	253	222
8	198	967	1104	705	247	114	186
6	228	708	1177	890	461	204	213
5	180	620	550	684	346	220	218
0	64	351	860	507	401	151	164
1	99	386	389	409	215	141	119
0	13	204	374	351	272	117	120
0	7	75	271	306	193	160	115
2	53	199	357	483	305	194	191
0	8	150	292	301	367	218	226
1	16	87	203	166	149	144	165
3	6	65	165	160	143	70	158
0	1	43	93	185	210	149	349
14	14	58	162	224	346	180	482
0	4	24	145	206	241	209	520
0	6	84	110	201	178	151	358
0	11	53	145	273	219	187	356
2	17	24	118	192	168	150	287
0	30	80	146	154	106	127	199
0	6	21	81	91	89	76	147
2	26	82	117	101	93	62	78

Table 22.6. Irish Sea plaice: Landings weight-at-age 1 to 8+ (kg), where rows are years 1981–2023 and columns are ages 1 to 8+,

IRISH SEA PLAICE
1 3
1981 2023
1 8
1

0.069	0.176	0.267	0.376	0.512	0.592	0.678	1.085
0.201	0.274	0.284	0.348	0.421	0.545	0.650	0.889
0.232	0.261	0.290	0.319	0.368	0.426	0.484	0.699
0.260	0.290	0.330	0.380	0.470	0.560	0.660	0.964
0.290	0.310	0.340	0.390	0.470	0.540	0.630	0.851
0.270	0.280	0.340	0.420	0.500	0.540	0.630	0.980
0.260	0.290	0.315	0.370	0.440	0.520	0.610	0.916
0.230	0.260	0.300	0.370	0.460	0.550	0.680	1.243
0.227	0.272	0.321	0.374	0.430	0.491	0.555	0.761
0.200	0.257	0.316	0.376	0.439	0.504	0.570	0.747
0.247	0.267	0.295	0.332	0.377	0.431	0.494	0.652
0.169	0.218	0.274	0.337	0.407	0.484	0.568	0.799
0.260	0.270	0.292	0.328	0.375	0.436	0.508	0.690
0.156	0.207	0.268	0.338	0.416	0.504	0.600	0.816
0.189	0.224	0.262	0.329	0.353	0.406	0.461	0.699
0.204	0.223	0.270	0.333	0.398	0.493	0.584	0.837
0.205	0.233	0.241	0.286	0.354	0.410	0.510	0.620
0.185	0.226	0.249	0.316	0.353	0.410	0.468	0.655
0.205	0.236	0.250	0.300	0.375	0.457	0.483	0.615
0.000	0.259	0.270	0.307	0.337	0.429	0.437	0.623
0.232	0.233	0.271	0.334	0.396	0.439	0.571	0.764
0.228	0.271	0.267	0.308	0.386	0.476	0.518	0.673
0.000	0.235	0.289	0.335	0.383	0.458	0.567	0.678
0.214	0.239	0.258	0.297	0.347	0.416	0.543	0.571
0.235	0.245	0.265	0.292	0.322	0.394	0.441	0.632
0.200	0.256	0.265	0.282	0.321	0.378	0.425	0.568
0.000	0.280	0.266	0.281	0.320	0.371	0.416	0.481
0.246	0.228	0.257	0.281	0.311	0.364	0.431	0.553
0.000	0.257	0.256	0.265	0.305	0.330	0.395	0.482
0.000	0.260	0.265	0.282	0.301	0.356	0.392	0.492
0.236	0.251	0.257	0.283	0.298	0.354	0.404	0.513
0.117	0.259	0.254	0.281	0.299	0.318	0.345	0.430
0.249	0.245	0.249	0.267	0.297	0.330	0.386	0.417
0.181	0.250	0.282	0.300	0.336	0.373	0.457	0.492
NA	0.183	0.264	0.287	0.299	0.340	0.403	0.617
0.113	0.149	0.229	0.318	0.422	0.362	0.433	0.660
0.166	0.222	0.273	0.345	0.370	0.405	0.442	0. 505
0.000	0.292	0.327	0.353	0.345	0.398	0.399	0.465
0.108	0.251	0.270	0.283	0.288	0.350	0.379	0.509
0.107	0.130	0.190	0.280	0.331	0.360	0.363	0.390
0	0.253	0.281	0.295	0.299	0.342	0.343	0.388
0.072	0.211	0.247	0.285	0.306	0.351	0.362	0.429
0.200	0.234	0.245	0.258	0.272	0.274	0.296	0.355

Table 22.7. Irish Sea plaice: Discards weight-at-age 1 to 8+ (kg), where rows are years 1981–2023 and columns are ages 1 to 8+.

IRISH SEA PLAICE

1 23

1981 2023

1 8

1

0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.087	0.105	0.130	0.153	0.170	0.231	0.318	0.211
0.057	0.115	0.145	0.164	0.211	0.290	0.238	0.210
0.099	0.117	0.134	0.179	0.178	0.277	0.644	0.356
0.141	0.113	0.141	0.145	0.162	0.210	0.274	0.077
0.044	0.081	0.113	0.140	0.150	0.205	0.219	0.243
0.096	0.097	0.116	0.135	0.151	0.173	0.217	0.170
0.033	0.080	0.119	0.147	0.165	0.196	0.232	0.276
0.083	0.101	0.138	0.183	0.201	0.140	0.194	0.225
0.077	0.098	0.116	0.141	0.157	0.168	0.164	0.176
0.026	0.038	0.081	0.119	0.162	0.200	0.157	0.182
0.064	0.069	0.094	0.116	0.144	0.157	0.181	0.181
0.056	0.067	0.084	0.120	0.128	0.150	0.152	0.153
0.088	0.059	0.079	0.101	0.095	0.126	0.152	0.136
0.136	0.103	0.109	0.120	0.146	0.161	0.155	0.170
0.093	0. 080	0. 118	0. 124	0. 128	0. 153	0. 137	0. 157
0.022	0.053	0.075	0.109	0.142	0.143	0.146	0.202
0.054	0.062	0.082	0.104	0.127	0.136	0.167	0.149
0.513	0.081	0.103	0.121	0.133	0.150	0.157	0.151
0.040	0.095	0.121	0.1387	0.167	0.172	0.204	0.258
0.048	0.079	0.102	0.121	0.143	0.153	0.176	0.186
0.067	0.091	0.113	0.132	0.139	0.140	0.137	0.126

Table 22.8. Irish Sea plaice: New stock weights-at-age modified to include discard element (kg), where rows are years 1981–2023 and columns are ages 1 to 8+.

IRISH SEA PLAICE
1 4
1981 2023
1 8
1

0.087	0.124	0.190	0.351	0.509	0.592	0.678	1.085
0.091	0.141	0.210	0.327	0.418	0.545	0.650	0.889
0.097	0.173	0.231	0.303	0.366	0.426	0.484	0.699
0.100	0.196	0.275	0.362	0.467	0.560	0.660	0.964
0.089	0.203	0.293	0.374	0.468	0.540	0.630	0.851
0.098	0.171	0.292	0.401	0.497	0.540	0.630	0.980
0.102	0.208	0.266	0.353	0.437	0.519	0.610	0.916
0.104	0.171	0.250	0.351	0.456	0.549	0.680	1.243
0.100	0.183	0.261	0.352	0.425	0.490	0.555	0.761
0.090	0.172	0.253	0.349	0.431	0.502	0.570	0.747
0.140	0.165	0.230	0.305	0.369	0.429	0.494	0.652
0.106	0.159	0.209	0.302	0.395	0.481	0.568	0.799
0.097	0.141	0.209	0.291	0.363	0.434	0.508	0.690
0.101	0.134	0.193	0.299	0.400	0.501	0.600	0.816
0.091	0.138	0.184	0.289	0.340	0.404	0.461	0.699
0.091	0.130	0.181	0.286	0.377	0.488	0.583	0.837
0.091	0.118	0.168	0.247	0.335	0.406	0.509	0.620
0.088	0.116	0.148	0.223	0.305	0.399	0.466	0.655
0.100	0.125	0.150	0.216	0.321	0.444	0.480	0.615
NA	0.121	0.157	0.222	0.300	0.420	0.436	0.623
0.091	0.119	0.161	0.239	0.352	0.431	0.569	0.764
0.088	0.114	0.161	0.228	0.347	0.467	0.517	0.673
NA	0.115	0.165	0.234	0.335	0.448	0.566	0.678
0.070	0.131	0.169	0.217	0.304	0.407	0.540	0.570
0.103	0.127	0.161	0.238	0.234	0.377	0.454	0.602
0.141	0.122	0.162	0.175	0.256	0.323	0.417	0.564
0.044	0.084	0.123	0.167	0.209	0.290	0.335	0.377
0.096	0.100	0.131	0.168	0.204	0.279	0.397	0.285
0.033	0.081	0.125	0.173	0.213	0.266	0.333	0.413
0.083	0.101	0.140	0.191	0.211	0.190	0.226	0.290
0.078	0.104	0.137	0.182	0.221	0.271	0.334	0.364
0.026	0.038	0.088	0.142	0.199	0.246	0.232	0.294
0.065	0.071	0.098	0.133	0.185	0.240	0.292	0.363
0.056	0.068	0.089	0.135	0.153	0.194	0.214	0.296
0.088	0.060	0.083	0.115	0.130	0.163	0.269	0.515
0.133	0.105	0.117	0.152	0.240	0.259	0.307	0.522
0. 093	0. 081	0. 121	0. 145	0. 163	0.198	0.223	0. 303
0.022	0.054	0.098	0.138	0.199	0.253	0.269	0.39
0.054	0.062	0.088	0.127	0.180	0.218	0.304	0.427
0.063	0.084	0.106	0.151	0.198	0.240	0.269	0.298
0.040	0.1	0.131	0.170	0.227	0.236	0.289	0.381
0.048	0.080	0.105	0.138	0.168	0.191	0.212	0.311
0.069	0.095	0.125	0.149	0.177	0.183	0.202	0.210

Table 22.9. Irish Sea plaice: Estimated landed numbers-at-age (thousands).

year\age	1	2	3	4	5	6	7	8	total
1981	22	1742	5939	2984	837	222	105	236	12087
1982	27	715	3288	3082	1358	330	137	213	9150
1983	51	2924	2494	3211	1521	648	211	252	11312
1984	41	3159	5179	1182	1054	459	299	252	11625
1985	4	2357	6152	3301	614	429	262	340	13459
1986	31	1652	5280	2942	1287	344	371	308	12215
1987	62	3717	5317	5252	1341	1072	123	338	17222
1988	46	2923	5040	2552	1400	750	316	405	13432
1989	24	1735	5945	2671	854	436	214	364	12243
1990	15	1019	2715	2935	1132	465	259	223	8763
1991	180	2008	1506	1929	1205	465	182	226	7701
1992	151	1958	3209	1435	1358	903	388	294	9696
1993	28	910	1649	1357	474	556	377	302	5653
1994	97	1146	2173	1309	644	318	245	263	6195
1995	21	961	1703	1936	764	318	138	157	5998
1996	37	856	1345	1196	943	370	128	135	5011
1997	28	830	1590	1513	1003	482	285	257	5988
1998	6	691	1739	1025	612	476	403	385	5336
1999	68	803	1505	1294	696	280	196	242	5083
2000	0	450	1174	1284	686	212	219	203	4228
2001	14	374	1138	1083	767	409	178	166	4130
2002	1	206	940	1482	842	539	318	170	4497
2003	0	286	1031	1314	707	415	253	222	4227
2004	8	198	967	1104	705	247	114	186	3529
2005	6	228	708	1177	890	461	204	213	3888
2006	5	180	620	550	684	346	220	218	2823
2007	0	64	351	860	507	401	151	164	2497
2008	1	99	386	389	409	215	141	119	1757
2009	0	13	204	374	351	272	117	120	1451
2010	0	7	75	271	306	193	160	115	1127
2011	2	53	199	357	483	305	194	191	1785
2012	0	8	150	292	301	367	218	226	1561
2013	1	16	87	203	166	149	144	165	931
2014	3	6	65	165	160	143	70	158	772
2015	0	1	43	93	185	210	149	349	1030
2016	14	14	58	162	224	346	180	482	1479
2017	0	4	24	145	206	241	209	519	1348
2018	0	6	84	109	201	178	151	358	1087
2019	0	11	53	145	273	219	187	356	1245

year\age	1	2	3	4	5	6	7	8	total
2020	2	17	24	118	192	168	150	287	959
2021	0	30	80	146	154	106	127	199	842
2022	0	6	21	81	91	89	76	147	512
2023	2	26	82	117	101	93	62	78	561

Table 22.10. Irish Sea plaice: Estimated discarded numbers-at-age (thousands). All discards are included (dead and alive portions).

year\age	1	2	3	4	5	6	7	8	total
1981	451	4589	7613	377	7	0	0	0	13037
1982	765	2570	3062	375	14	0	0	0	6786
1983	724	3771	1457	346	18	1	0	0	6316
1984	532	3218	1970	102	11	1	0	0	5834
1985	508	2572	1781	232	5	1	0	0	5098
1986	495	2707	1572	228	12	1	0	0	5015
1987	668	2962	1917	446	14	2	0	0	6010
1988	360	3903	2081	249	21	2	0	0	6615
1989	240	1987	2710	290	17	2	0	0	5246
1990	604	1278	1398	403	34	3	0	0	3719
1991	364	3363	980	348	50	4	0	0	5109
1992	528	2124	2661	342	75	9	1	0	5740
1993	460	3187	1726	358	29	6	1	0	5767
1994	406	2849	2606	353	45	4	0	0	6265
1995	507	2502	2423	561	59	4	0	0	6057
1996	1205	3086	2329	417	94	7	0	0	7138
1997	935	7406	3079	619	116	11	1	0	12166
1998	686	6642	9665	1364	215	31	6	0	18609
1999	582	4459	7451	1734	247	18	4	0	14495
2000	0	3763	4922	1558	193	10	3	0	10449
2001	513	2934	4078	1201	186	16	1	0	8931
2002	490	3399	3168	1558	188	21	1	0	8825
2003	0	3281	3685	1623	204	19	1	0	8813
2004	85	1381	3570	1679	324	19	1	0	7059

year\age	1	2	3	4	5	6	7	8	total
2005	198	2844	2793	1096	1392	78	14	26	8441
2006	854	2775	2964	1968	479	170	12	2	9224
2007	837	4704	4892	3568	947	381	104	127	15560
2008	831	4393	3188	1354	837	171	27	278	11079
2009	56	2862	4318	1318	677	251	71	60	9613
2010	980	4066	4113	3254	2853	638	836	359	17099
2011	540	1344	1134	888	589	245	79	151	4970
2012	219	4415	3492	1755	800	567	329	274	11851
2013	238	1610	3066	1633	450	163	122	49	7331
2014	1027	1886	2710	1843	1149	591	274	218	9697
2015	18	1348	1659	1104	896	997	170	93	6285
2016	101	300	858	831	430	364	149	189	3222
2017	45	529	1057	1376	1198	1118	530	723	6576
2018	321	1464	823	814	524	235	159	143	4482
2019	167	2147	1729	990	549	352	103	105	6142
2020	9	289	511	501	395	227	128	177	2237
2021	186	951	1112	577	184	175	82	10	3278
2022	208	1017	959	709	486	380	319	138	4217
2023	127	987	857	733	246	194	89	135	3368

Table 22.11. Irish Sea plaice: Estimated population numbers-at-age (thousands).

year\age	1	2	3	4	5	6	7	8	total
1981	17134	19755	17881	7228	2021	692	330	766	65808
1982	22045	12723	13191	7773	3291	1011	394	661	61089
1983	23433	20362	7904	6404	3343	1671	571	647	64336
1984	22541	21040	14262	3366	2758	1502	890	707	67067
1985	21008	20127	14603	7269	1550	1428	815	947	67748
1986	21296	17664	14697	7025	3503	789	842	1005	66819
1987	20551	19477	12272	7586	3140	1841	403	1053	66323
1988	15697	19957	13096	5349	2982	1411	878	823	60194
1989	12948	13443	14566	5987	2184	1292	652	893	51966
1990	15893	9387	9149	7475	2760	1080	679	800	47223
1991	16326	14430	5588	4587	3689	1387	562	797	47366
1992	17647	12835	9720	2464	2139	2076	775	763	48419
1993	16044	16435	7653	4254	845	886	1153	796	48066
1994	15304	12328	11739	3534	1685	513	454	988	46544
1995	17949	10742	7552	5577	1533	815	296	744	45208
1996	21853	13433	6668	3455	2958	960	429	638	50394
1997	22492	17530	9810	3902	2125	1920	726	759	59264
1998	19745	20631	11975	4836	2288	1299	1155	1013	62943
1999	19026	16950	15447	6521	2683	1374	925	1306	64232
2000	24230	14553	11793	9520	3810	1512	1084	1444	67945
2001	24342	18602	10483	6980	5965	2085	1005	1653	71115
2002	24998	20803	15144	7349	4979	4465	1601	1816	81155
2003	22561	22550	16847	11531	4726	3630	3152	2434	87432
2004	21139	17861	18054	12034	7841	2707	2400	3395	85431
2005	18044	18591	13140	11199	7783	4958	1860	3629	79204
2006	22610	15082	14734	8777	6639	4518	3012	3384	78756
2007	26504	18551	12003	10733	5729	3890	3165	3980	84555
2008	21484	23247	13129	8540	7648	3564	2274	4661	84548
2009	17860	16478	18695	9142	6522	6313	2578	4695	82283

year\age	1	2	3	4	5	6	7	8	total
2010	23486	16169	12899	13442	7587	5487	5404	5569	90043
2011	27016	17408	11481	8323	9501	5630	4062	7706	91128
2012	24052	24921	14052	9561	6157	7239	4640	8843	99464
2013	23630	20467	19776	12141	8425	5377	5893	9536	105246
2014	27947	22145	17868	15617	10312	7526	5196	11717	118327
2015	17329	23965	17873	14144	11801	9258	5973	13786	114129
2016	14092	15600	19178	16128	12231	10411	8552	16015	112206
2017	10110	13433	13649	15489	14440	10203	8763	18706	104792
2018	12046	11034	11599	10981	11872	11504	8560	17729	95325
2019	10985	12380	10456	9606	9100	9673	9615	16670	88485
2020	8425	8805	8077	7382	7101	6619	7646	17189	71244
2021	10000	8159	7905	5692	5322	5089	4739	14016	60923
2022	12748	8940	6240	6021	3926	4223	3953	11732	57783
2023	11910	10973	6792	4432	3980	2910	3179	10772	54947

Table 22.12. Irish Sea plaice: Estimated fishing mortality-at-age.

year\age	1	2	3	4	5	6	7	8	F_{bar} (3-6)
1981	0.020	0.27	0.64	0.68	0.57	0.48	0.42	0.42	0.59
1982	0.020	0.27	0.62	0.67	0.57	0.48	0.42	0.42	0.59
1983	0.021	0.28	0.67	0.72	0.62	0.53	0.46	0.46	0.63
1984	0.0189	0.25	0.59	0.64	0.56	0.48	0.42	0.42	0.57
1985	0.0184	0.24	0.57	0.63	0.55	0.48	0.42	0.42	0.56
1986	0.0192	0.25	0.59	0.66	0.58	0.51	0.45	0.45	0.59
1987	0.023	0.30	0.70	0.78	0.68	0.60	0.52	0.52	0.69
1988	0.022	0.29	0.68	0.76	0.68	0.60	0.52	0.52	0.68
1989	0.020	0.26	0.60	0.67	0.59	0.53	0.46	0.46	0.60
1990	0.021	0.27	0.59	0.66	0.58	0.52	0.45	0.45	0.59
1991	0.022	0.28	0.61	0.67	0.59	0.51	0.44	0.44	0.59
1992	0.027	0.33	0.73	0.81	0.72	0.63	0.54	0.54	0.72
1993	0.024	0.30	0.64	0.71	0.65	0.56	0.48	0.48	0.64
1994	0.025	0.30	0.64	0.70	0.63	0.54	0.46	0.46	0.63
1995	0.025	0.29	0.61	0.64	0.57	0.48	0.41	0.41	0.58
1996	0.024	0.29	0.58	0.59	0.51	0.42	0.36	0.36	0.52
1997	0.025	0.29	0.57	0.58	0.49	0.41	0.34	0.34	0.51
1998	0.025	0.28	0.56	0.56	0.47	0.39	0.32	0.32	0.50
1999	0.0199	0.23	0.44	0.44	0.36	0.29	0.24	0.24	0.38
2000	0.0167	0.189	0.37	0.36	0.30	0.24	0.189	0.189	0.32
2001	0.0145	0.163	0.32	0.32	0.26	0.21	0.159	0.159	0.27
2002	0.0123	0.137	0.27	0.27	0.22	0.173	0.130	0.130	0.23
2003	0.0102	0.113	0.22	0.22	0.180	0.139	0.101	0.101	0.189
2004	0.0079	0.086	0.165	0.167	0.137	0.105	0.074	0.074	0.143
2005	0.0108	0.116	0.21	0.22	0.176	0.132	0.090	0.090	0.185
2006	0.0130	0.135	0.24	0.24	0.189	0.140	0.092	0.092	0.20
2007	0.0149	0.153	0.27	0.26	0.21	0.150	0.097	0.097	0.22
2008	0.0122	0.122	0.21	0.20	0.161	0.119	0.076	0.076	0.172
2009	0.0090	0.090	0.153	0.149	0.122	0.091	0.058	0.058	0.129

year\age	1	2	3	4	5	6	7	8	F_{bar} (3-6)
2010	0.0131	0.129	0.22	0.21	0.175	0.132	0.083	0.083	0.184
2011	0.0089	0.085	0.141	0.140	0.117	0.090	0.057	0.057	0.122
2012	0.0089	0.085	0.141	0.141	0.119	0.094	0.059	0.059	0.124
2013	0.0062	0.058	0.095	0.094	0.080	0.065	0.040	0.040	0.083
2014	0.0063	0.058	0.095	0.097	0.084	0.070	0.043	0.043	0.086
2015	0.0039	0.037	0.061	0.064	0.059	0.051	0.032	0.032	0.059
2016	0.0036	0.033	0.054	0.057	0.052	0.046	0.030	0.030	0.052
2017	0.0047	0.042	0.068	0.071	0.065	0.056	0.036	0.036	0.065
2018	0.0055	0.049	0.075	0.076	0.065	0.054	0.033	0.033	0.068
2019	0.0062	0.055	0.084	0.084	0.071	0.058	0.034	0.034	0.074
2020	0.0044	0.040	0.061	0.062	0.053	0.043	0.025	0.025	0.055
2021	0.0066	0.058	0.089	0.088	0.072	0.057	0.032	0.032	0.077
2022	0.0081	0.072	0.110	0.109	0.089	0.070	0.039	0.039	0.094
2023	0.0074	0.066	0.101	0.100	0.081	0.063	0.034	0.034	0.086

Table 22.13. Irish Sea plaice: SAM stock assessment summary ('High' and 'Low' refer to approximate 95% confidence intervals). Recruitment (000s), spawning–stock biomass (SSB, tonnes), mean fishing mortality (F_{bar}) for ages 3–6, total stock biomass (TSB, tonnes) and dead catch tonnage (the sum of landings and 60% of discards).

Year	Recruitment (thousands)			SSB (t)			F_{bar} (3–6)			TSB (t)			Dead catch (t)		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
1981	11328	17134	25917	5634	7091	8924	0.45	0.59	0.78	10440	12894	15924	3187	4393	6056
1982	15391	22045	31574	5488	6806	8442	0.45	0.59	0.76	10284	12473	15128	3096	4057	5316
1983	16493	23433	33292	5001	6105	7454	0.49	0.63	0.82	10639	12937	15732	3039	3899	5001
1984	15963	22541	31831	6296	7718	9462	0.44	0.57	0.73	12981	15853	19359	3528	4563	5903
1985	14921	21008	29578	6918	8488	10413	0.43	0.56	0.72	13599	16587	20232	3892	5055	6565
1986	15112	21296	30009	7411	9084	11136	0.46	0.59	0.75	13828	16720	20215	4173	5399	6985
1987	14526	20551	29074	7002	8513	10349	0.54	0.69	0.88	13658	16483	19892	4433	5696	7318
1988	11150	15697	22099	6544	7982	9737	0.53	0.68	0.87	12226	14735	17759	4027	5148	6581
1989	8995	12948	18638	5805	7121	8735	0.46	0.6	0.77	10682	12973	15755	3352	4356	5660
1990	11354	15893	22246	5278	6479	7954	0.46	0.59	0.75	9259	11158	13447	2907	3752	4844
1991	11740	16326	22703	4249	5172	6295	0.47	0.59	0.76	9044	10880	13088	2366	3004	3815
1992	12828	17647	24276	4278	5205	6333	0.57	0.72	0.91	8424	10109	12130	2687	3404	4313
1993	12065	16044	21334	3597	4390	5357	0.5	0.64	0.82	7602	9133	10971	2209	2792	3528
1994	11474	15304	20412	3742	4625	5718	0.49	0.63	0.8	7472	9022	10894	2288	2896	3667
1995	13487	17949	23886	3214	3984	4937	0.45	0.58	0.74	6651	8035	9706	1888	2389	3022
1996	16372	21853	29169	3441	4299	5370	0.41	0.52	0.68	7178	8703	10552	1825	2287	2865

Year	Recruitment (thousands)			SSB (t)			F_{bar} (3–6)			TSB (t)			Dead catch (t)		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
1997	16877	22492	29974	3684	4588	5714	0.4	0.51	0.66	7766	9420	11426	1966	2467	3097
1998	14827	19745	26295	3955	4961	6224	0.38	0.5	0.65	8044	9802	11944	2074	2612	3288
1999	14190	19026	25509	4575	5800	7353	0.29	0.38	0.51	9035	11091	13614	1972	2485	3132
2000	17790	24230	33000	5011	6421	8226	0.23	0.32	0.43	9302	11522	14271	1749	2226	2832
2001	18097	24342	32741	5953	7740	10064	0.199	0.27	0.38	10581	13232	16546	1741	2192	2760
2002	18495	24998	33787	7074	9280	12173	0.168	0.23	0.32	11957	15112	19100	1756	2202	2761
2003	16533	22561	30789	8444	11206	14870	0.134	0.189	0.27	13619	17448	22354	1717	2177	2760
2004	15572	21139	28697	8414	11193	14889	0.1	0.143	0.21	13199	17011	21925	1329	1701	2178
2005	13308	18044	24464	8105	10756	14273	0.131	0.185	0.26	12816	16381	20937	1559	1973	2496
2006	16800	22610	30428	7168	9544	12709	0.144	0.2	0.28	12473	15853	20149	1477	1859	2341
2007	19445	26504	36126	5912	7882	10509	0.157	0.22	0.31	8972	11516	14781	1277	1613	2039
2008	15954	21484	28932	5934	7892	10495	0.123	0.172	0.24	10270	13068	16627	1111	1395	1752
2009	13067	17860	24411	6752	9069	12180	0.091	0.129	0.182	9425	12258	15942	881	1124	1434
2010	17383	23486	31732	6916	9145	12093	0.13	0.184	0.26	10928	13924	17741	1273	1636	2103
2011	19873	27016	36727	8075	10963	14884	0.087	0.122	0.172	12160	15812	20560	942	1185	1492
2012	17788	24052	32521	6766	9247	12638	0.088	0.124	0.174	8784	11639	15422	750	945	1189
2013	17464	23630	31974	8226	11260	15413	0.059	0.083	0.118	11674	15359	20207	648	815	1027

Year	Recruitment (thousands)			SSB (t)			F_{bar} (3–6)			TSB (t)			Dead catch (t)		
	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High	Low	Mid	High
2014	19954	27947	39141	8358	11394	15533	0.061	0.086	0.122	11812	15523	20401	688	867	1092
2015	12634	17329	23769	10812	15194	21353	0.041	0.059	0.083	14065	19051	25805	549	698	887
2016	10390	14092	19113	15765	21801	30146	0.037	0.052	0.075	19994	26851	36058	736	931	1178
2017	7317	10110	13970	11966	16452	22620	0.046	0.065	0.092	14737	19765	26510	689	869	1097
2018	8833	12046	16428	12798	17773	24683	0.048	0.068	0.096	14383	19673	26908	680	860	1088
2019	8016	10985	15053	11744	16501	23184	0.052	0.074	0.106	13491	18573	25569	629	799	1014
2020	5841	8425	12152	9027	12643	17708	0.038	0.055	0.08	10668	14598	19978	372	478	615
2021	7341	10000	13623	7793	10947	15379	0.054	0.077	0.109	9382	12814	17501	457	577	730
2022	9200	12748	17663	5395	7665	10889	0.066	0.094	0.135	6884	9395	12823	388	493	626
2023	8140	11910	17427	4162	5850	8223	0.059	0.086	0.125	6082	8119	10838	318	408	523

Table 22.14 Short-term forecast. Annual catch options. Intermediate year assumptions.

Variable	Value	Notes
$F_{ages\ 3–6}$ (2024)	0.086	$F_{sq}=F_{average\ (2021-2023)}$
SSB (2025)	8134	Tonnes; Fishing at *status quo* (F_{sq}).
R_{age} 1 (2024 and 2025)	11910	Median resampled recruitment (2015–2023) as estimated by a stochastic projection; in thousands.
Total catch (2024)	674	Tonnes; Fishing at F_{sq} plus surviving discards.
Projected landings (2024)	217	Tonnes; Assuming average discard pattern (2021–2023).
Projected discards (2024)	457	Tonnes; Assuming average discard pattern (2021–2023).
Discard survival rate	40%	Catchpole *et al*. (2015).
Projected surviving discards (2024)	183	Tonnes; Assuming average discard pattern (2021–2023) where 40% of the discards survive.
Projected dead discards (2024)	274	Tonnes; Assuming average discard pattern (2021–2023) where 40% of the discards survive.

Table 22.15. Short-term forecast. Annual catch options. All weights are in tonnes.

Basis	Total catch (2025)	Projected landings (2025)	Projected Surviving discards (2025)	Projected dead discards (2025)	Total projected discards* (2025)	F_{total} (2025)	$F_{projected\ landings}$ (2025)	$F_{projected\ discards}$** (2025)	SSB (2026)	% SSB change ***	% advice change^	Probability of SSB (2026) < Blim (%)
ICES advice basis												
MSY approach: $F=F_{MSY} \times SSB_{2025}/MSY\ B_{trigger}$	1504	485	408	612	1019	0.182	0.048	0.134	8237	1.27	-21	0
Other scenarios												
F_{MSY}	1610	519	436	655	1091	0.196	0.051	0.145	8167	0.41	-15.4	0
$F_{MSY\ lower} \times SSB_{2025}/MSY\ B_{trigger}$	1043	336	283	424	707	0.124	0.032	0.091	8539	5.0	-45	0
$F_{MSY\ upper} \times SSB_{2025}/MSY\ B_{trigger}$	2166	698	587	881	1468	0.27	0.071	0.20	7794	-4.2	13.9	0.6
$F= F_{MSY\ lower}$	1119	361	303	455	758	0.133	0.035	0.098	8486	4.3	-41	0
$F= F_{MSY\ upper}$	2312	745	627	940	1567	0.29	0.077	0.22	7678	-5.6	22	0.6
$F= F_{pa}$	3054	984	828	1242	2070	0.40	0.105	0.26	7130	-12.3	61	2.1
F = 0	0	0	0	0	0	0	0	0	9329	14.7	-100	0
$F = F_{lim}$	3625	1168	983	1474	2457	0.50	0.130	0.37	6723	-17.0	91	4.4
$SSB_{2026} = B_{lim}$	7560	2436	2050	3074	5124	1.41	0.37	1.04	3958	-51	297	50
$SSB_{2026} = B_{pa}$	5619	1811	1523	2285	3808	0.88	0.23	0.65	5294	-35	195	21.7
$SSB_{2026} =$ MSY $B_{trigger}$	743	239	201	302	503	0.087	0.023	0.064	8757	7.7	-61	0
Rollover advice	1902	613	516	773	1289	0.24	0.062	0.174	7990	-1.77	0	0.1
$F = F_{2024}$	734	236	199	298	497	0.086	0.022	0.063	8765	7.8	-61	0
$SSB_{2026} = SSB_{2025}$	1676	540	454	682	1136	0.21	0.054	0.151	8134	0	-11.9	0

*** Dead + surviving projected discards.**

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

***** SSB 2026 relative to SSB 2025.**

^ Advice value for 2025 relative to the advice value for 2024 (1902 tonnes). TAC 2024 was equal to the advice value.

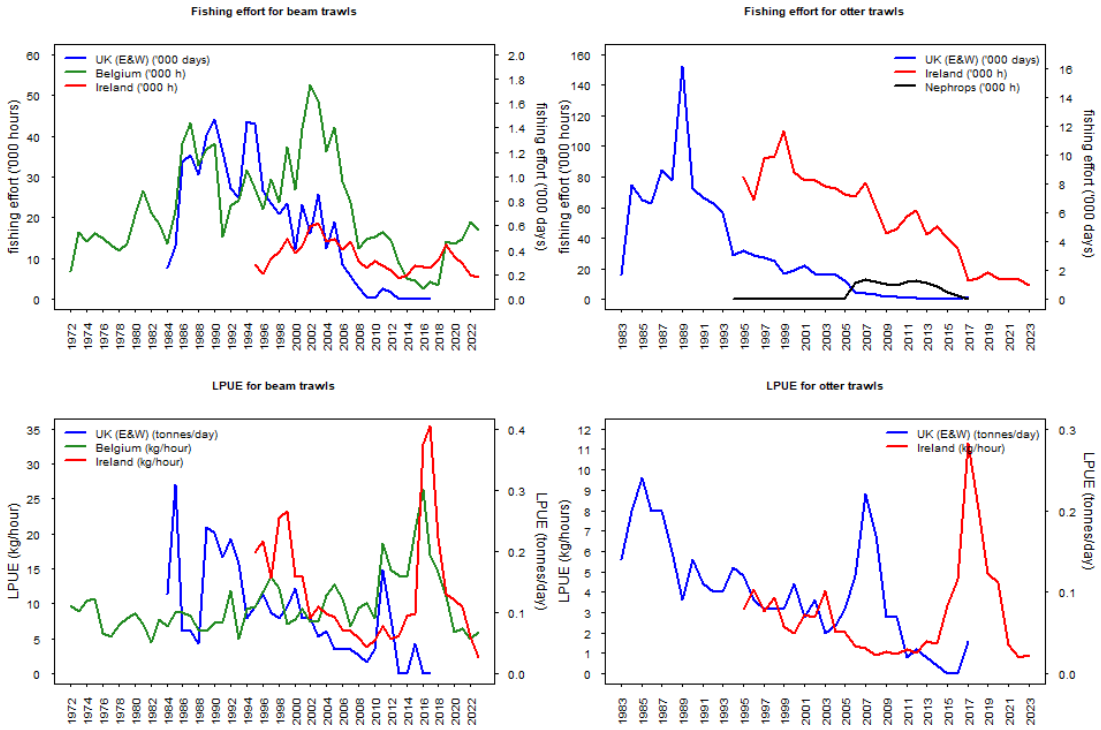

Figure 22.1. Irish Sea plaice: Effort and LPUE for commercial fleets from UK (E&W), Ireland and Belgium.

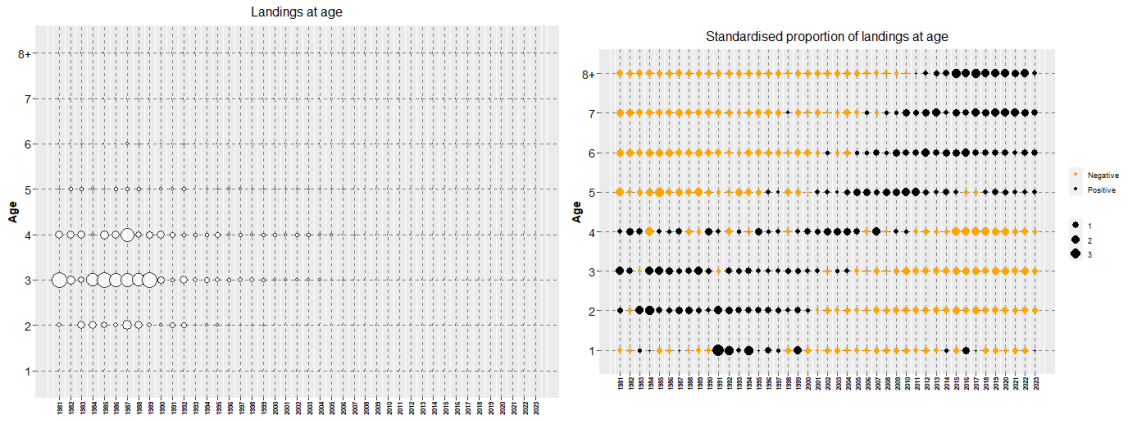

Figure 22.2a. Landings-at-age data (left) and mean standardised proportion-at-age (right, black bubbles are positive values and orange bubbles are negative). Mean standardised proportion-at-age = [(proportion-at-age in year) – mean (proportion-at-age over all years)] / STDEV(proportion-at-age over all years).

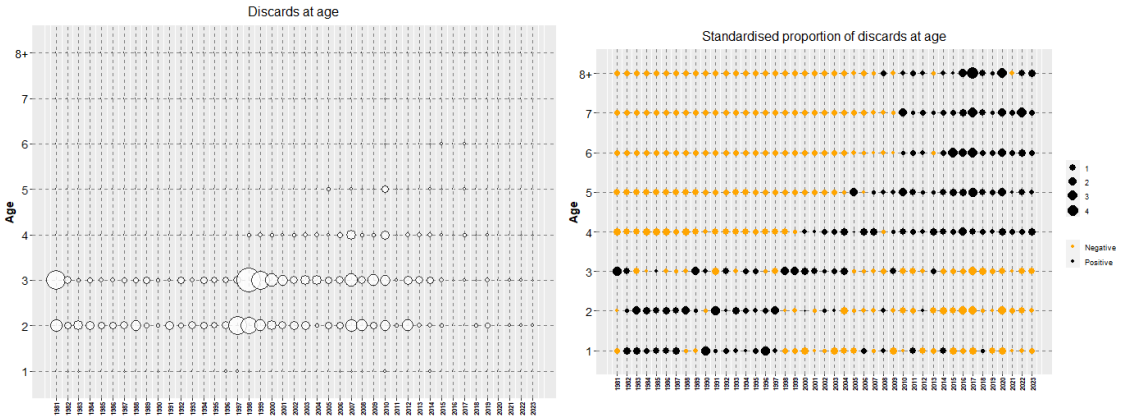

Figure 22.2b. Discards-at-age data (left) and mean standardised proportion-at-age (right, black bubbles are positive values and orange bubbles are negative). Mean standardised proportion-at-age = [(proportion-at-age in year) – mean (proportion-at-age over all years)] / STDEV(proportion-at-age over all years).

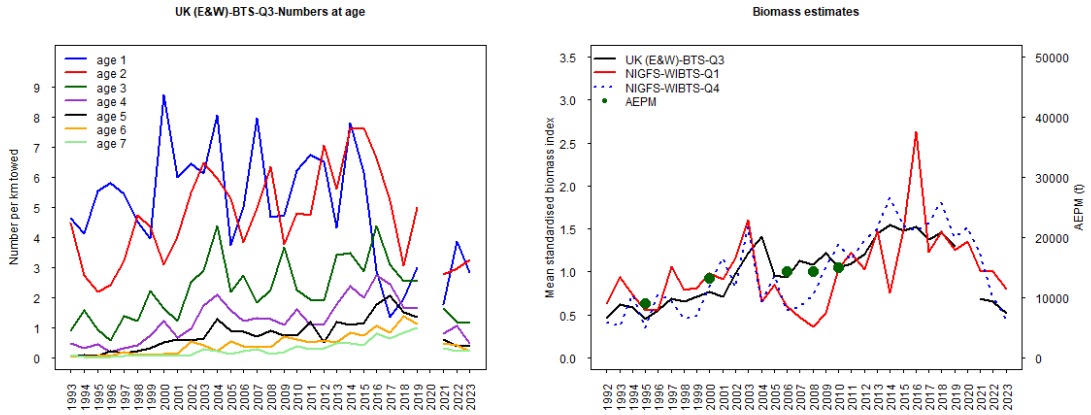

Figure 22.3. Left: UK(E&W)-BTS-Q3 (extended area) CPUE by age (circles in 2021 due to missing data in 2020). Right: standardised indices of SSB derived from NIGFS-WIBTS, biomass from UK(E&W)-BTS-Q3 (extended area) (black circle in 2021 due to missing data in 2020) and the SSB estimates from the Annual Egg Production Methods (circles, right).

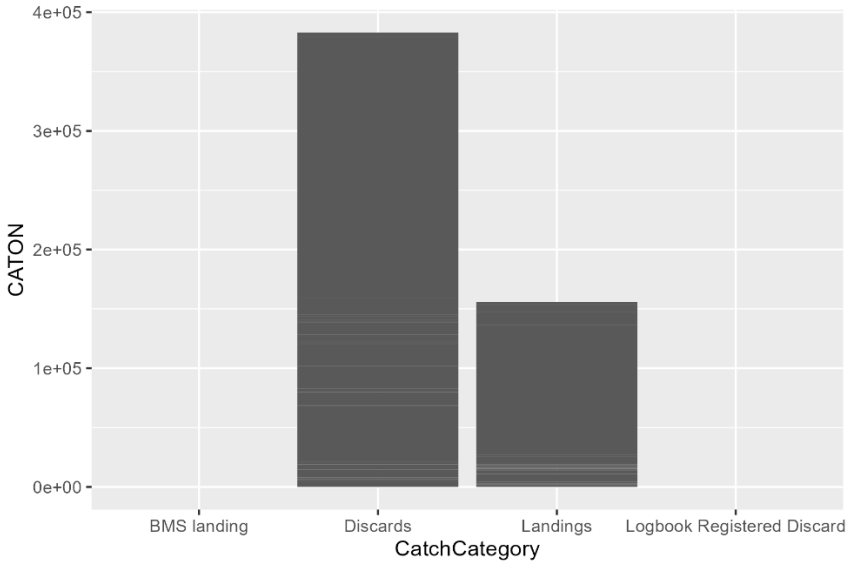

Figure 22.4. Make up of catch estimates from InterCatch.

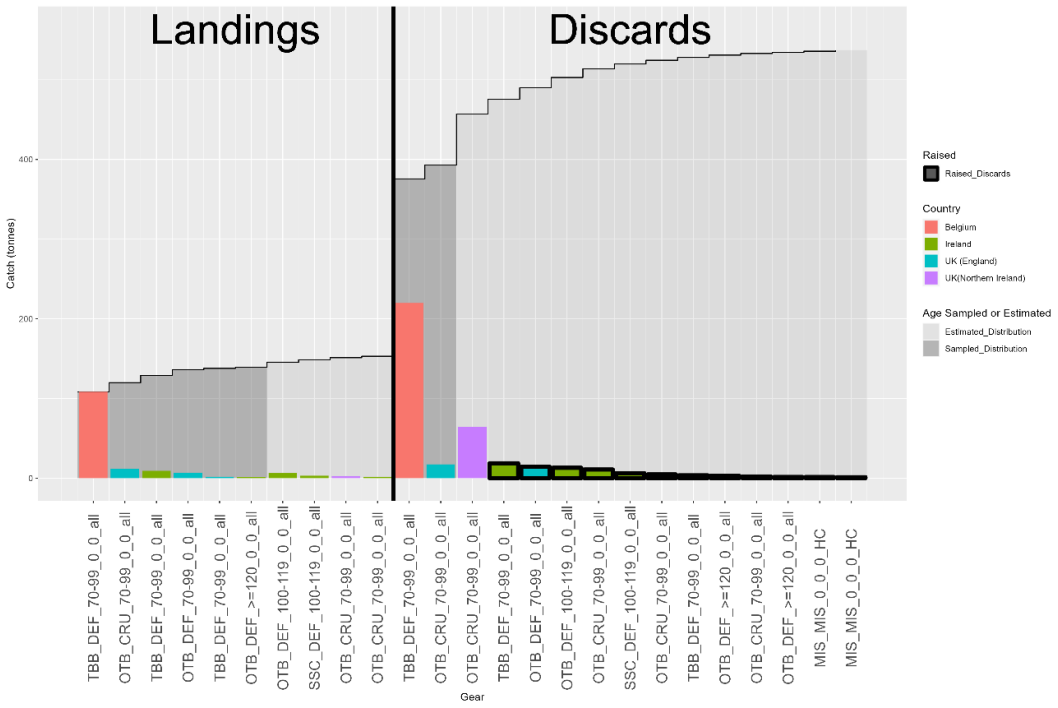

Figure 22.5. Catch sampling for landings (left) and discards (right) by country and gear type. Gears contributing less than 1 tonne are excluded for clarity.

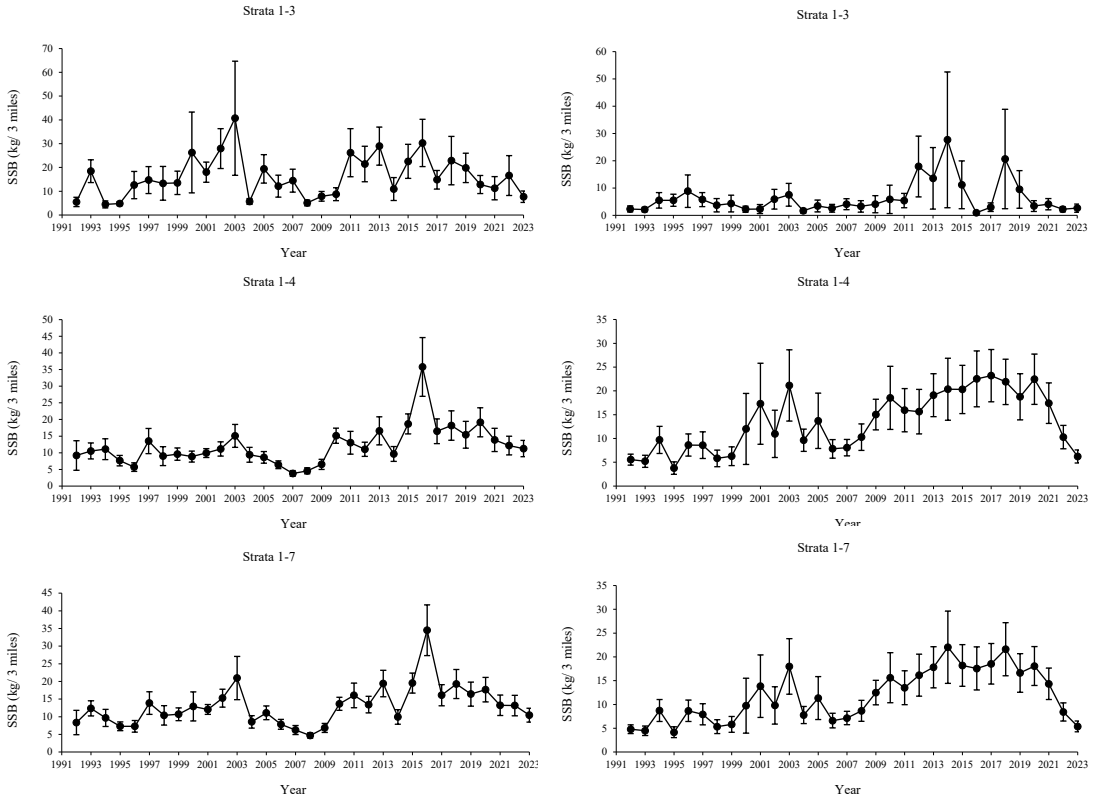

Figure 22.6. Northern Irish Groundfish Survey SSB indices split into spring (left hand panels) and autumn (right hand panels) sampling by western strata (1–3), eastern strata (4–7) and total survey area (strata 1–7) with confidence intervals (± 1 standard error, vertical lines).

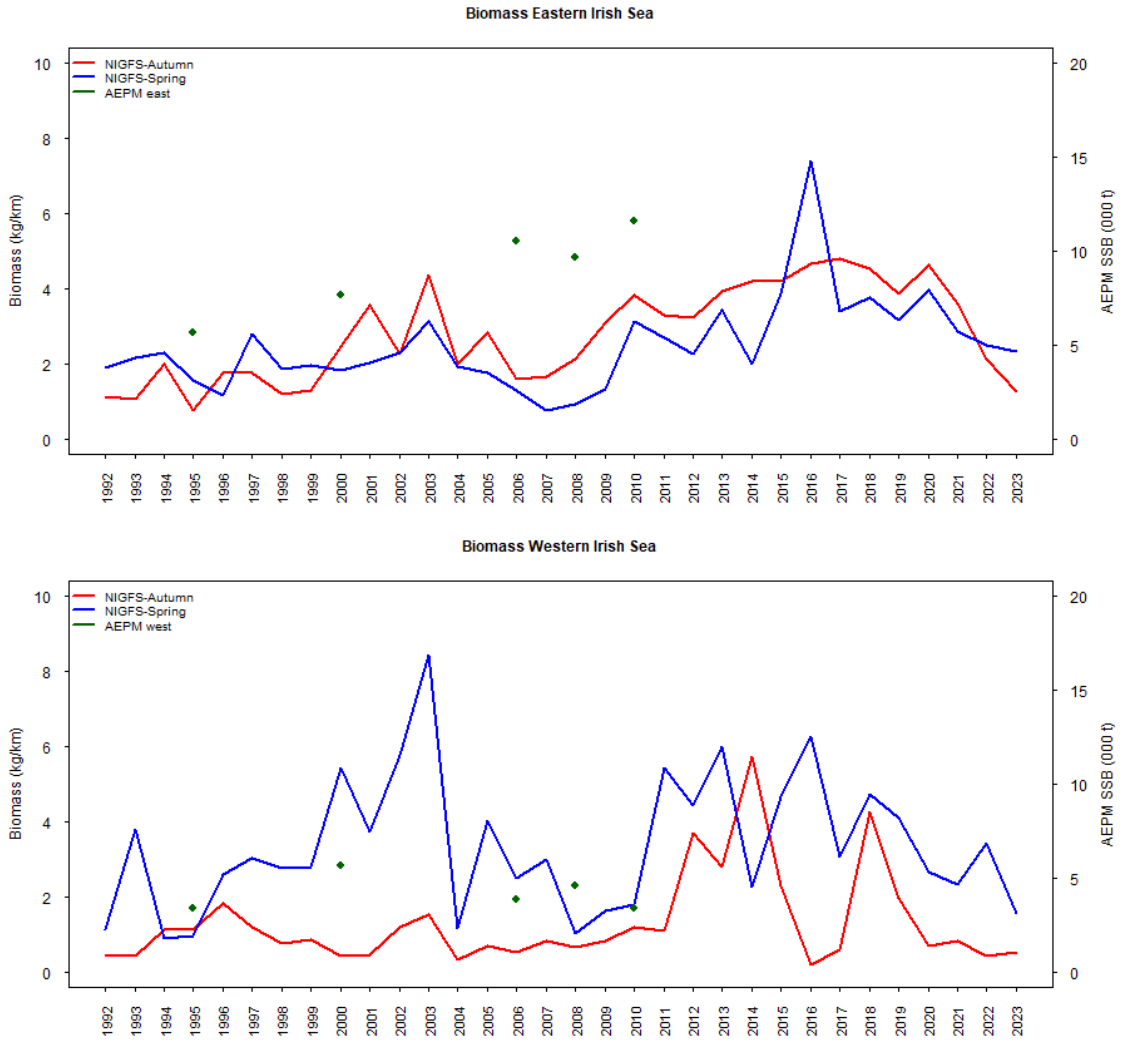

Figure 22.7. Trends in biomass indices (kg per km towed) the NIGFS-WIBTS-Q1 and -Q4 (blue and red lines respectively) in the eastern Irish Sea (top) and the western and southern Irish Sea (bottom). Also shown (green dots, right axis) are the estimates of SSB from the Annual Egg Production Method (AEPM) from Armstrong *et al*. (2001).

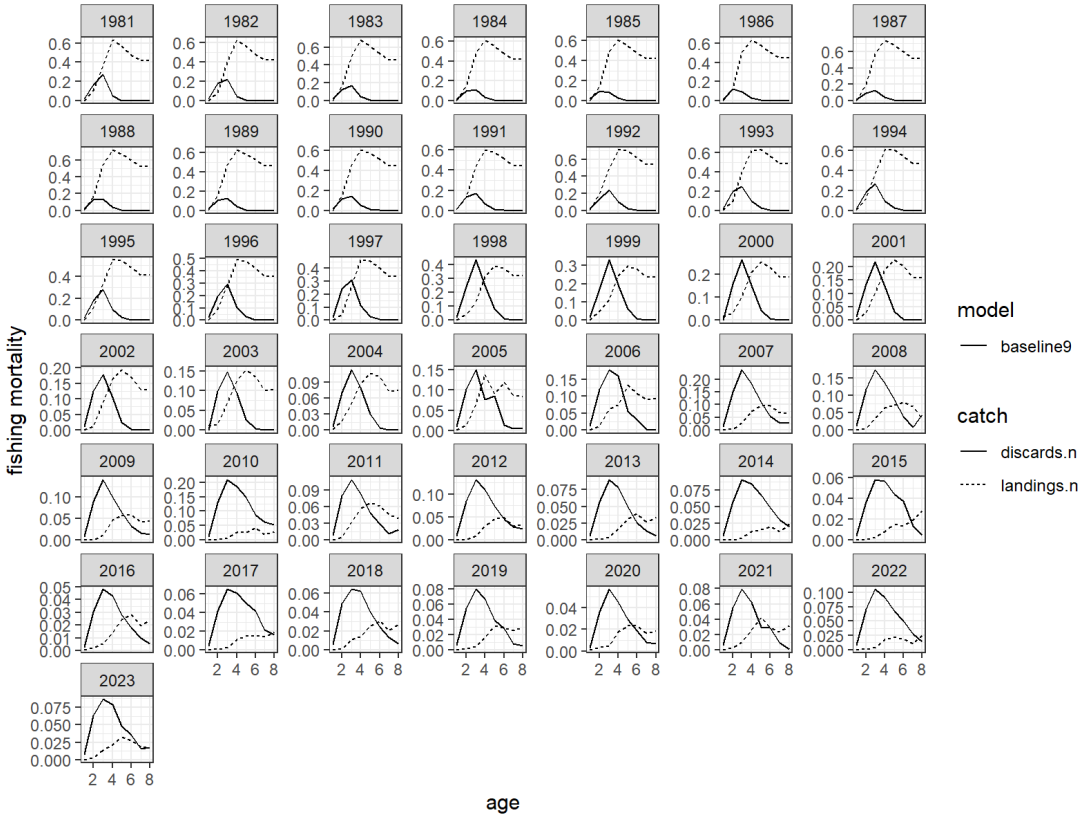

Figure 22.8. Selectivity of the fishery split into the landed (dashed) and discarded (solid) components as estimated by the SAM model, where the x-axis shows age and the y-axis gives the fishing mortality-at-age split by the proportion of fish (by number) discarded and landed at-age.

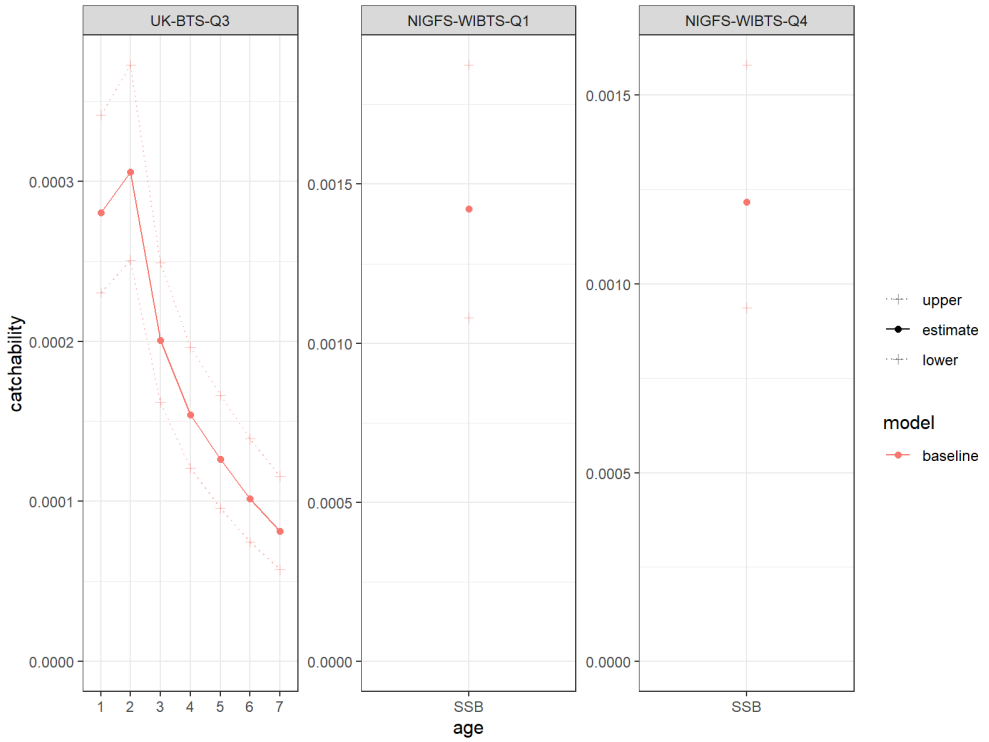

Figure 22.9. Catchability for the UK (E&W)-BTS-Q3 extended index by age, NIGFS-WIBTS-Q1 and NIGFS-WIBTS-Q4 as estimated by the SAM model.

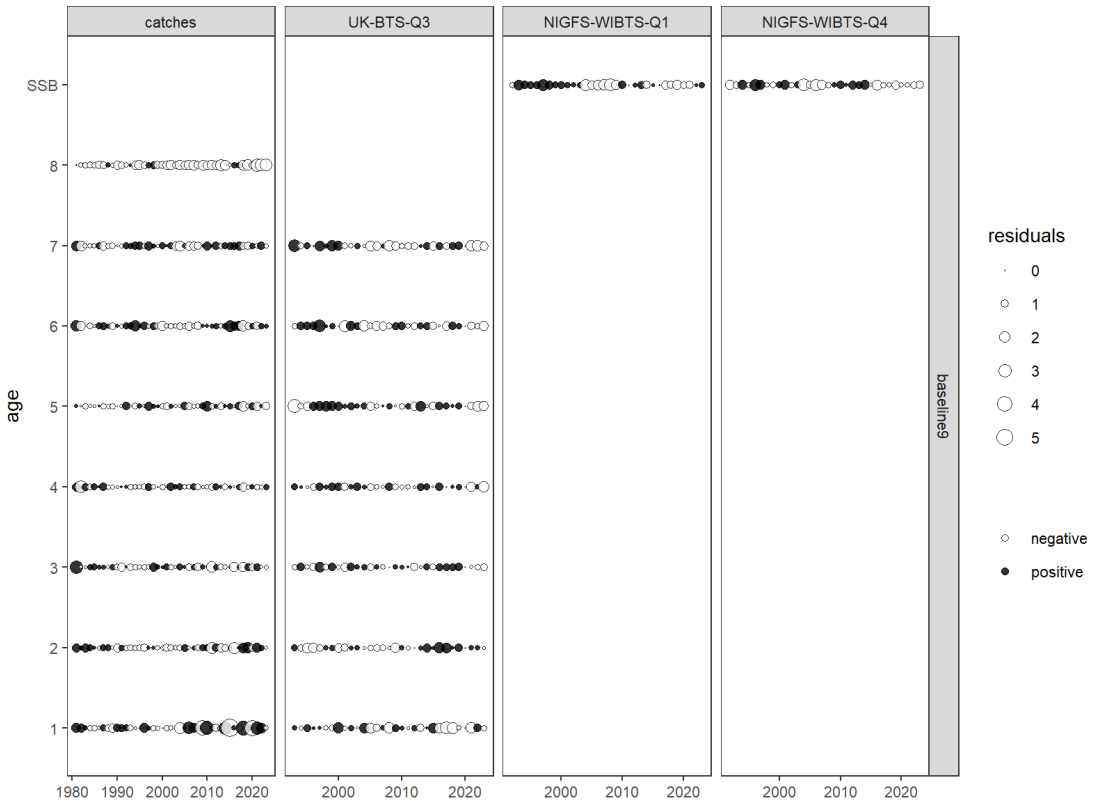

Figure 22.10. Residuals in fits to catch and survey data from the baseline model. Expected values were estimated by the SAM model.

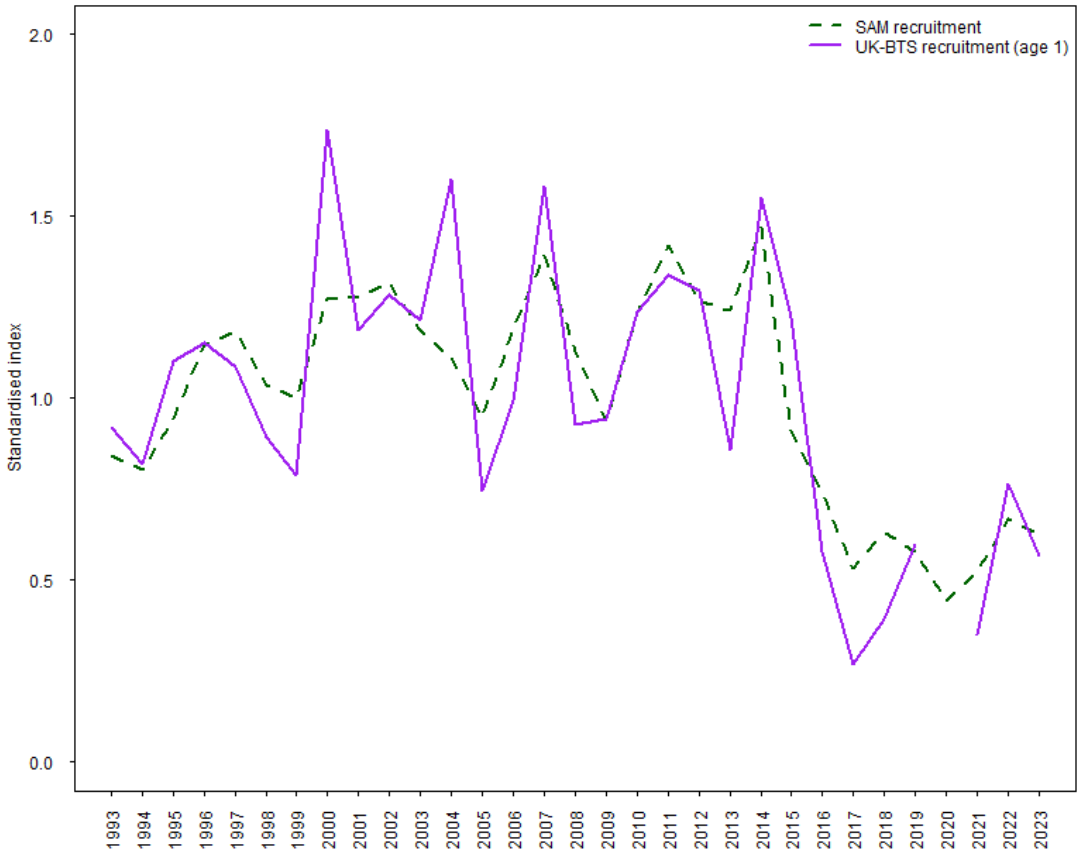

Figure 22.11. Comparison of the standardised age 1 index from the UK (E&W)-BTS-Q3 extended area (purple line) and the standardised recruitment (green dashed line) estimated by the SAM model.

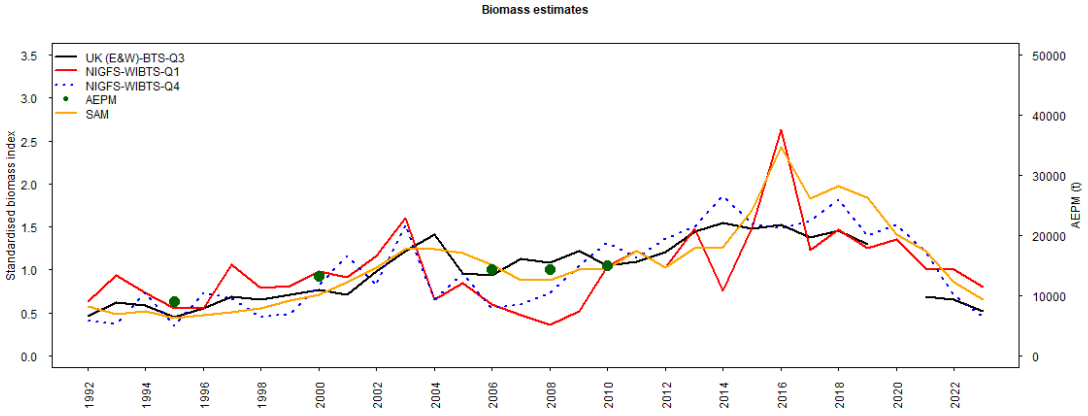

Figure 22.12. SAM model estimates of mean standardised SSB (orange line) overlaid with standardised NIGFS in spring (red) and autumn (blue dashed) relative SSB indices, standardised biomass (ages 1–4) from the UK(E&W)-BTS (black solid line) and AEPM SSB index (circles, right axis). Standardized: minus mean and divided by standard deviation.

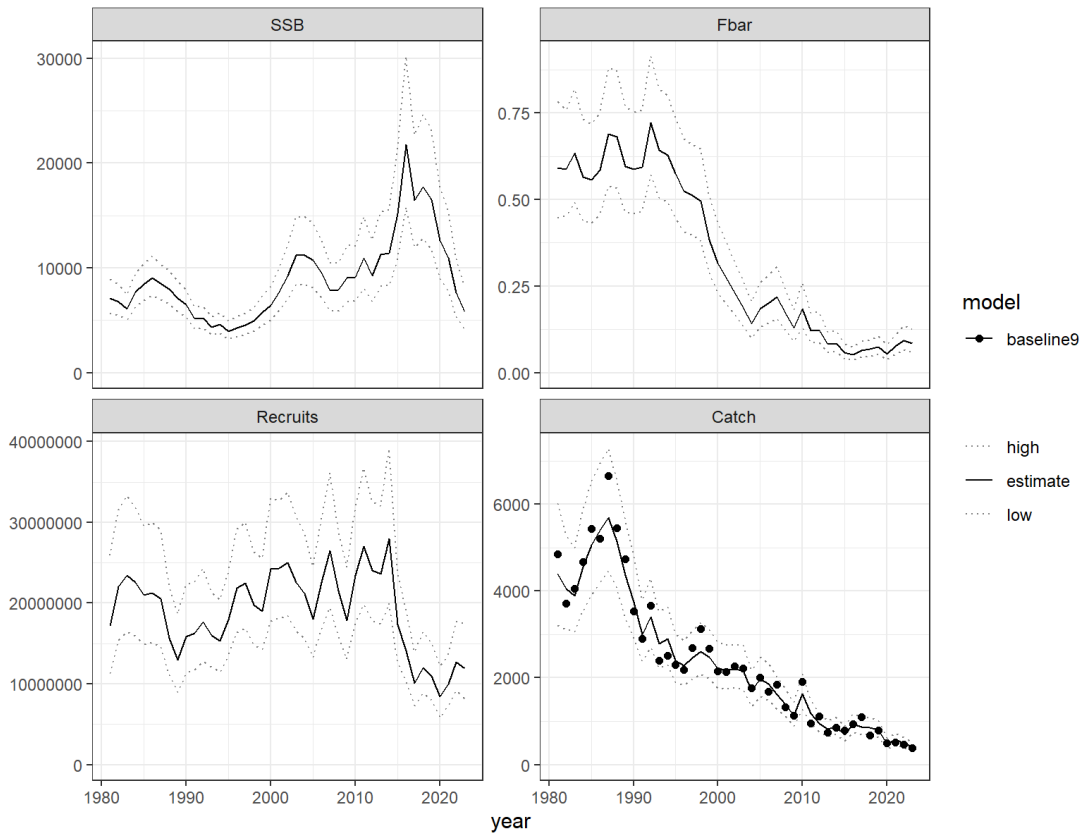

Figure 22.13. Modelled SSB (tonnes, top left), recruitment (thousands, bottom left), F_{bar} (ages 3–6, bottom right) catch tonnage (bottom right) using the SAM model. Error dashed lines indicate approximate 95% confidence intervals.

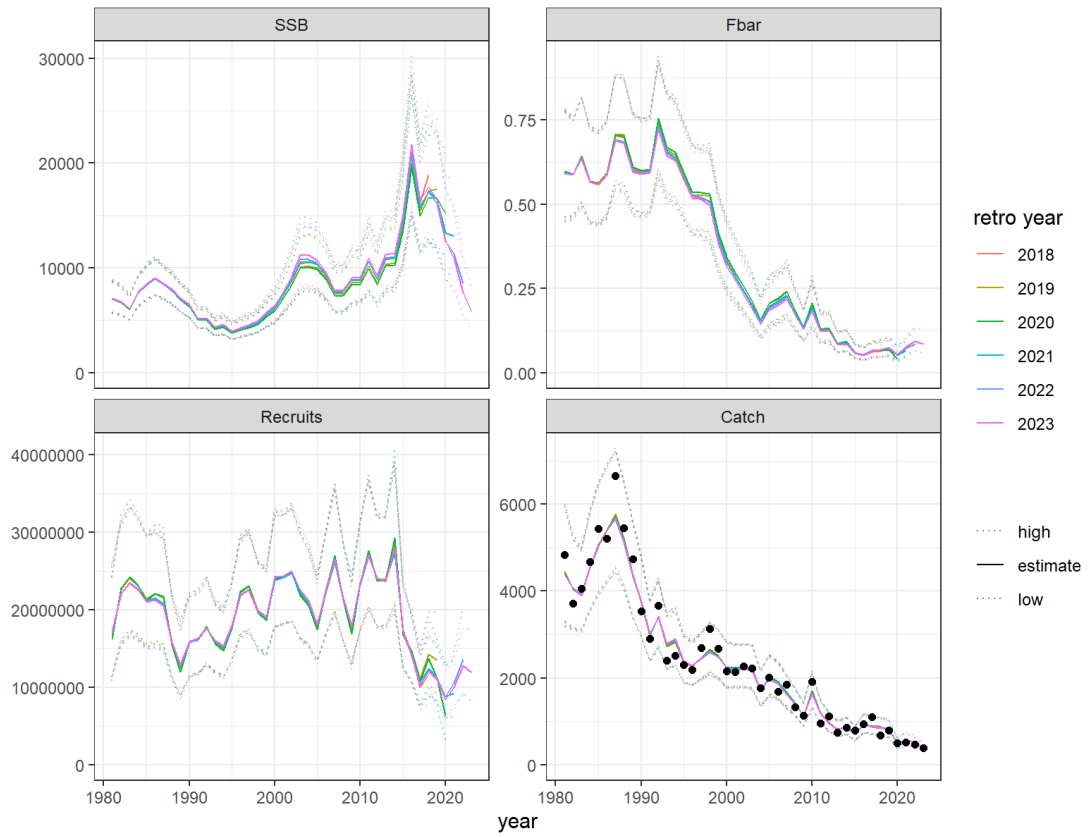

Figure 22.14. Retrospective assessments for years 2018–2023 from the baseline model. SSB (tonnes, top left), recruitment (thousands, bottom left), F_{bar} (ages 3–6, bottom right) catch tonnage (bottom right). Error dashed lines indicate approximate 95% confidence intervals.

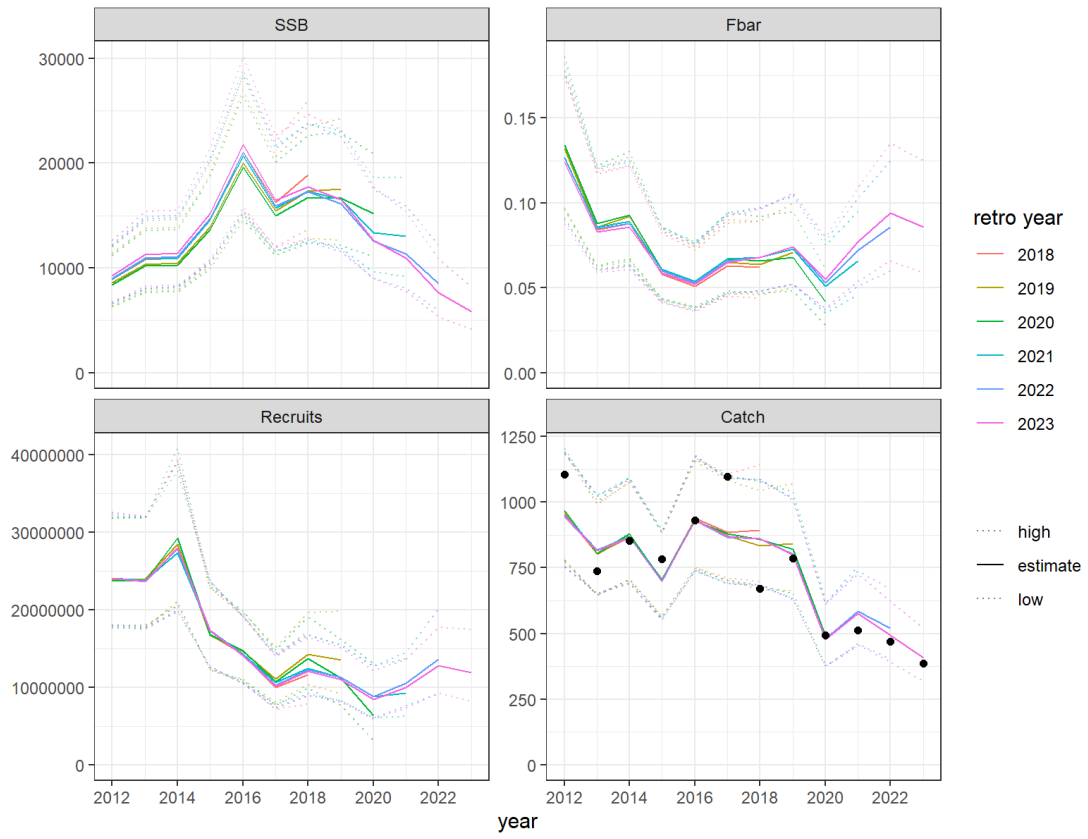

Figure 22.15. Retrospective assessments for years 2018–2023 from the baseline model, showing final years. SSB (tonnes, top left), recruitment (thousands, bottom left), F_{bar} (ages 3–6, bottom right) catch tonnage (bottom right). Error dashed lines indicate approximate 95% confidence intervals.