Contents

7 Haddock (*Melanogrammus aeglefinus*) in Division7.a (Irish Sea)

Type of assessment

Age-structured assessment model using Age Structured Assessment Program (ASAP).

ICES advice applicable to 2023

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 2648 tonnes.

ICES advice applicable to 2024

ICES advises that when the MSY approach is applied, catches in 2024 should be no more than 2263 tonnes.

ICES advice applicable to 2025

ICES advises that when the MSY approach is applied, catches in 2025 should be no more than 1893 tonnes.

7.1 General

Stock descriptions and management units

The stock and management units are both ICES Division 7.a (Irish Sea). Landings reported by Irish vessels in the southern most rectangles of 7.a have been reassigned to the 7.b–k stock since 2003 because they are believed to be part of the Celtic Sea stock.

Management applicable to 2024 and 2025

Management measures include TAC and effort restrictions as well as technical measures. Due to the bycatch of cod in the haddock fishery, the regulations affecting Irish Sea haddock remain linked to those implemented under the cod recovery plan. From 1st January 2019 all fleets catching haddock are subject to the landing obligation. The minimum landing size for haddock in the Irish Sea is 30 cm.

Landings obligation

According to the delegate regulation (EC, 2015) vessels where more than 25% of their landings using trawls and seines in the reference years (2013 & 2014) and area were specified gadoids (cod, haddock, whiting and saithe) are covered by the Landings Obligation. In UK waters All quota species must now be landed, however, these will no longer be taken into account when enforcing catch composition rules (DEFRA, 2023).

7.2 Fishery in 2023

The characteristics of the fishery are described in the stock annex (see Annex 2).

The fishery in 2023 was prosecuted by a similar fleet and gears as in recent years, with directed fishing restricted during the cod closure under special conditions. The targeted whitefish fishery that developed during the 1990 using semi-pelagic trawls was in decline but since 2014 there has been a slight increase in activity due to abundance of the haddock stock and increased fishing opportunity. However, in 2023 this declined further with an increase in fuel cost and low price of haddock making it more profitable for vessels to fish nephrop and herring rather than whitefish. A proportion of the TAC is taken as bycatch in the *Nephrops* fishery in a mixed fishery.

In 2023, the uptake of TAC was 61%. The primary two nations exploiting the stock are the UK and Ireland. ICES catch estimates are adjusted for reallocation of Irish landings from southern rectangles of 7.a to 7.g, as it is believed that these fish do not belong to the 7.a stock. In 2023 this reallocation was greater than the catch from the other rectangles in 7a. Table 7.1 gives nominal landings of haddock from the Irish Sea (Division 7.a) as reported by each country to ICES since 1984.

Data

For a second year there are lower sampling levels for some fleets which commonly discard haddock. In 2023 recent discard rates were used to estimate these unsampled catches, while it was assumed that the discard rates would be lower than the recent average due to low recruitment over the past few years. In 2024 the discards were raised to the landings of similar fleets in another country. Sensitivity analyses indicated that this has minimal impact on the perception of the stock status.

A part of the survey area was not covered by the NIGFS Q4 survey; data were averaged for the missing stations by a 3 year average for those stations. Sensitivity analyses showed that the assessment was robust with respect to this.

Landings

Table 7.2 gives the long-term trend of nominal landings of haddock from the Irish Sea (Division 7.a) as reported to ICES since 1972, together with Working Group estimates. The 1993–2005 WG estimates includes sampled-based re-estimates of landings into the main Irish Sea ports. Sampled based evidence suggests that WG estimates are similar to reported landings since 2006. Following the benchmark (WKROUND 2013) the landings have been revised since 1993, and exclude landings from the southern rectangles in the Irish Sea as they not are believed to be part of this stock.

The methods for estimating quantities and composition of haddock landings from 7.a, used in previous years, are described in the stock annex (see Annex 2). The series of numbers-at-age in the international commercial catch is given in Table 7.4. Sampling levels were not considered adequate to derive catch age compositions in 2003.

Discards

Annual discard data were updated for Northern Ireland. Issues relating to the reliability and confidence in the data were addressed at the benchmark assessment for this stock (WKROUND 2013; WKIrish3 2017). For a second year no discard data were available for the republic of

Ireland. The catches and numbers were raised based on the NI fleets and landings from the Irish fleet.

Methods for estimating quantities and composition of discards from UK (NI) and Irish *Nephrops* trawlers are described in the stock annex. The recent estimates of discarding for *Nephrops* fleets observed by previous WG are still evident. A historic time-series of discard numbers-at-age was constructed at the benchmark. Discard rates are very variable between fleets.

Biological data

The derivation of biological parameters and variables is described in the stock annex (see Annex 2). Natural mortality-at-age was calculated using the methods proposed by Lorenzen (1996) at WKIrish2 (2016). The proportions mature-at-age was also recalculated at the benchmark, and based on the mean proportion observed during the NIGFS-WIBTS-Q1 survey with a smoother fitted that is updated annually (Table 7.3).

Surveys

The survey data considered in the assessment for this stock are given in Table 11.5. All survey series data for haddock available to the Working Group are described in the stock annex (see Annex 2). The following age-structured abundance indices were used in the assessment:

- UK (NI) groundfish survey (NIGFS) in March (age classes 1 to 4, years 1992–2023). Acronym NIGFS-WIBTS-Q1.
- UK (NI) groundfish survey (NIGFS) in October (age classes 0 to 3; years 1991 to 2023). Acronym NIGFS-WIBTS-Q4.
- UK (NI) Methot–Isaacs–Kidd (NI-MIK) net survey in June (age 0; years 1994–2023, excluding 2020 and 2022).
- UK Fishery Science Partnership (UKFspW) western Irish Sea roundfish survey (age classes 2 to 5, years 2004–2023, the survey was not conducted in 2014).

In 2022 the UK (NI) Methot-Isaac Kid (NI MIK) net survey was not carried used in the assessment. Experts from the survey deemed that due to survey timing it was unlikely that the survey provided a reliable indication of recruitment.

In 2023 the Q4 NIGFS had reduced coverage, excluding areas in the Republic of Ireland waters. Different options were investigated to deal with the loss of the stations, which is detailed further down.

The relative log standardised indices for cohorts are plotted against time in Figure 7.2. Whilst ages 2 to 4 appear to show strong signal in the UKFspW the ability to detect the year class in age 5 haddock is less clear. The strong 2013 year class could be tracked in all indices, indicating that the different surveys are capturing the prominent year-class signals in this stock (Figure 7.2). Correlation between survey indices by age is positive for all surveys and show high consistency within each survey (Figure 7.3). The indices from the UKFspW survey in the western Irish Sea also show similar year-class signals to the other survey-series, but are noisy with strong year effects (Figure 7.2).

7.3 Assessment

The assessment presented is the single fleet ASAP model.

The following model settings were applied in 2024.

ASAP was used for the assessment and model settings:

Option	Setting
Use likelihood constant	Yes
Mean F (F_{bar}) age range	2–4
Fleet selectivity block 1	Asymptotic (1993-2000)
Fleet selectivity block 2	Age coefficients (age 0–5) (0.2;0.5;0.8;1;0.7;0.5) (2001-2007)
Fleet selectivity block 3	Age coefficients (age 0–5) (0.3;0.6;0.7;0.7;0.4;0.2) (2008-2012)
Fleet selectivity block 4	Age coefficients (age 0–5) (0.1;0.6;0.8;0.9;1.0;1.0) (since 2013)
Discards	Included in catch (not specified separately from landings)
Index units	4 (numbers)
Index month	NIGFS-Q1 (3); NIGFS-Q4 (10); NIMIK (7); UKFSPW(3)
Index selectivity linked to fleet	-1 (not linked)
Index age range	NIGFS-Q1 (1–4); NIGFS-Q4 (0–3); NIMIK (0); UKFSPW(2–5)
Index Selectivity (NIGFS-Q1)	Double logistic
Index Selectivity (NIGFS-Q4)	Asymptotic
Index Selectivity (NIMIK)	
Index Selectivity (UK-FSPW)	Asymptotic
Index CV & ESS (NIGFS-Q1)	Observed strata CV (lower limit 0.1); ESS = 50
Index CV & ESS (NIGFS-Q4)	Observed strata CV (lower limit 0.1); ESS = 50, in 2023 ESS=30
Index CV & ESS (NIMIK)	Observed station CV (lower limit 0.1); ESS = 50; not used for 2020 & 2022
Index CV & ESS (UK-FSPW)	CV = 0.7; ESS = 10
Phase for F-Mult in 1st year	1
Phase for F-Mult deviations	2
Phase for recruitment deviations	3
Phase for N in 1st Year	1
Phase for catchability in 1st Year	3
Phase for catchability deviations	-5 (Assume constant catchability in indices)

Option	Setting
Phase for unexploited stock size	1
Phase for steepness	-5 (Do not fit stock–recruitment curve)
Catch total CV	1993–2000 (0.175); 2003–2006 (0.2); 2007– 2019 (0.15); 2020 (0.175); 2021 -2022 (0.15), 2023 (0.175)
Catch effective sample size	1993–2000 (50); 2003–2006 (1); 2007–2019 (50); 2020 (1); 2021 - 2022 (50), 2023 (45)
Lambda for recruit deviations	0 (freely estimated)
Lambda for total catch	1
Lambda for total discards	NA (discards included in catch)
Lambda for F-Mult in 1st year	0 (freely estimated)
Lambda for F-Mult deviations	0 (freely estimated)
Lambda for index	1 for both indices in the model
Lambda for index catchability	0 for all indices (freely estimated)
Lambda for catchability devs	NA (phase is negative)
Lambda N in 1st year deviations	0 (freely estimated)
Lambda devs initial steepness	0 (freely estimated)
Lambda devs unexpl stock size	0 (freely estimated)

Final update assessment

The final assessment was run with the same settings as established by WKIrish 2017 and described in the stock annex, with the addition of a new selectivity pattern 2013–2023, as applied in 2018 and with a lower starting value for selection of age 0 haddock in the final selectivity block. Additionally there was an increase in the CV on catch due to the reduced sampling of at-sea catch for some fleets in 2022 and 2023. Hence the changes as described in the stock annex were followed. Discards were combined with the landings as catch in the model.

Figure 11.5 shows the predicted and observed catch. The catch information from 2007 to present is regarded as the most confident, during 2003–2006 it is regarded that catch and sampling information is of relatively lower quality due to lack of sampling opportunity. Before 2003, the catch series is regarded as of intermediate confidence. The model has close fit to the current observed catch 2011–present. Before this time, there is consistent over estimation of the catch 2000–2011 following a period of consistent underestimation of catch 1993–2001. Figure 7.6 shows the residuals of the catch proportions-at-age. For all ages there appears to good fit with no consistent pattern, however, there are some large deviations from observed and predicted for age 5 fish since 2015. Figure 7.7 shows that the catch is dominated by fish <4 years, therefore the large residuals for fish of age 5 are likely to result from low sampling and small contribution of 5+ fish to the stock. The fishing pressure (F)-at-age is shown in Table 7.6.

The residuals of the indices are shown in Figure 7.8. A good fit to the NI-MIK index is seen across the series, although some single year events are observed with a strong deviation in the last two

years of the index. For the UKFSPW survey a poor fit in years 2017 and 2018 is evident. This suggests an inability of the model to track the large survey index values, this should be investigated further to explore the method of index calculation. There is strong tracking of both NIGFS-WIBTS-Q1 and NIGFS-WIBTS-Q4 index patterns in general, however, a general trend to under estimate the NIGFS-WIBTS-Q1 index by the model early 2000s to 2013, followed by a period of over estimation (during years of high abundance, and with the decline in SSB the model is once again underestimating Q1 survey index.

Figure 7.9 shows the residuals of the survey proportions-at-age. For all indices there is close fit between the observed and model predicted fit for fish up to four years old. The largest deviations occur in five year old fish in the UKFSPW survey, which over-reported five year old fish prior to 2014.

Figure 7.10 shows the retrospective analysis. The predicted catch shows no obvious retrospective pattern, neither does the recruitment estimate or fishing pressure. The results of the assessment are given in Table 7.8.

Comparison with previous assessments

Figure 7.11 shows the comparison of the current assessment with previous ASAP and model. There is close agreement with the stock trends of the current assessment and the previous assessment. Mohn's Rho values were calculated for five retrospective runs 2023: 2018 for F_{bar} (0.03), SSB (-0.08) and recruitment (-.55).

State of the stock

Following a period of sustained decline, since 2008, SSB increased markedly from 2012–2018. A short-term decline was observed in 2014, but was reversed, and since 2014 the SSB has increased markedly. The stock is characterized by highly variable recruitment. The model indicates above average recruitment for the 2009–2012 year class after below average recruitment for the 2007 and 2008 year classes. Recruitment in 2013 is amongst the highest observed in the time-series and has been followed by strong recruitment in 2014 and 2015. Since 2018 SSB has declined from the highest observed level and continued the decline in 2023.

With low recruitment in 2020-2023, the SSB is further projected to decline in 2024, 2025 and 2026.

7.4 Short-term projections

Short-term projections were performed using FLR libraries. Recruitment for 2024–2025 was estimated at (GM 1993–2021; 355689 in thousands). The F used in the forecast for 2024 was derived as Fsq= Faverage (2021-2023) = 0.104.

Catches were split into landings and discards using the proportions of the catch that were discarded over the full the last three years. Input data for the short-term forecast are given in Table 7.7. The management options output is given in Table 7.9.

Estimates of the relative contribution of recent year classes to the 2025 landings and 2026 SSB are shown in Figure 7.12. The contribution to landings in 2025 consists mainly of the 2020 cohort (73%), with the SSB in 2026 largely be dependent on the 2021 cohort, comprising 64% of the SSB and assumed recruitment in 2024 contributing 20%. This is an issue as the SSB will largely consist of the plus group and a GM year.

7.5 Biological references points

MSY evaluations

In response to an EU special request to provide plausible and updated F_{MSY} ranges for Irish Sea haddock the management reference points for the stock were re-estimated (Table 11.10 ICES, 2018). The B_{lim} was set as the lowest SBB at which above recruitment in the upper quartile has been observed (2994 t). The S–R plot for Irish Sea haddock shows no obvious S–R relationship mainly because the recruitment is highly variable. B_{lim} was estimated as 4160 t. MSY B_{pa} is set to 4281 t as the stock has been fished at or below F_{MSY} for more than five years. F_{MSY} median point estimates is 0.28. The upper bound of the F_{MSY} range giving at least 95% of the maximum yield was estimated to 0.35 and the lower bound at 0.20. F_{lim} is estimated to be 0.50 as F with 50% probability of SSB <B_{lim}; F_{pa} as 0.41= $F_{p.05}$ the F that leads to SSB>B_{lim} with 95% probability; F_{lim} x exp(-1.645 x σ); σ = 0.20.

Yield and biomass-per-recruit

Not available for this stock, previous explorations are detailed in the stock annex.

7.6 Management Plans

There is no specific management plan for haddock in the Irish Sea. The regulations affecting Irish Sea haddock remain linked to those implemented under the cod management plan due to potential for bycatch of cod in a fishery targeting haddock (Council Regulation (EC) 1342/2008).

7.7 Uncertainties and bias in assessment and forecast

Sampling levels of the landed catch for recent years are considered to be sufficient to support current assessment. However, within the assessment there is relocation of reported landings in rectangles 33E2 and 33E3 which are not considered part of the stock. For the first time in time series used in the assessment the reallocated catch is greater than the catch estimated for the Irish Sea catch. Historic misreporting estimates are considered in the assessment and accounted for. Current misreporting is not considered to be a factor within the fishery.

Discards

Sampling levels of discarding at sea remains high. For Northern Irish vessels targeting haddock 75.0% of trips are observed and 2.4% of the main *Nephrops* targeted fishery trips observed. However, there were very low numbers of trips targeting haddock undertaken. Some fleets which commonly discard haddock were not sampled in 2022 and 2023. In 2023 for these fleets a linear model based on recent discard rates were used to estimate these unsampled catches. Sensitivity analyses indicated that this has minimal impact on the perception of the stock status. However, this was deemed unsuitable for a second year in row, in particular as this part of the fleet, targeting *Nephrops*, largely discards young fish. With the very poor recruitment observed in recent years, application of an average multi-year linear model derived discard rate seemed inappropriate. The landings – to – discard rates of the same metier in another country was therefore applied.

Sensitivity runs of model assuming different levels of confidence in the catch data were conducted to reflect higher uncertainly in catch estimates due to missing sampling data. The results show that the model is robust to increasing the coefficient of variation with neglible change on the estimated numbers at age (Age 0 and Age 1).

Selectivity

A breakpoint in selectivity is applied in 2000, associated with management measures to reduce fishing mortality on cod. The model included three selectivity blocks in fishery-dependent data, reflecting bycatch and targeted fishery until the year 2000 (asymptotic). After 2007, a fleet selectivity pattern without targeted fishing of older fish (dome-shaped) is applied. During 2000–2007 a transition between a fully selected stock to a regime without targeted fishing of older fish is fitted. The use of current specified selectivity blocks may require review at annual at regular intervals. In the current assessment a new selectivity pattern for the fishery was added from 2013 onwards with full selection of fish older than three years. With advice and management for haddock or other species, it is possible that the character of the fishery may change. A retrospective analysis demonstrated a consistent historic downward revision of the perceived SSB trend, however, there is consistent estimation of F. The initial two years of the retrospective plot show significant deviations. This was considered due to the model having a selectivity block, beginning in 2007, with reduced selection for older fish and the introduction of the UKFspW, with an asymptotic selectivity pattern, starting in 2007. The short period to estimate the selectivity parameters for both the fishery and survey index are considered to contribute to the instability of the model during this time.

The high over estimation of older fish in the catch (Figure 7.6) suggest that there might be a change in selectivity. The last selectivity block starts in 2013, ahead of the large recruitment event and a large targeted fishery. Since 2020, with the impact of COVID-19 and subsequent rises in fuel prices, the targeted fishery has been largely decreased due to a combination of factors unrelated to the stock. This would explain the discrepancy between the caught older fish and those estimated by the model.

In 2024 the introduction of a 5th selectivity block was investigated. However, while the fit of the catch-at-age was improved, there was no real over-all improvement of the model. WGCSE decided in the light of the the change in fleet behaviour likely being short-term and the inclusion of an extra selectivity block warranting an external review and no apparent change/improvement in the assessment, to postpone the decision to a future benchmark.

Surveys

The survey indices used in the model have spatial coverage of the assessment area. The combination of a recruitment index (NI-MIK), juvenile fish survey indices (NIGFS-WIBTS-Q1 & NIGFS-WIBTS-Q4) and the UKFspW survey aimed at older fish using commercial fishing gear means that the full age range of the stock is covered by survey information.
In 2023 the Irish part of the NIGFS Q4 could not be conducted, therefore an average of the previous 3 years of the stations missed (abundance by age) was applied. Sensitivity analysis suggest that this approach was feasible to use in the circumstances.

7.8 Recommendations for next benchmark

This stock was benchmarked through the WKIrish (2017) process in 2016–2017. New estimation of the MikNet survey and re-estimation of ages from separate targeting and non-targeting fisheries should be considered. Ecosystem based indicators of productivity should be investigated

to allow progress toward Ecosystem Based Fisheries Management. There has been increasing uncertainty of 'older' (age 5 fish), contributing to a 'high' retrospective pattern – with the model predicting more older fish than observed in the fishery data this may in part be due to the post 2020 - change in fleet behaviour with a decline in the directed fishery. The stock definition should be revised to reflect the understanding that the southern rectangles of the Irish Sea are considered part of the Celtic Sea haddock stock

7.9 References

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7.10 Tables and Figures

Table 7.1. Haddock in 7.b,c, e-k. Official landings (quota uptake in brackets).

Year	BEL	ESP	FRA	IRL	UK*	Others	Total	TAC**
1994	123	0	2788	908	240	17	4076	
1995	189 (28%)	19	2964 (74%)	966 (72%)	266 (44%)	64	4468	6000
1996	133 (9%)	48	4527 (49%)	1468 (47%)	439 (31%)	38	6653	14000
1997	246 (16%)	54	6581 (71%)	2789 (90%)	569 (41%)	31	10270	14000
1998	142 (6%)	260	3674 (28%)	2788 (63%)	444 (22%)	52	7360	20000
1999	51 (2%)	88	2725 (19%)	2034 (42%)	278 (13%)	71	5247	22000
2000	90 (5%)	110	3088 (28%)	3066 (83%)	289 (17%)	13	6656	16600
2001	165 (12%)	646	4842 (61%)	3608 (135%)	422 (35%)	19	9702	12000
2002	132 (128%)		4348 (70%)	2188 (106%)	315 (34%)	106	7089	9300
2003	118 (130%)		5781 (106%)	1867 (103%)	393 (48%)	82	8241	8185
2004	136 (127%)		6130 (96%)	1715 (80%)	313 (33%)	159	8453	9600
2005	167 (130%)		4174 (54%)	2037 (80%)	292 (25%)	197	6867	11520
2006	99 (77%)		3191 (42%)	1874 (73%)	274 (24%)	183	5621	11520
2007	119 (93%)		4143 (54%)	1931 (75%)	385 (33%)	50	6628	11520
2008	109 (84%)		3638 (47%)	1800 (70%)	566 (49%)	121	6234	11579
2009	131 (102%)		5430 (70%)	2983 (116%)	716 (62%)	48	9308	11579
2010	170 (132%)		6240 (81%)	2609 (101%)	852 (74%)	128	9999	11579
2011	211 (143%)		8389 (95%)	3323 (112%)	1657 (124%)	129	13709	13316
2012	232 (125%)		11793 (106%)	4129 (112%)	1901 (114%)	166	18221	16645
2013	174 (111%)		8747 (93%)	2699 (86%)	1455 (103%)	23	13098	14148
2014	99 (94%)		6375 (101%)	2092 (99%)	785 (83%)	21	9372	9479
2015	118 (127%)		5679 (102%)	1657 (89%)	769 (92%)	6	8229	8342
2016	88 (109%)		4487 (93%)	1730 (107%)	692 (95%)	27	7024	7258
2017	110 (128%)		4885 (95%)	1677 (97%)	690 (89%)	12	7374	7751
2018	89 (116%)		4470 (97%)	1444 (94%)	583 (84%)	9	6595	6910
2019	90 (97%)		4526 (82%)	1559 (84%)	516 (62%)	170	6861	8329
2020	107 (88%)		3808 (53%)	2628 (109%)	543 (50%)	222	7308	10859
2021	155 (105%)		4249 (48%)	3379 (114%)	515 (21%)	149	8447	15000
2022	190 (130%)		3904 (45%)	3110 (107%)	587 (23%)	234	8025	15000
2023	108 (95%)		2855 (42%)	2987 (131%)	642 (24%)	287	6878	11901

*** UK Includes Channel Islands.**

**** TAC Applied to subareas 7–10 from 1995 to 2008 and to 7b–k, 8, 9 and 10 from 2009 onwards.**

Table 7.2. Haddock in 7.b,c, e-k. ICES estimate of the landings (lan) and discards (dis).

Year	BEL Lan	ESP Lan	FRA Lan	IRL Lan	UK Lan	Others Lan	Total Lan	FRA Dis*	IRL Dis**	Others Dis***	Total Dis****	Total Catch
1993							3348	505	594	109	1208	4556
1994							4131	1116	594	176	1886	6017
1995							4470	730	1221	267	2218	6688
1996							6756	3170	713	426	4309	11065
1997							10827	2129	502	253	2883	13710
1998							7928	680	140	114	934	8862
1999							4970	477	54	55	586	5556
2000							7499	1587	727	189	2503	10002
2001							9278	2234	743	441	3418	12696
2002	134	85	3878	2070	301	20	6488	871	5651	552	7073	13561
2003	116	82	5960	1731	362	41	8292	1835	6941	680	9456	17748
2004	137	143	6336	1785	303	73	8777	1108	5156	486	6750	15527
2005	166	209	4101	2078	285	0	6839	1564	5818	2571	9953	16792
2006	98	194	3131	1899	269	1	5592	1313	2745	1841	5899	11491
2007	117	186	4134	2139	385	1	6961	372	2483	696	3552	10513
2008	108	166	4577	1984	558	0	7392	990	3741	2930	7660	15052
2009	129	49	5503	3270	711	2	9664	905	3320	3098	7322	16986
2010	170	115	6421	2899	821	3	10429	3260	4570	10870	18701	29130
2011	211	78	8381	3702	1551	35	13957	3963	4329	7515	15807	29764
2012	232	79	12293	4596	1929	67	19196	2754	2653	2878	8285	27481
2013	174	51	8738	3097	1458	20	13538	671	1116	2175	3962	17501
2014	99	3	6350	2543	849	2	9846	1732	1171	2715	5619	15464
2015	118	0	5683	2035	766	6	8608	2024	2519	2398	6941	15549
2016	88	0	4573	2271	689	27	7648	5482	2810	3773	12065	19713
2017	111	0	4895	2381	699	11	8099	2633	1928	2130	6691	14789
2018	89	0	4377	1989	578	12	7046	1920	1189	2688	5798	12844
2019	89	89	4548	2412	518	0	7656	1616	1445	542	3603	11259
2020	102	176	3815	3193	546	27	7859	1450	1873	937	4260	12119
2021	149	108	4257	4211	516	19	9260	706	1075	604	2385	11645
2022	189	230	3915	3974	584	4	8895	1219	1049	505	2773	11668
2023	107	280	2855	3819	658	-	7718	246	1296	705	2246	9964

*** For 1993–2007 fixed discard ratios were used to estimate French discards.**

**** For 1993–1994, the mean Irish discards over 1995–1999 were used.**

***** Estimated from the proportion of the landings of `Others' between 1993 and 2012.**

****** Discard estimates are available from 2005; prior to 2005, discard estimates are based on limited sampling.**

Table 7.3. Haddock in 7.b,c, e–k. LPUE (kg/hour fishing) of haddock and effort (hours fishing x 1000) for Irish Otter trawls in 7.bc, 7.fgh and 7.jk, the French demersal fleet in 7.bc–ek and effort only for the UK trawl fleets (excluding beam trawls) in 7.e–k (effort in fishing days).

	FR GAD 7ek effort	FR GAD 7ek lpue	IRL OTB 7bc effort	IRL OTB 7bc lpue	IRL OTB 7fgh effort	IRL OTB 7fgh lpue	IRL OTB 7jk effort	IRL OTB 7jk lpue	UK Trawl 7e–k effort
1983	NA	NA	NA	NA	NA	NA	NA	NA	51.5
1984	NA	NA	NA	NA	NA	NA	NA	NA	161.8
1985	NA	NA	NA	NA	NA	NA	NA	NA	143.7
1986	NA	NA	NA	NA	NA	NA	NA	NA	123.5
1987	NA	NA	NA	NA	NA	NA	NA	NA	108.9
1988	NA	NA	NA	NA	NA	NA	NA	NA	112.9
1989	NA	NA	NA	NA	NA	NA	NA	NA	119.9
1990	NA	NA	NA	NA	NA	NA	NA	NA	133.2
1991	NA	NA	NA	NA	NA	NA	NA	NA	118.8
1992	NA	NA	NA	NA	NA	NA	NA	NA	129.9
1993	NA	NA	NA	NA	NA	NA	NA	NA	101.1
1994	NA	NA	NA	NA	NA	NA	NA	NA	88.5
1995	NA	NA	78	5.77	64	1.48	106	2.20	88.1
1996	NA	NA	47	4.16	60	5.35	73	3.24	89.5
1997	NA	NA	63	4.36	65	5.83	92	8.23	101.8
1998	NA	NA	79	5.71	72	4.09	99	5.88	94.6
1999	NA	NA	77	5.27	51	2.35	52	3.53	132.8
2000	306	6.12	74	4.73	61	10.43	72	4.25	141.1
2001	333	10.57	78	4.30	69	8.69	81	7.41	117.5
2002	289	10.63	63	2.81	79	3.22	108	5.50	113.1
2003	264	15.15	81	2.09	87	3.26	123	3.88	102.4
2004	217	19.39	82	2.51	97	3.49	108	3.35	105.5
2005	175	14.67	69	2.45	127	4.53	93	3.70	100.9
2006	167	10.64	60	2.56	119	4.19	89	3.59	106.3
2007	160	14.97	60	3.31	136	4.01	103	3.66	113.6
2008	148	19.60	48	4.36	127	4.56	84	4.60	93.7
2009	150	22.65	48	5.47	141	9.25	82	7.09	98.6
2010	131	30.83	54	4.36	144	7.33	101	5.15	103.7

	FR GAD 7ek effort	FR GAD 7ek lpue	IRL OTB 7bc effort	IRL OTB 7bc lpue	IRL OTB 7fgh effort	IRL OTB 7fgh lpue	IRL OTB 7jk effort	IRL OTB 7jk lpue	UK Trawl 7e–k effort
2011	216	22.90	40	6.39	129	10.51	84	5.58	87.1
2012	188	45.03	44	4.93	135	13.17	84	6.58	86.2
2013	215	27.40	42	5.38	126	8.69	80	4.92	40.3
2014	203	19.81	46	5.22	142	5.11	77	3.91	32.1
2015	NA	NA	31	4.42	150	4.95	78	2.91	21.2
2016	NA	NA	39	2.41	164	4.94	83	3.09	NA
2017	NA	NA	36	2.25	151	5.10	92	2.43	NA
2018	NA	NA	46	2.19	125	5.33	93	1.70	NA
2019	NA	NA	32	2.42	127	5.86	93	1.73	NA
2020	NA	NA	34	2.80	98	11.2	84	1.86	NA
2021	NA	NA	39	4.23	92	14.68	86	2.70	NA
2022	NA	NA	40	4.66	73	15.50	75	1.96	NA
2023	NA	NA	35	9.40	73	12.36	65	2.37	NA

Table 7.4. Haddock in 7.b,c, e–k. Landings numbers-at-age.

	Age0	Age1	Age2	Age3	Age4	Age5	Age6	Age7	Age8 +
1993	0	491	3291	948	810	255	129	129	45
1994	0	1277	5223	674	302	94	24	35	16
1995	0	4275	1622	1327	270	245	46	0	0
1996	0	3693	15998	818	313	93	32	10	9
1997	0	1353	9645	5553	716	354	139	144	110
1998	0	167	3184	7403	1443	307	178	86	61
1999	0	476	654	1464	2425	307	18	19	6
2000	0	2197	2996	784	741	1250	205	35	28
2001	0	4297	8638	1131	303	317	321	54	39
2002	0	879	4274	3400	765	39	89	74	26
2003	0	703	8791	2160	1226	116	43	49	51
2004	0	125	5948	4663	928	589	51	12	20
2005	0	1075	1732	4230	1821	280	75	1	3
2006	0	839	3250	1034	2189	484	42	28	0
2007	0	404	4617	2916	737	1310	161	33	4
2008	0	1692	3268	3736	1046	286	414	91	50
2009	0	338	7111	2760	1890	577	228	234	38
2010	0	1757	5192	6031	1036	580	257	110	123
2011	0	100	12726	3607	3410	661	261	129	132
2012	0	82	1135	19931	2559	1795	323	109	108
2013	0	86	465	1899	10533	861	468	96	44
2014	0	277	854	467	1511	5585	368	219	40
2015	0	41	4881	632	309	928	2030	257	80
2016	0	62	310	5200	216	143	546	682	92
2017	0	58	2019	1071	3930	135	117	246	312
2018	0	70	714	2833	926	1653	42	64	150
2019	0	513	1566	1257	2678	529	762	41	110
2020	0	120	4318	1449	755	1381	260	175	30
2021	0	285	1295	6691	740	569	640	248	169
2022	0	187	1067	2455	4952	317	175	176	82
2023	0	15	2676	1199	2470	3186	104	48	46

Table 7.5. Haddock in 7.b,c, e–k. Discard numbers-at-age.

	Age0	Age1	Age2	Age3	Age4	Age5	Age6	Age7	Age8+
1993	0	7617	2816	160	6	0	0	0	0
1994	0	15120	3069	170	5	0	0	0	0
1995	0	32830	1977	91	4	0	0	0	0
1996	0	20734	8976	187	9	0	0	0	0
1997	0	12613	10022	493	5	0	0	0	0
1998	0	3580	2348	445	5	0	0	0	0
1999	0	3742	1562	100	10	0	0	0	0
2000	0	29015	2521	64	3	0	0	0	0
2001	0	25234	6772	219	2	0	0	0	0
2002	0	21624	20729	249	7	0	0	0	0
2003	0	52412	11075	352	8	0	0	0	0
2004	0	11733	21598	1395	61	0	0	0	0
2005	0	30472	25291	6821	97	1	0	0	0
2006	0	20089	4529	11	10	4	1	0	0
2007	0	10748	8498	572	6	6	0	0	0
2008	0	34221	12620	1676	78	0	0	0	0
2009	0	21175	13989	592	64	0	0	0	0
2010	0	95699	19014	2742	34	1	0	0	0
2011	0	5881	58967	1675	262	16	1	0	1
2012	0	2732	5169	18518	153	55	2	0	0
2013	0	4076	2767	1372	4028	58	2	1	1
2014	0	20197	3315	507	631	732	4	1	0
2015	0	3590	18090	704	26	155	162	13	6
2016	0	27587	5222	8406	51	12	56	501	2
2017	0	3208	11913	1602	2121	31	2	4	3
2018	0	5287	5127	5306	491	215	0	2	2
2019	0	12878	2847	773	409	37	17	1	4
2020	0	2722	10938	597	28	25	1	1	0
2021	0	4890	3773	2799	23	12	1	0	0
2022	0	3498	2128	2216	1743	29	18	0	0
2023	0	566	5206	903	900	687	0	0	0

Table 7.6. Haddock in 7.b,c, e–k. VAST survey data.

Year \Age	0	1	2	3	4	5	6	7
2003	34657.1	183901.4	14824.11	1271.209	1077.005	20.317	15.05	8.221
2004	104108	18644.98	23294.92	2331.764	857.426	427.252	855.369	9.569
2005	76847.96	31331.95	4530.519	6780.567	867.029	210.172	50.803	0
2006	30897.08	10023.17	6396.957	1428.127	1299.173	240.659	56.086	32.995
2007	292627.7	15370.73	3664.862	2102.062	678.878	801.197	107.088	14.935
2008	84867.76	52050.11	2551.022	672.422	793.756	288.593	777.782	187.043
2009	895176.1	18738.14	15438	606.974	369.291	275.464	406.445	164.14
2010	36900.74	304741.5	10123.78	4855.938	247.623	213.787	354.202	110.356
2011	22551.86	13340.71	75804.35	2271.317	1240.737	211.431	146.219	51.953
2012	7666.998	6687.683	3972.997	13359.49	748.524	585.504	109.112	51.764
2013	261170.2	2477.077	2832.642	1366.481	5305.446	371.162	418.306	48.924
2014	30548.27	55737.78	1017.904	865.09	931.7	1846.524	347.384	129.816
2015	132153.5	26940.71	16984.26	596.107	374.817	617.137	1228.794	78.781
2016	21883.07	47017.02	12361.18	5441.418	428.786	196.485	933.596	265.76
2017	69643.4	6054.359	15135.19	2681.514	927.991	90.063	17.304	189.139
2018	281978.1	9037.188	1621.882	2571.67	1496.166	678.873	28.096	28.995
2019	104146.9	127131.6	4507.18	964.693	1677.255	481.623	348.946	25.758
2020	32072.81	37079.58	54321.79	944.239	493.966	1061.173	1272.678	358.153
2021	74420.03	14555.64	12443.3	12688.66	277.992	73.44	349.207	162.558
2022	867.503	23531.07	5573.722	4502.198	5772.396	166.346	91.706	130.105
2023	931.74	610.792	11343.55	1614.277	1441.52	2096.595	140.238	11.766

Table 7.7. Haddock in 7.b,c, e–k. Fishing mortality- (F) at-age.

	Age0	Age1	Age2	Age3	Age4	Age5	Age6	Age7	Age8
1993	0	0.332	0.724	0.576	0.576	0.568	0.551	0.617	0.617
1994	0	0.324	0.702	0.555	0.547	0.536	0.52	0.582	0.582
1995	0	0.321	0.698	0.555	0.546	0.533	0.518	0.578	0.578
1996	0	0.313	0.691	0.56	0.554	0.539	0.524	0.583	0.583
1997	0	0.322	0.721	0.608	0.62	0.613	0.602	0.665	0.665
1998	0	0.316	0.716	0.614	0.646	0.65	0.644	0.706	0.706
1999	0	0.302	0.69	0.592	0.628	0.636	0.633	0.686	0.686
2000	0	0.324	0.758	0.656	0.704	0.72	0.72	0.763	0.763
2001	0	0.33	0.786	0.689	0.752	0.772	0.777	0.815	0.815
2002	0	0.319	0.777	0.684	0.76	0.789	0.801	0.838	0.838
2003	0	0.307	0.748	0.669	0.754	0.83	0.857	0.896	0.896
2004	0	0.306	0.744	0.662	0.735	0.817	0.842	0.862	0.862
2005	0	0.298	0.709	0.603	0.633	0.672	0.667	0.676	0.676
2006	0	0.263	0.609	0.507	0.518	0.544	0.54	0.574	0.574
2007	0	0.248	0.584	0.49	0.48	0.491	0.484	0.523	0.523
2008	0	0.247	0.598	0.521	0.506	0.507	0.505	0.564	0.564
2009	0	0.23	0.565	0.519	0.519	0.527	0.526	0.595	0.595
2010	0	0.21	0.525	0.504	0.52	0.544	0.555	0.642	0.642
2011	0	0.192	0.485	0.491	0.528	0.572	0.6	0.715	0.715
2012	0	0.181	0.458	0.481	0.531	0.593	0.634	0.774	0.774
2013	0	0.171	0.43	0.449	0.497	0.559	0.605	0.758	0.758
2014	0	0.158	0.403	0.427	0.467	0.532	0.581	0.745	0.745
2015	0	0.145	0.373	0.411	0.449	0.512	0.569	0.744	0.744
2016	0	0.144	0.366	0.416	0.461	0.524	0.579	0.76	0.76
2017	0	0.141	0.365	0.426	0.488	0.558	0.604	0.784	0.784
2018	0	0.135	0.352	0.422	0.487	0.563	0.604	0.784	0.784
2019	0	0.119	0.314	0.395	0.477	0.564	0.614	0.799	0.799
2020	0	0.106	0.277	0.363	0.46	0.563	0.609	0.787	0.787
2021	0	0.109	0.28	0.372	0.496	0.635	0.699	0.897	0.897
2022	0	0.109	0.275	0.362	0.484	0.626	0.697	0.896	0.896
2023	0	0.117	0.289	0.373	0.492	0.623	0.681	0.871	0.871

Table 7.8. Haddock in 7.b,c, e–k. Stock numbers-at-age (start of year) (`1000).

	Age0	Age1	Age2	Age3	Age4	Age5	Age6	Age7	Age8
1993	136156	49682	12994	4506	1238	369	300	188	87
1994	400185	45383	17435	3517	1579	443	137	115	100
1995	473824	135535	15666	4841	1255	599	172	55	83
1996	165127	160880	47081	4324	1726	474	237	69	53
1997	58956	55508	58936	12692	1526	649	188	97	48
1998	86301	19599	19236	16754	4033	525	236	70	52
1999	365380	28769	6892	5304	5755	1293	180	83	41
2000	347571	124329	10464	1945	1859	2016	448	65	43
2001	475192	116519	43548	2726	623	609	646	144	35
2002	1009731	159202	40009	11221	828	187	190	196	54
2003	232693	345601	57562	9814	3597	231	59	58	74
2004	347182	80248	119250	15173	3060	1068	64	17	36
2005	242907	115439	29985	31363	4742	896	279	16	15
2006	186495	79864	39443	8138	10134	1558	286	89	11
2007	703465	63896	29716	11961	3156	3917	590	113	36
2008	393393	229802	24496	9339	4479	1313	1590	246	64
2009	2401344	131042	85193	7600	3508	1747	559	652	119
2010	204335	806739	51954	27076	2896	1372	699	230	296
2011	86208	69508	309456	17107	9943	1203	539	272	199
2012	56808	28709	29678	103842	6513	3771	474	200	162
2013	627247	19600	11781	11805	38631	2513	1368	171	113
2014	215795	207471	8323	4278	5385	14804	987	500	91
2015	482405	74731	84798	3207	1713	2464	5740	383	191
2016	98216	163740	33192	32090	1296	708	1063	2178	188
2017	144659	32738	66171	13357	12373	507	280	413	752
2018	920762	45443	14040	24782	5630	4787	187	106	372
2019	308835	311039	18095	5654	9907	2279	1795	70	156
2020	154967	100757	136524	6793	2347	3909	894	647	70
2021	234566	52335	44724	58565	2683	928	1410	337	227
2022	8353	79521	22354	19658	25521	1015	327	448	156
2023	4104	2949	35923	9447	8591	10254	352	107	161

Table 7.9. Haddock in 7.b,c,e–k. Stock Summary: Estimated recruitment, spawning–stock biomass (SSB), and average fishing mortality.

Year	Low	R(age 0)	High	Low	SSB	High	Low	Fbar(3-5)	High
1993	65039	136156	285039	6115	9236	13948	0.40	0.57	0.83
1994	245618	400185	652018	7566	10995	15979	0.40	0.55	0.76
1995	291900	473824	769133	8183	11578	16381	0.41	0.55	0.73
1996	102561	165127	265861	15401	20813	28128	0.42	0.55	0.73
1997	36627	58956	94897	19167	25326	33465	0.48	0.61	0.78
1998	53458	86301	139320	15485	19884	25534	0.51	0.64	0.80
1999	227790	365380	586077	10497	13147	16466	0.50	0.62	0.77
2000	218042	347571	554046	9579	11655	14180	0.57	0.69	0.84
2001	303962	475192	742878	14056	18511	24378	0.61	0.74	0.89
2002	658021	1009731	1549426	18376	23546	30171	0.62	0.74	0.90
2003	157956	232693	342794	22289	27899	34920	0.61	0.75	0.92
2004	237526	347182	507463	31972	40622	51612	0.59	0.74	0.92
2005	165861	242907	355744	23704	29128	35793	0.52	0.64	0.78
2006	125904	186495	276245	20371	24529	29534	0.41	0.52	0.66
2007	479952	703465	1031067	19042	22418	26392	0.39	0.49	0.61
2008	269643	393393	573936	17484	20644	24375	0.42	0.51	0.63
2009	1636595	2401344	3523446	26402	32509	40029	0.43	0.52	0.64
2010	133955	204335	311691	32758	38900	46193	0.43	0.52	0.64
2011	59521	86208	124860	77023	98507	125983	0.44	0.53	0.65
2012	38240	56808	84390	56384	70609	88423	0.44	0.54	0.66
2013	429961	627247	915056	36601	45453	56447	0.41	0.50	0.61
2014	145940	215795	319087	23476	28588	34814	0.39	0.48	0.58
2015	331718	482405	701543	32384	39786	48880	0.37	0.46	0.56
2016	67204	98216	143538	30886	37113	44595	0.38	0.47	0.57
2017	95422	144659	219303	35825	42970	51540	0.40	0.49	0.60
2018	625003	920762	1356477	27966	33265	39568	0.40	0.49	0.60
2019	209689	308835	454858	25080	29349	34345	0.39	0.48	0.59
2020	104372	154967	230086	45339	57873	73873	0.37	0.46	0.58
2021	151342	234566	363555	44201	55479	69635	0.39	0.50	0.64
2022	4759	8353	14660	33702	42137	52684	0.38	0.49	0.64
2023	1827	4104	9217	27276	34916	44696	0.36	0.50	0.69
2024	4104	234566*	2401344	16427	16427	31739			

*** Median resampled (1993–2023), as estimated by stochastic projection.**

Table 7.10. Haddock in divisions 7.b,c,e–k. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 3–5}$ (2024)	0.496	$F = F_{Average\ (2021–2023)}$, rescaled to F_{2023}
SSB (2025)	13307	Short-term forecast; in tonnes
$R_{age\ 0}$ (2024, 2025)	234566	Median recruitment, resampled from the years 1993–2023; in thousands
Total catch (2024)	7698	Short-term forecast; in tonnes
Projected landings (2024)	6874	Short-term forecast, assuming average 2021–2023 landing pattern; in tonnes
Projected discards (2024)	824	Short-term forecast, assuming average 2021–2023 discard pattern; in tonnes

* **Random resampling of a distribution may lead to different median estimates.**

Table 7.11. Haddock in divisions 7.b,c,e–k. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2025)	Projected landings (2025)	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_{MSY}	4644	3375	1269	0.353	0.282	0.071	19379	46	-44	7.5
Other scenarios										
EU MAP ^^: F_{MSY}	4644	3375	1269	0.353	0.282	0.071	19379	46	-44	7.5
EU MAP^^ $F_{MSY\ lower}$	3099	2277	822	0.221	0.177	0.044	20896	57	-62	4.5
EU MAP^^ $F_{MSY\ upper}$	6353	4548	1805	0.521	0.416	0.105	17715	33	-23	11.6
F = 0	0	0	0	0	0	0	24025	81	-100	1.14
F_{pa}	7978	5624	2354	0.71	0.57	0.142	16118	21	-3	16.8
F_{lim}	12384	8239	4145	1.40	1.12	0.28	12013	-9.7	50	34
$SSB_{2026} = B_{lim}$	15544	9778	5766	2.2	1.75	0.44	9227	-31	88	50
$SSB_{2026} = B_{pa}$= MSY $B_{trigger}$	11488	7748	3740	1.23	0.98	0.25	12822	-3.6	39	30
$F = F_{2024}$	6115	4387	1728	0.50	0.40	0.100	17946	35	-26	11.0
$SSB_{2026} = SSB_{2025}$	10968	7451	3517	1.14	0.91	0.23	13307	0.00	33	28

* SSB_{2026} forecast relative to SSB_{2025}.
^ Advice values for 2025 relative to the MSY value for 2024 (8252 tonnes).
^^ EU multiannual plan (MAP) for the Western Waters (EU, 2019).

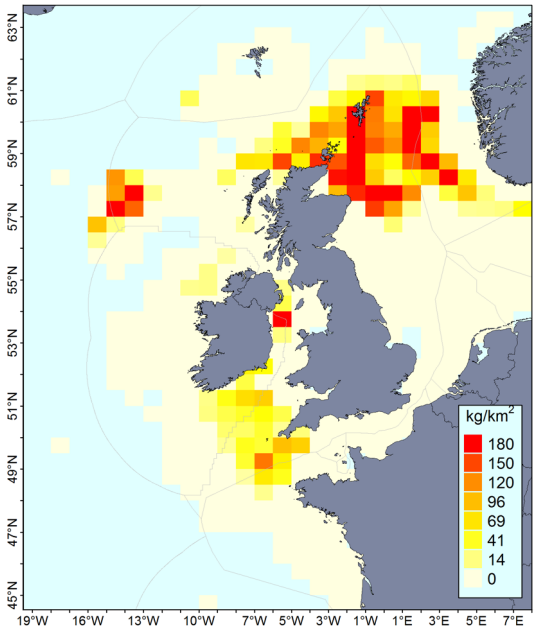

Figure 7.1. International haddock landings by ICES rectangle (all gears; 2016–2020, data from https://stecf.jrc.ec.europa.eu/data-dissemination).

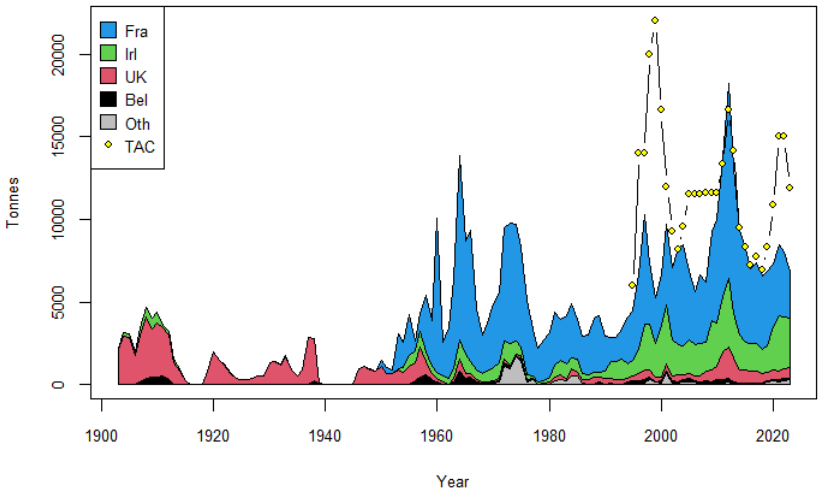

Figure 7.2. Haddock in 7.b,c,e–k. Official ICES landings and TAC of haddock in 7.b–k.

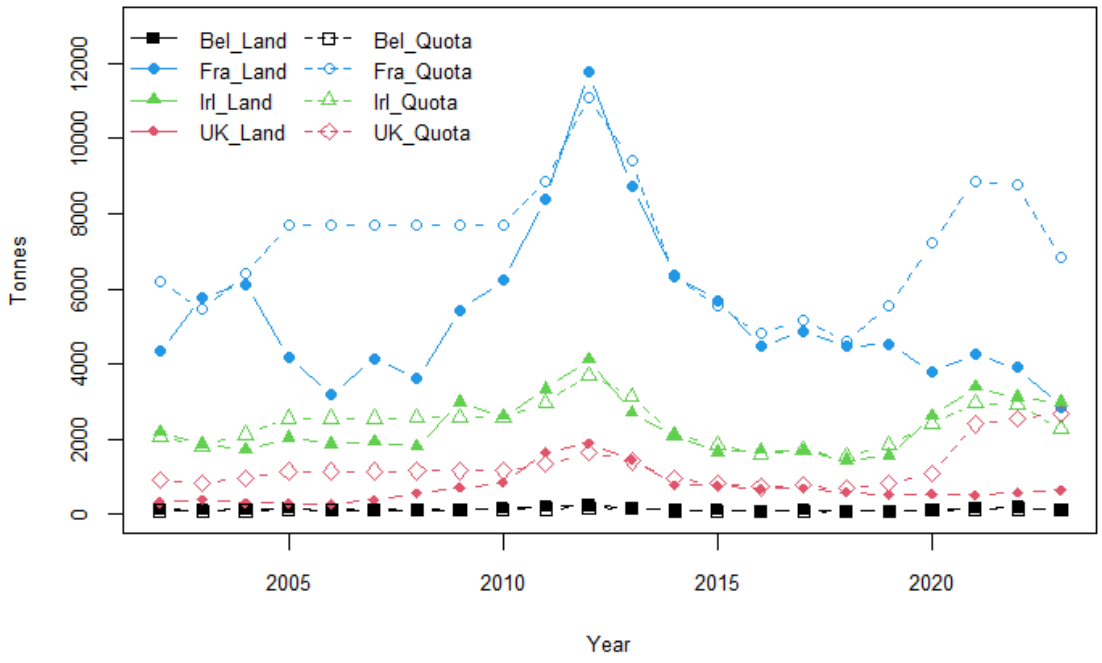

Figure 7.3. Haddock in 7.b,c,e–k. Official ICES landings and quota by country.

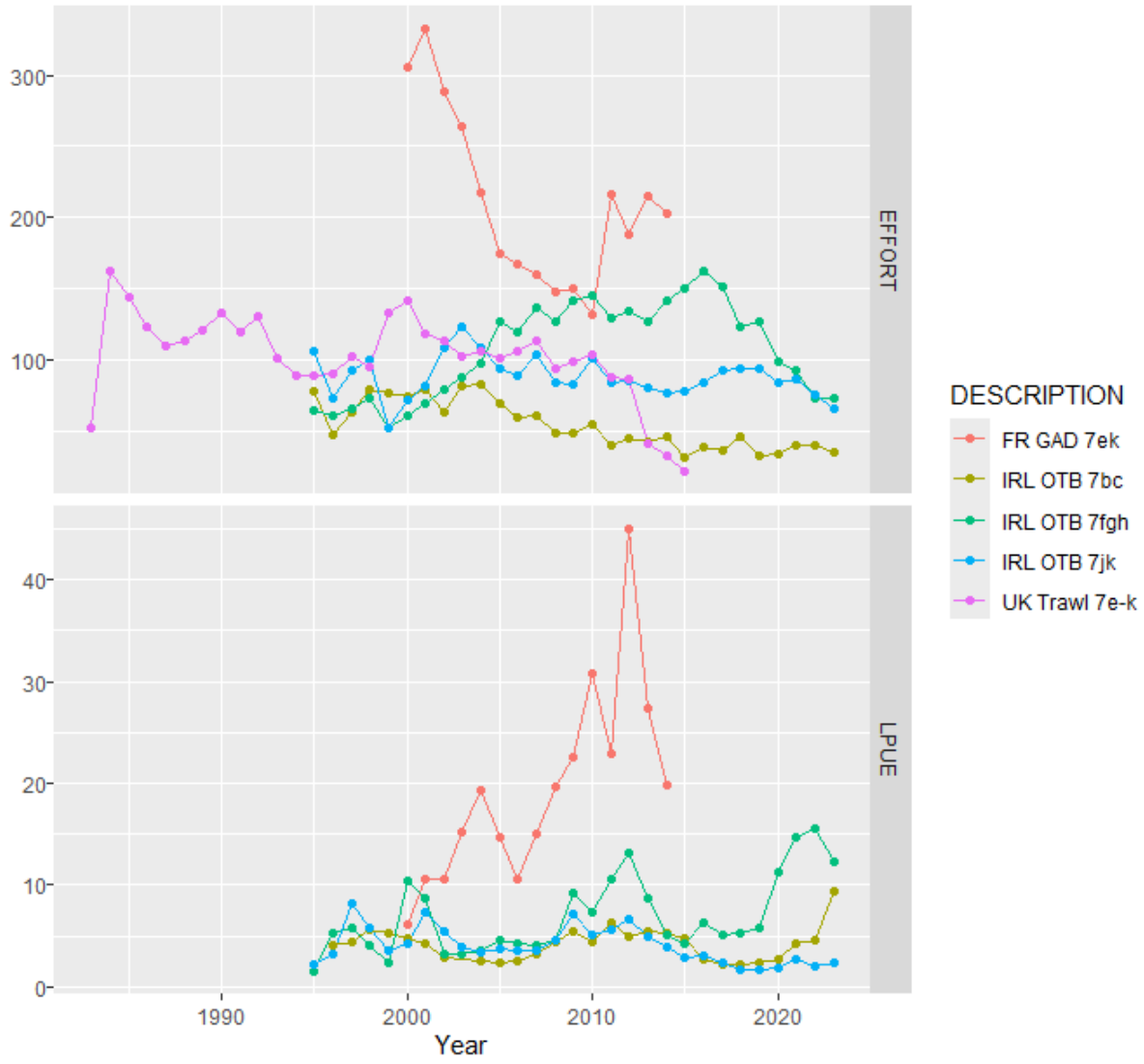

Figure 7.4. Haddock in 7.b,c,e–k. Effort ('1000 h) of the Irish Otter trawl fleets, the French demersal otter trawl fleet and for UK trawl fleet (effort in fishing days, rescaled to other fleets) and LPUE(kg/h) for the Irish and French fleets.

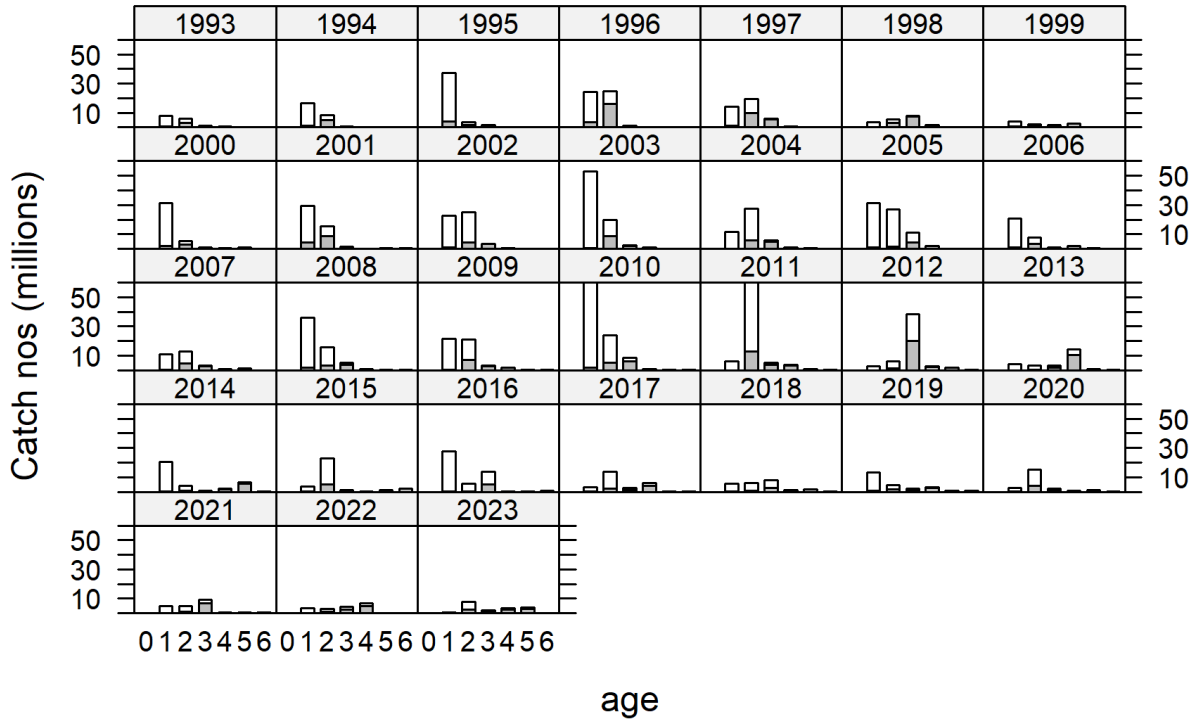

Figure 7.5. Haddock in 7.b,c,e–k. Catch by number by age class (grey = landings, white = discards).

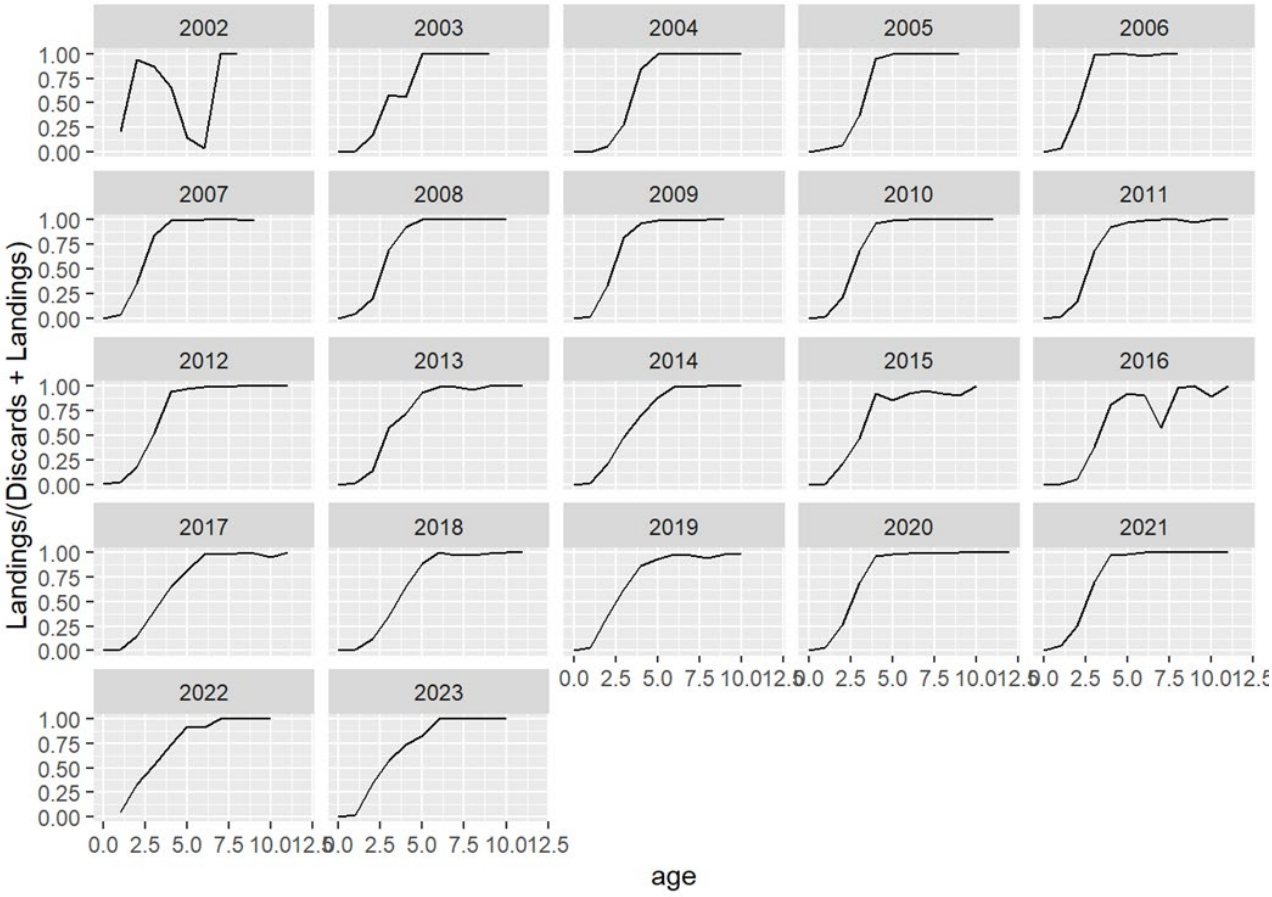

Figure 7.6. Haddock in 7.b,c,e–k. Proportional representation of landings relative to catch (discards + landings) by age.

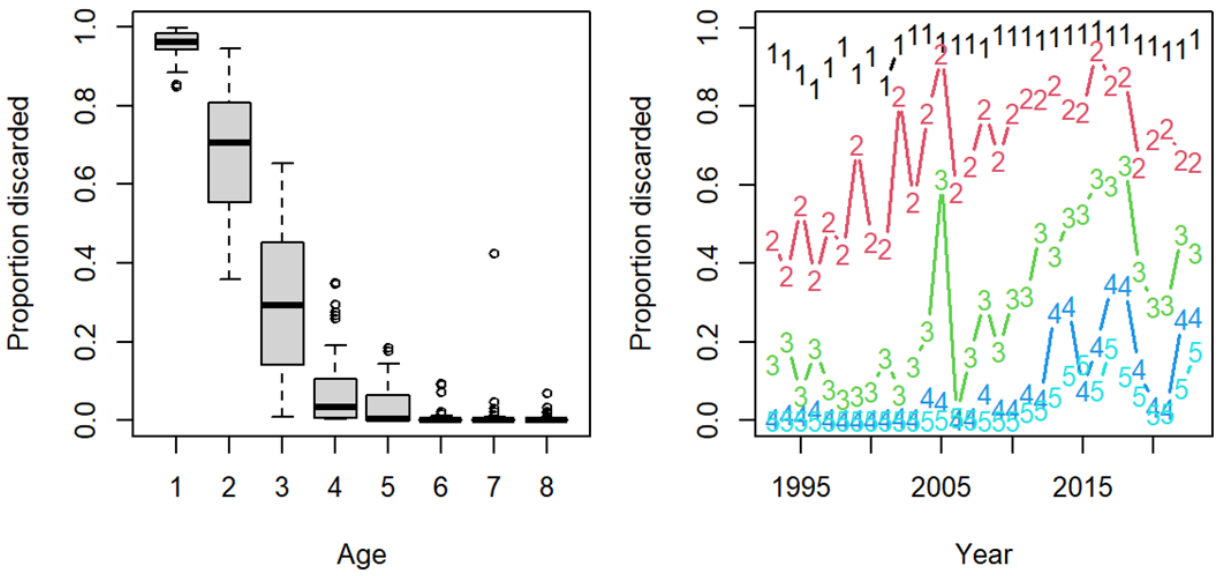

Figure 7.7. Haddock in 7.b,c,e–k. Proportion of discards by age (left) and year (right).

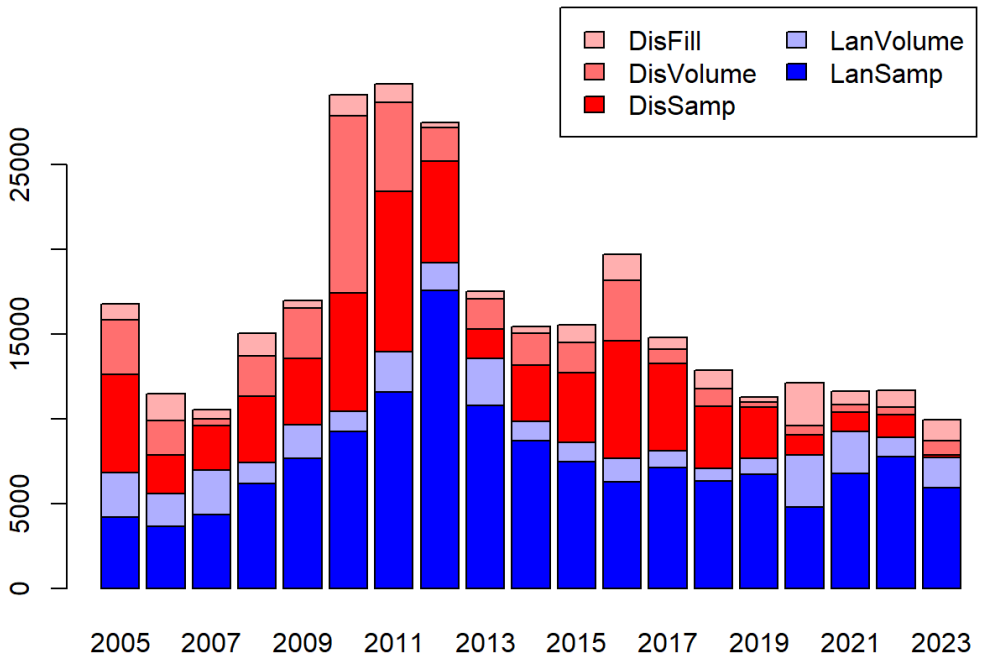

Figure 7.8. Haddock in 7.b,c,e–k. Distribution sampled and unsampled catches by country.

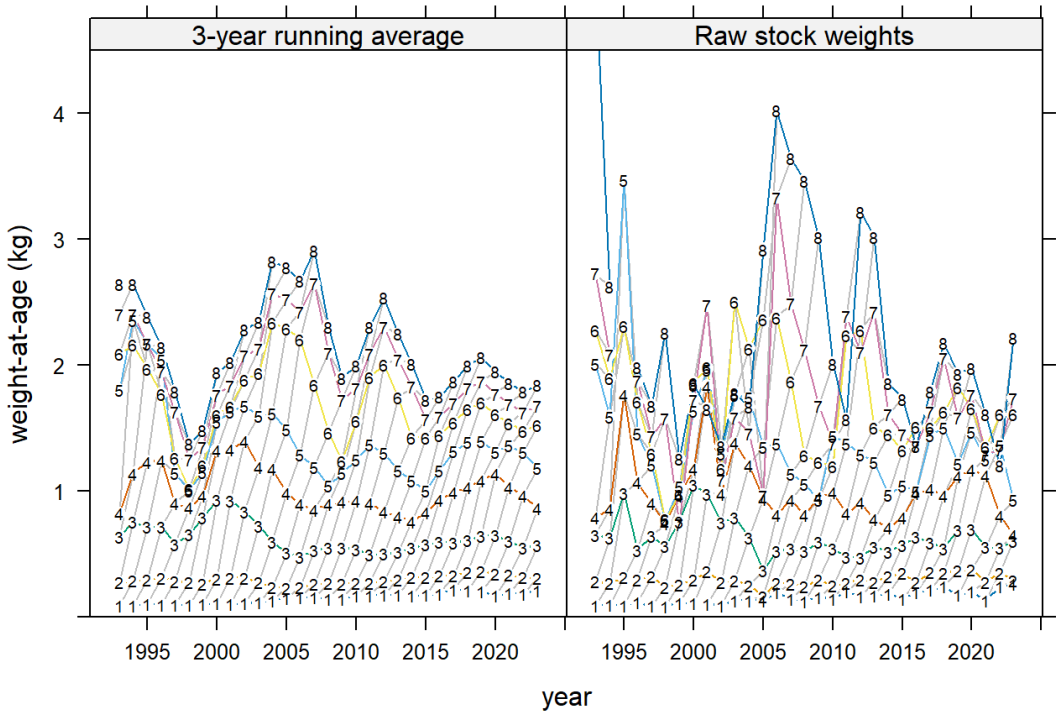

Figure 7.9. Haddock in 7.b,c,e–k. Raw stock weights-at-age (right) and the three-year running average stock weights (left).

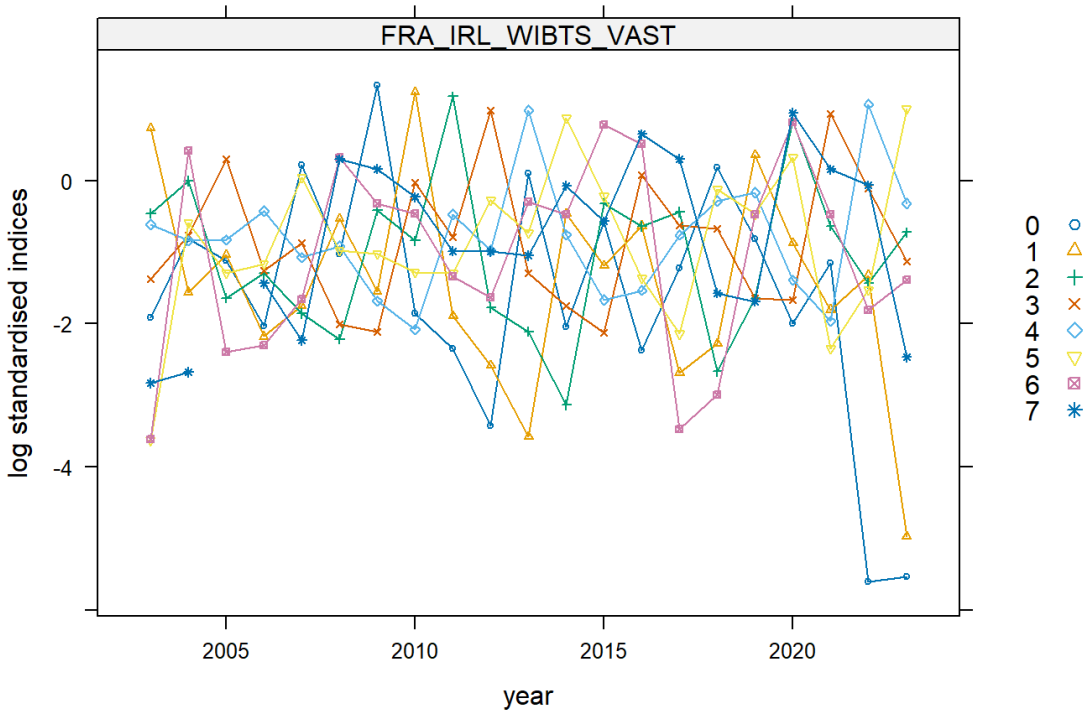

Figure 7.10. Haddock in 7.b,c,e–k. Log VAST standardised tuning fleets by year. The FRA-IRL-IBTS survey is the combined French EVHOE Q4 WIBTS and Irish IGFS Q4 WIBTS survey.

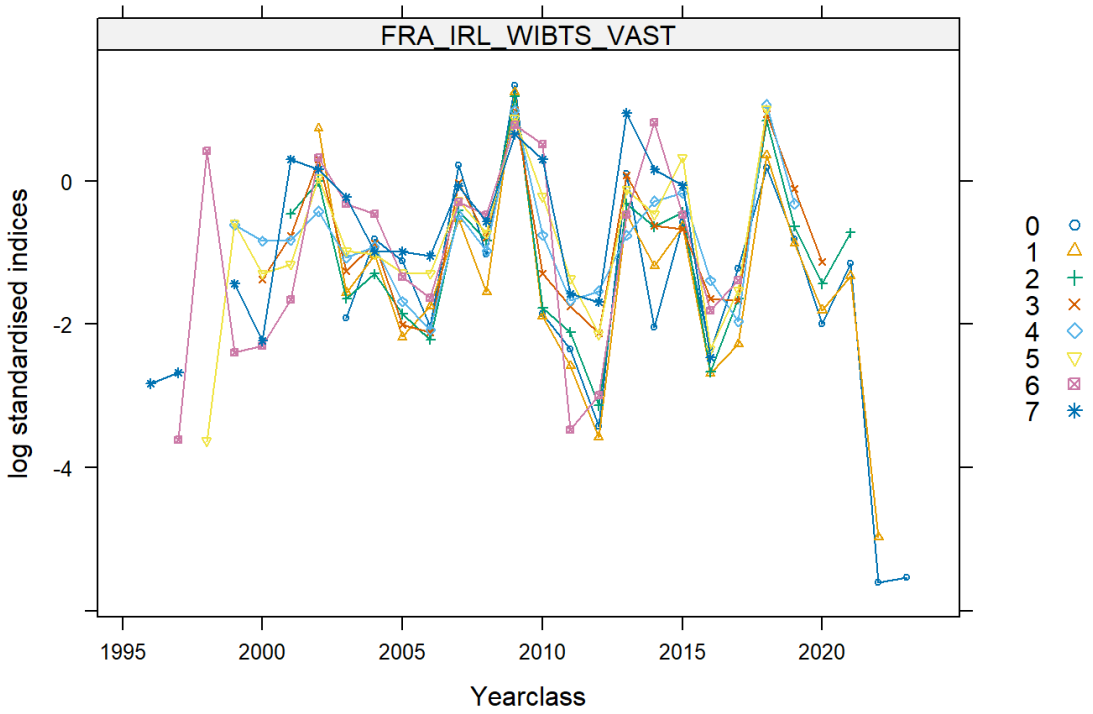

Figure 7.11. Haddock in 7.b,c,e–k. Log VAST standardised tuning fleets by cohort.

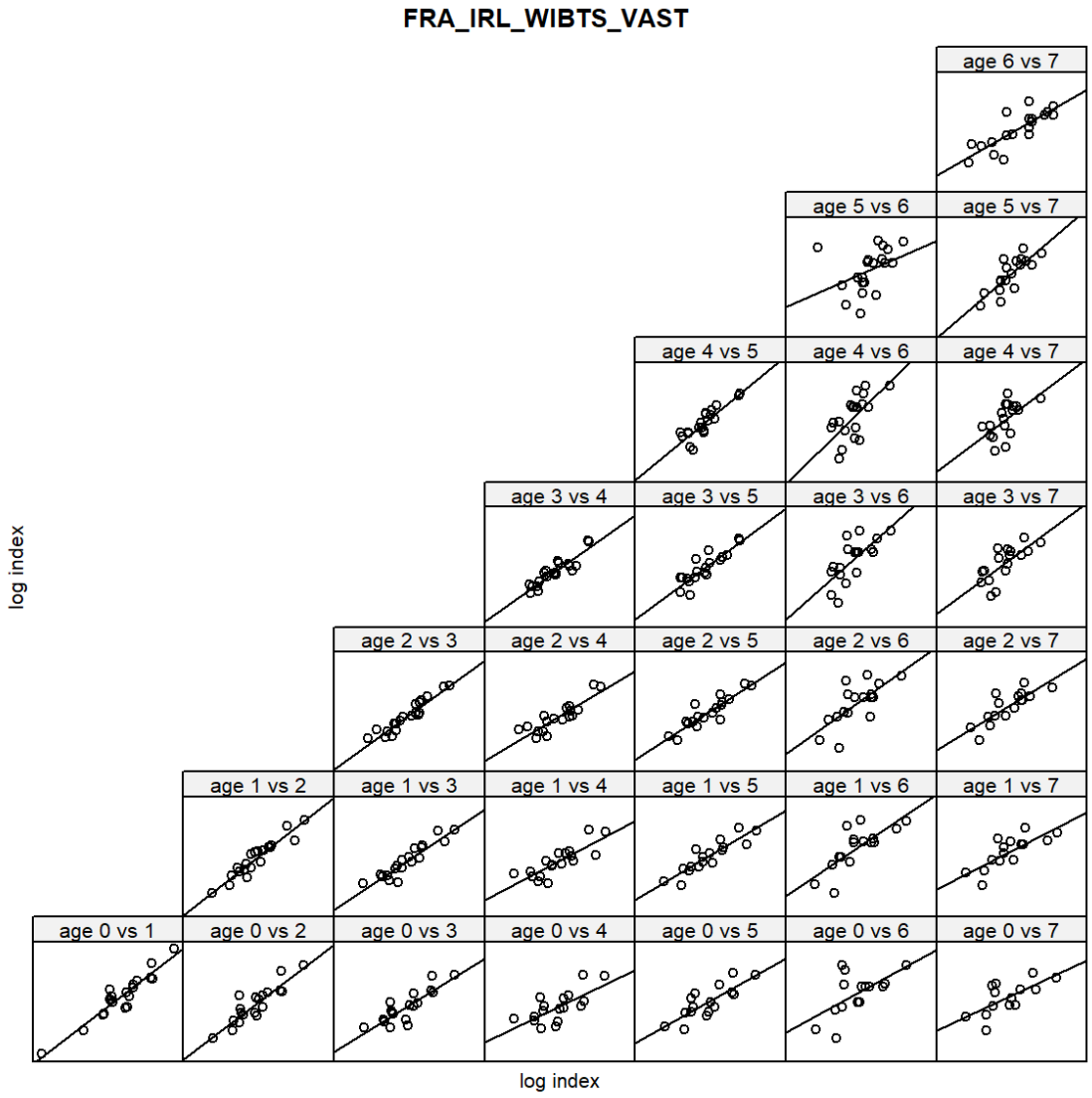

Figure 7.12. Haddock in 7.b,c,e–k. Scatterplot matrix of log indices of cohorts at different ages.

Figure 7.13. Haddock in 7.b,c,e–k. Residuals of the proportions-at-age in catch (upper) and survey (lower).

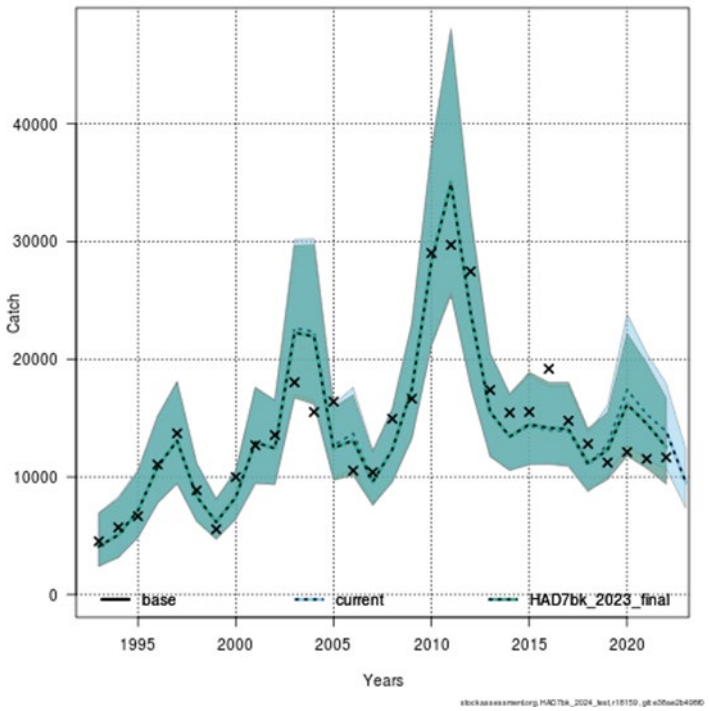

Figure 7.14. Haddock in 7.b,c,e–k. Observed (line) and predicted (x) catches.

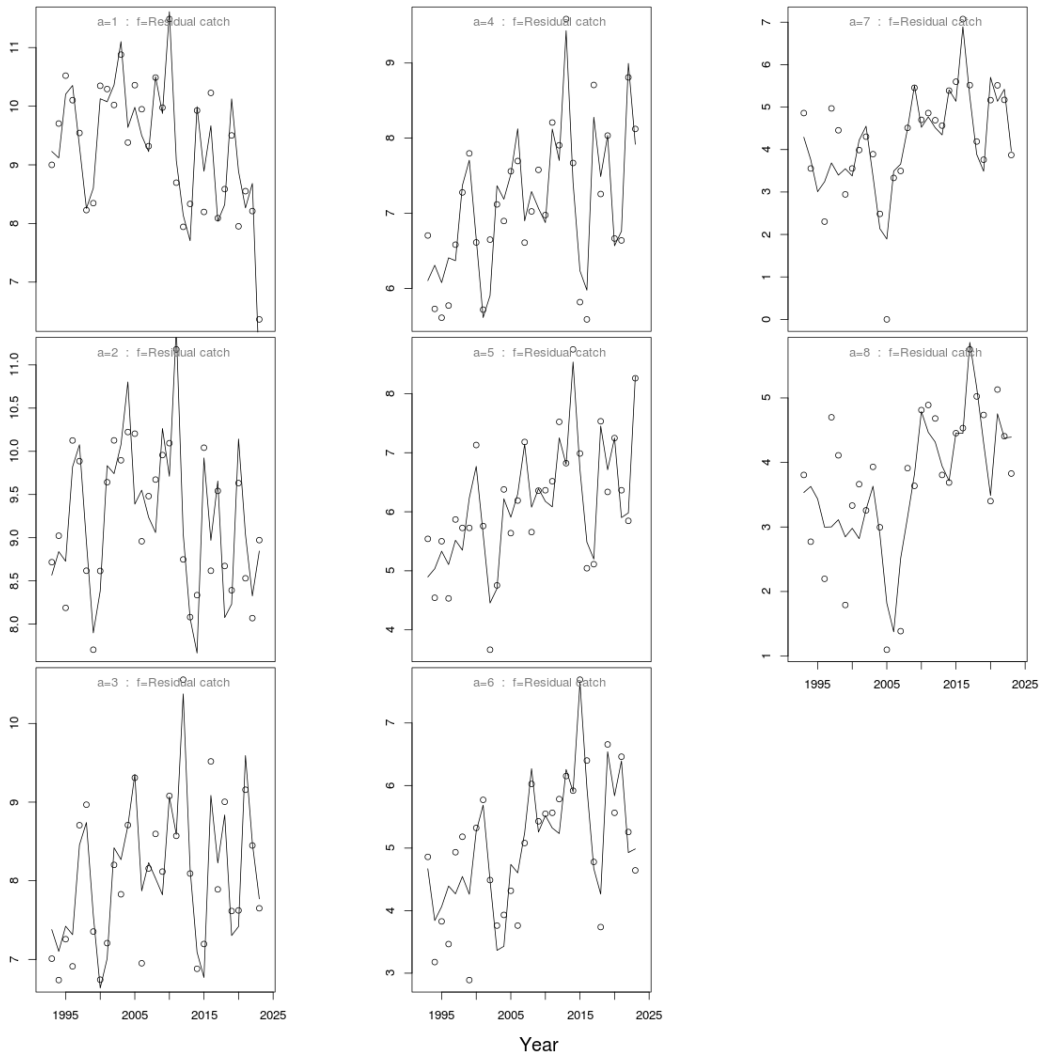

Figure 7.15. Haddock in 7.b,c,e–k. Observed and predicted (circles and line respectively) catch-at-age.

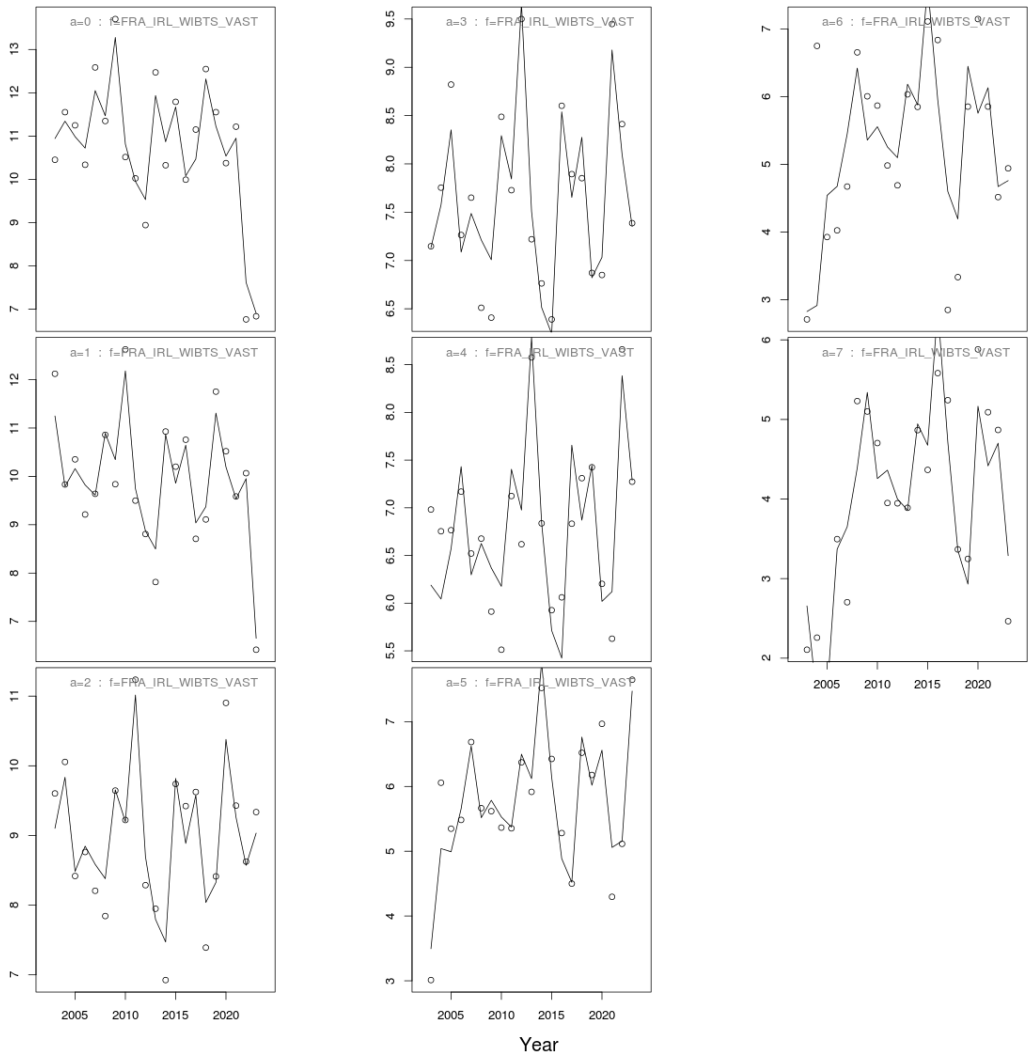

Figure 7.16. Haddock in 7.b,c,e–k. Observed and predicted (circles and line respectively) VAST survey indices.

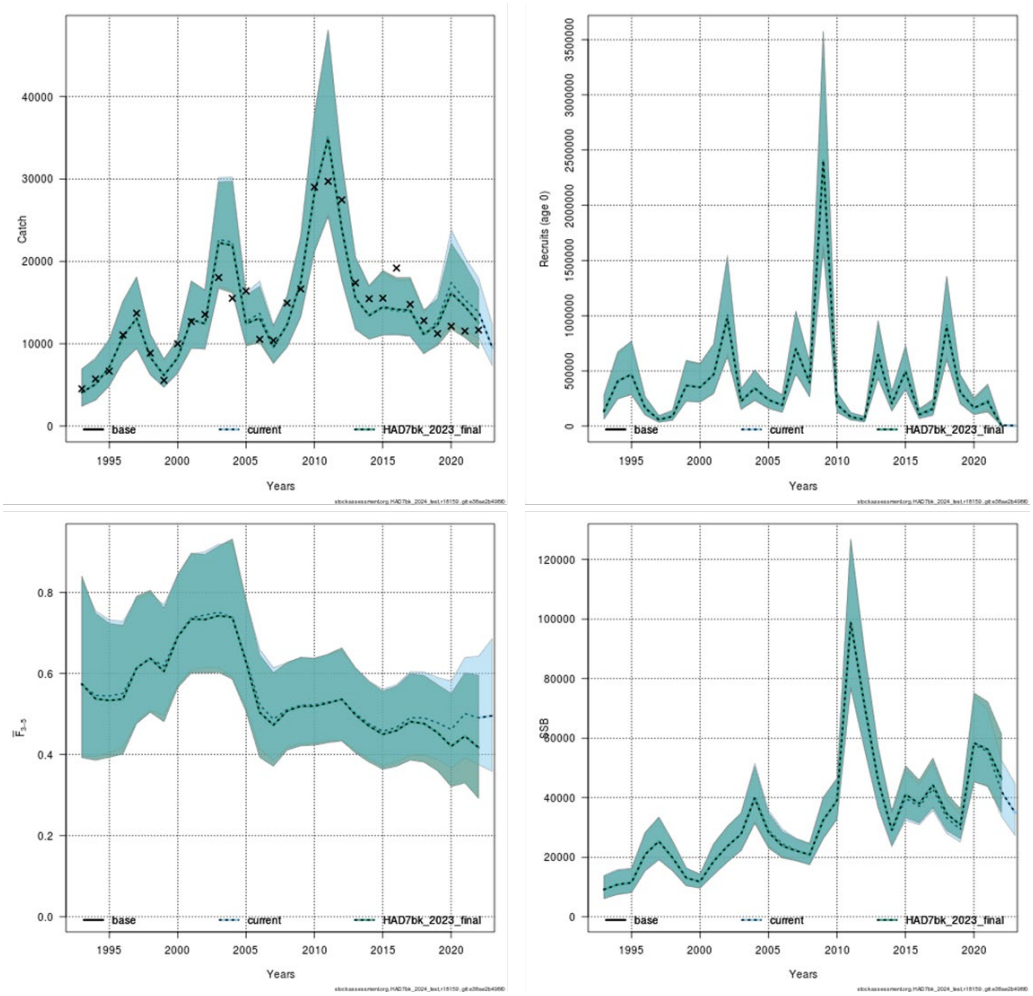

Figure 7.17. Haddock in 7.b,c,e–k. SAM assessment stock summary plots.

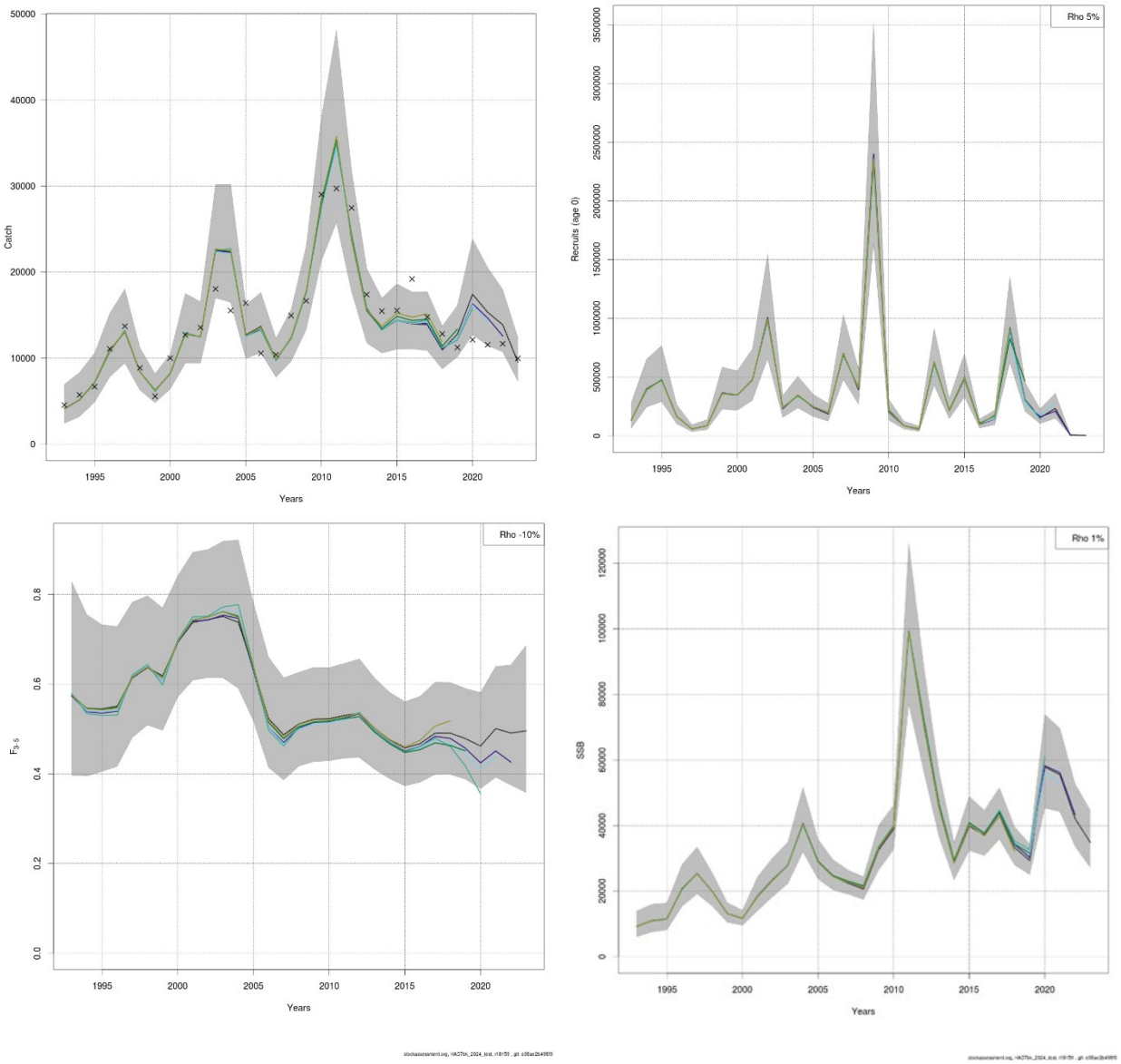

Figure 7.18. Haddock in 7.b,c,e–k. Retrospective analysis of the final SAM assessment run. Catch (top left), recruitment (top right), F (bottom left) and SSB (bottom right).

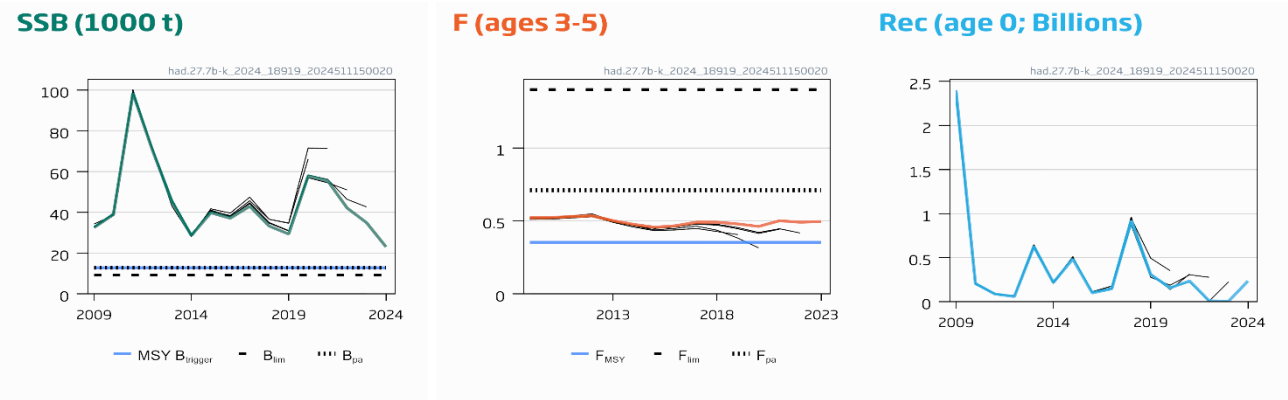

Figure 7.19. Haddock 7.b,c,e–k. Historical assessment results (final-year recruitment and SSB assumptions included).

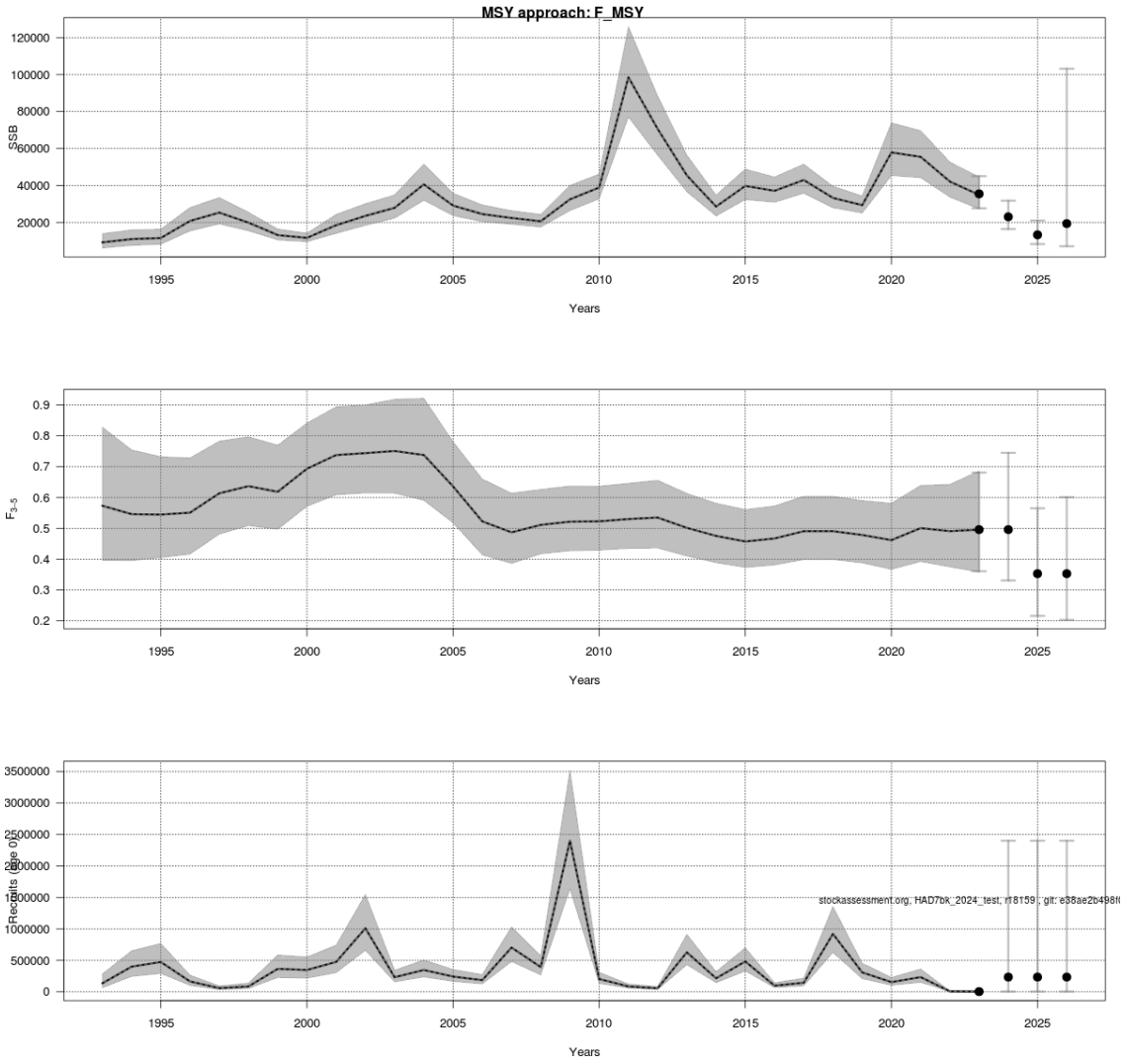

Figure 7.20. Haddock in 7.b,c,e–k. Assessment and forecast of the final SAM run. SSB (top), and F (middle) and recruitment (bottom).

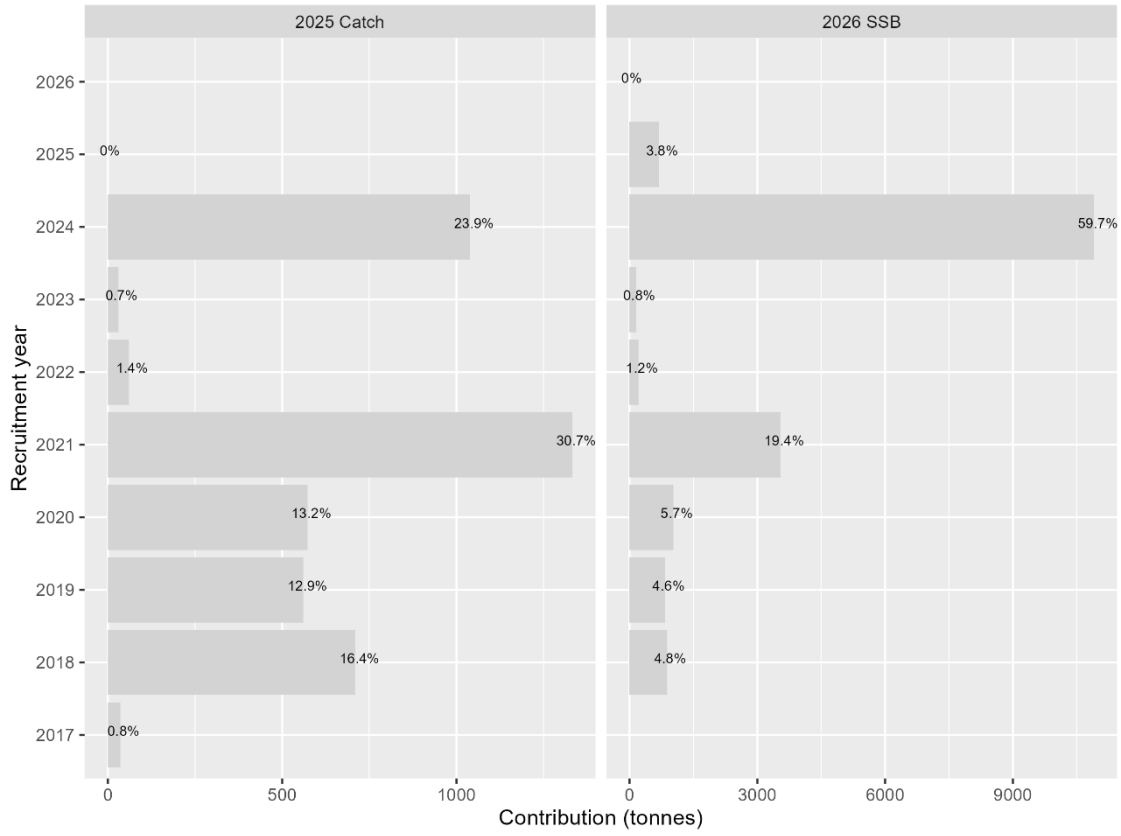

Figure 7.21. Haddock 7.b,c,e–k. Recruitment Contribution of recent year classes used in predictions, and the relative (%) contributions to catch and SSB (by weight) of these year classes.