

8 Mackerel in Northeast Atlantic and adjacent waters

Scomber scombrus in subareas 1–8 and 14 and divisions 9.a, 12.a and 12.b (mac.27.nea)

8.1 ICES advice and international management applicable to 2026

From 2001 to 2007, there was an internationally agreed arrangement covering most of the distribution area of the Northeast Atlantic mackerel. From 2008 to 2014, no agreement was reached among the Coastal States on the sharing of the mackerel quotas. In 2014, three of the Coastal States (European Union, Norway and the Faroe Islands) agreed on a sharing arrangement for 2014 to 2018. In November 2018, the 2014 agreement was extended for a further two years until 2020. No agreement on the share of the stock was reached from 2021 to 2024. In 2024, three of the Coastal States (UK, Norway and the Faroe Islands) agreed on a three year (2024-2026) sharing arrangement of mackerel. However, in late 2025 Iceland joined in forming a four-party sharing arrangement for 2026 onwards.

Despite various agreements, the total declared quotas in each of the years 2015 to 2026 all exceeded the TAC advised by ICES. An estimate of the expected quota uptake in 2026 was carried out by the Working Group based on the declared quotas by nations (as reported to NEAFC and documented in Coastal States Agreed Records), transfer from the previous year, and an estimation of uptake for the remainder of the year. The expected total catch of mackerel for 2026 is 398 thousand tonnes, exceeding the ICES advice for 2026 (174 thousand tonnes) by approximately 224 thousand tonnes (128%).

8.2 The fishery

8.2.1 Fleet Composition in 2025

The total fleet can be considered to consist of the following components: freezer trawlers, purse seiners, pelagic trawlers, lines and jigging and gillnets.

The fishery in 2025

The total ICES estimated catch for 2025 was 809 175 tonnes. The fishery includes catch from 16 countries. Catches per ICES statistical rectangle are shown in Figures 8.2.2.1 to 8.2.2.4. It should be noted that these figures are a combination of official catches and ICES estimates and may not indicate the true location of the catches or represent the location of the entire stock. These data are based on catches reported by all the major catching nations and represents almost the entire ICES estimated catch.

Of the total catch in 2025, the UK accounted for the greatest proportion (23%) followed by Norway (19%), Iceland (16%) and Russia (14%) and Faroes (8%). In the absence of sharing arrangements, the fishing parties declared unilateral quotas for 2025.

In 2025, catches in the northern areas (Subareas 1, 2, 5, 14, 12a, 12b) remained high and amounted to 417 401 tonnes which is an increase of around 74 000 tonnes from 2024 (see Table 8.2.2.1). UK and Norwegian catches decreased in 2025 and were 182 000 t and 156 000 t respectively. Icelandic

and Russian were over 100 000t in 2025. Increased catches were also reported from Greenland with over 35 000 t landed.

Catches from Division 2.a accounted for 51% of the total catch in 2025, an increase from 38% in 2024. Catches were taken over a wide geographical area with a similar distribution as in 2024. The most notable difference in 2025 was higher concentrations in the international zone (33%), than in 2024 (14%). Catches around Iceland were low and there were no catches from Subarea 12 or 14.

The time series of catches by country from the North Sea, Skagerrak and Kattegat (Subarea 4, Division 3.a) is given in Table 8.2.2.2. Catches in 2025 were at a lower level (290 kt) than 2023 and 2024 which were around 370 kt. Catches in 2025 accounted for 36% a decrease from 41% in 2024. The majority of the catch is from Subarea 4. Small catches were also reported in Divisions 3.a-d.

Catches in the western area (Subareas 6, 7 and Divisions 8.a, b, d and e) reduced significantly in 2025 to around 79 000 t, down from 150 000 t in 2024. Most of this catch is taken in 6.a. The catches are detailed in Table 8.2.2.3.

Table 8.2.2.4 details the catches in the southern areas (Divisions 8.c and 9.a) which are taken mainly by Spain and Portugal. The reported catch in 2025 is 21 897 t which is similar to 2024.

8.2.2 Quarterly Distribution of the catch

The proportion of the catches by quarter (%) is presented in Table 8.2.3.1 and Figure 8.2.3.1.

The quarterly distribution of catch from 2010-2025 is similar to recent years with the northern summer fishery in Q3 accounting for the greatest proportion of the total catch. The average proportion taken in quarter 3 from 2010-2025 is 48%. In 2025 there was an increase in the proportion taken in Q3 from 49% in 2024 to 52% in 2025. A decrease was seen in Q4 from 27% to 18%. The proportion of the catch taken in quarters 1 and 2 has increased from 24% to 30%.

- First quarter 2025 (192 238 tonnes – 24%)

The distribution of catches in the first quarter is shown in Figure 8.2.2.1. The proportion of the fishery taken in quarter 1 has remained stable in 2025 with the Scottish and Irish pelagic fleets targeting mackerel mainly in Divisions 6.a but also in 4.a. Substantial catches are also taken by the Dutch owned freezer trawler fleet. The Spanish fisheries also take significant catches along the north coast of Spain during the first quarter.

- Second quarter 2025 (50 757 tonnes – 6%)

The distribution of catches in the second quarter is shown in Figure 8.2.2.2. The quarter 2 fishery is traditionally the smallest and this was also the case in 2025. Quarter 2 is the start of the summer fishery in northern waters by Icelandic, Norwegian and Russian fleets in Division 2.a. There are also significant catches taken in Division 8.c.

- Third quarter 2025 (421 043 tonnes – 52%)

Figure 8.2.2.3 shows the distribution of the quarter 3 catches. Large catches were taken in Division 2.a, with high concentrations in the international zone (2.a.1). Fishing was carried out mainly by vessels from Russia, Norway, Iceland, the Faroes and Greenland. There were also catches from Division 4.a and Division 5.a.

- Fourth quarter 2025 (145 136 tonnes – 18%)

The fourth quarter distribution of catches is shown in Figure 8.2.2.4. The proportion of the catch taken in the fourth quarter has decreased to 18% in 2025. The summer fishery in northern waters

has largely finished. The largest catches in quarter 4 are taken by Scotland around the Shetland Isles in Division 4.a. with small catches taken in Sub Areas 7 and 8.

8.3 Quality and adequacy of sampling data from commercial fishery

The sampling of the commercial catch of Northeast Atlantic mackerel in Table 8.3.1. Overall sampling effort in 2025 was similar to previous years with 88% of the catch sampled. Nations with large, directed fisheries are capable of sampling 100 % of their catch which may conceal deficiencies in sampling elsewhere.

The 2025 sampling levels by country are shown in Table 8.3.2. Most countries achieved a high level of sampling coverage. Belgian catches consist of by-catch in the demersal fisheries in the North Sea. Belgium, France, Sweden, Greenland, Northern Ireland and Poland did not supply sampling information in 2025. Portugal sampled landings from 9.a only. England sampled landings from the handline fleet operating off the Cornish coast as well as from freezer trawlers. Cooperation between the Dutch and German sampling programmes is designed to provide complete coverage for the freezer trawlers operating under these national flags and also those of England and France. This year Russian age sample information and catch by quarter and ICES division and ICES rectangle for 2025 were officially delivered to Faroe Marine Research Institute, and ICES decided to use this information.

Catch sampling levels per ICES Division are shown in Table 8.3.3. 95% of the total catch is taken in divisions 2.a, 4.a and 6.a and these areas are well sampled. In general, areas with insufficient sampling have relatively low levels of catch.

8.4 Catch data

8.4.1 ICES Catch Estimates

Total Catch 2025

The total ICES estimated catch for 2025 was 809 175 tonnes which represents a decrease of 88 526 t from 2024 (897 701 t).

The combined 2025 estimated catch uptake used in the 2025 forecast, arising from agreements and autonomous quotas, and transfers amounted to 755 142 tonnes. The ICES catch estimate for 2025 (809 175 tonnes) represents an overshoot of 54 033 t of the estimated figure and this is 40% above the ICES advice of 576 958 tonnes for 2025. The combined expected catch for 2026, as best ascertained by the Working Group (see Section 8.1), amounts to 398 186 tonnes. This is also above the ICES advice for 2026 which is 174 357 t.

Catches reported for 2025 and in previous Working Group reports are considered to be best estimates. In most cases, catch information comes from official logbook records. Other sources of information include catch processors. Some countries provide information on discards and slipped catch from observer programs and compliance reports. In several countries discarding is illegal.

The total catch as estimated by ICES is shown in Table 8.4.1.1. It is broken down by ICES area group and illustrates the development of the fishery since 1969.

Discard Estimates

With a few exceptions, estimates of discards have been provided to the Working Group for the ICES Subareas and Divisions 6, 7/8.a,b,d,e and 3/4 (see Table 8.4.1.1) since 1978. Historical discard estimates were revised during the data compilation exercise undertaken for the 2014 benchmark assessment (ICES, 2014). The Working Group considers that the estimates for these areas are incomplete. In 2025, discard data for mackerel were provided by France, the Netherlands, Ireland, Spain, Denmark, England, Scotland and Sweden. Total discards amounted to 2236 tonnes which is similar to 2024. The German and Portuguese pelagic discard monitoring programmes did not record any instances of discarding of mackerel. Estimates from the other countries supplying data include results from the sampling of demersal fleets.

8.4.2 Catch at Age

This catch in numbers relates to a total ICES estimated catch of 809 175 tonnes. These figures have been appended to the catch-at-age assessment table (see Table 8.7.1.2).

Age distributions of commercial catch were provided by, Germany, Faroes, Iceland, Ireland, the Netherlands, Norway, Portugal, Denmark, UK, Spain and Russia. There remain gaps in the age sampling of catches, notably from Belgium, Sweden, Greenland, Northern Ireland, Poland and France.

Catches for which there were no sampling data were converted into numbers-at-age using data from the most appropriate fleets. Accurate national fleet descriptions are required for the allocation of sample data to unsampled catches.

The catch numbers at age show several strong year classes in this fishery. Almost 80 % of the catch in numbers in 2025 consists of 2 to 10-year olds with the 2020 year class (age 5) and 2019 (age 6) being the strongest. In 2025 the 2020 year class represents 16% of the catch numbers at age. The 2019 year class (6 year olds in 2025) represented 14% of the total. The 2019 and 2020 year classes have been strong in previous years also. The 2016 year-class is also being tracked through the fishery each year and in 2025 accounted for 8% of the catch numbers at age. The 2015 year-class does not look as strong as the other year classes and represents 5% of the total. In 2025 there was a significant proportion of fish in the plus group. The plus group now represents 12% of the catch numbers at age, an increase from 7% in 2021. The big 2010 and 2011 year classes are in the plus group.

Comparison of age readings between countries shows good agreement for younger fish but some differences at older ages. This has been examined by age reading workshop in 2018 and exchanges in 2021 and 2024. In 2025 the Norwegian fleet operating in 2a caught a high proportion of older fish when compared to other countries. This area was well sampled with age reading carried out by experienced readers. This difference can be explained by the fact that this fleet operates outside the international zone and uses purse seines. This differs from other fleets, that are using trawls. The combined catch numbers at age for 2025 including data from all nations, shows a decline in numbers at 12+ between 2024 and 2025 as would be expected as the big year classes are being fished out.

8.5 Biological data

8.5.1 Length Composition of Catch

The mean length-at-age in the catch for 2025 is given in Table 8.5.1.1.

For the most common ages which are well sampled there is little difference to recent years. The length of juveniles is traditionally rather variable. The range of lengths recorded in 2025 for 0 group mackerel is 19-25 cm. The rapid growth of 0-group fish combined with variations in sampling between northern and southern areas will contribute to the observed variability in the observed size of 0-group fish. Growth is also affected by fish density as indicated by a study which demonstrated a link between growth of juveniles and adults (0-4 years) and the abundance of juveniles and adults (Jansen and Burns, 2015). A similar result was obtained for mature 3- to 8-year-old mackerel where a study over 1988-2014 showed declining growth rate since the mid-2000s to 2014, which was negatively related to both mackerel stock size and the stock size of Norwegian spring spawning herring (Ólafsdóttir et al., 2015).

8.5.2 Weights at Age in the Catch and Stock

The mean weight-at-age in the catch for ages 2-12+ from 1998 are presented in Table 8.7.1.3. There is a trend towards increasing weight-at-age for the most age classes starting around 2005, continuing until 2013 (Figure 8.5.2.1). This decrease in the catch mean weight-at-age seems to have stopped since 2013 and a slow increase in mean weight in the catch is observed since then for most age groups. In 2025, 3-year-olds show a small decrease in mean weight.

For the 2025 stock weights, the Working Group used weight-at-age in the stock calculated as the average of the weight-at-age in three areas, corresponding to definition of the former spawning components, weighted by the relative mackerel biomass in each area (as estimated by the 2025 egg survey for the southern and western areas and the 2017 egg survey for the North Sea area). Mean weight-at-age for 2025 for the western area are estimated from biological sampling data from commercial catches obtained through a specific data call. The biological sampling data taken during the Norwegian tagging survey and during the 2025 mackerel egg survey were also used. Only samples corresponding to mature fish, from areas and periods corresponding to spawning, as defined at the 2014 benchmark assessment (ICES, 2014) and laid out in the Stock Annex, were used to compute the mean weight-at-age in the western spawning area.

For the North Sea area, mean weight-at-age in 2025 were calculated from samples of the commercial catches collected from Divisions 4.a and 4.b in the second quarter of 2025. Stock weights for the southern area are based on samples from the Spanish catches and surveys in Divisions 8.c and 9a in the 2nd quarter of the year. The mean weights in the three area and in the stock in 2025 are shown in Table 8.5.2.

As for the catch weights, the decreasing trend observed since 2005 for fish of age 3 and older seems to have stopped in 2013 and values in the last 10 years show an increase (Figure 8.5.2.2). Several age-classes show a slight decrease again after 2022 (ages 5 to 8).

The mean weights in the stock show an increase in 2025 which is particularly sharp for certain ages (2 to 4). As this was not observed in the catch weights (Figure 8.5.2.2), the samples available for 2025 were more closely investigated. The main source of the increase in the 2025 stock weights was related to the mean weight in the western spawning area. In this area, the number of samples available for 2025 is high (Figure 8.5.2.3), mainly due to the large number of samples collected during the egg survey. There was also a wealth of samples collected during the tagging survey, and samples from the commercial catches also available, but in a lower number. The mean weight-at-age calculated separately for each of the sources of samples in the western area show that samples from the egg survey have higher mean weight at age than the two other data sources for the ages 2 and 3 in 2025 (Figure 8.5.2.4). No such discrepancy between the egg survey samples and the other data source was observed for the earlier years.

Further inspection of the samples collected during the egg survey could not identify any reason why, unlike previous years, the egg survey samples would not be representative of the spawning stock:

- Apart from Dutch samples collected by the industry and which could have been not selected randomly, and a sample from Denmark which was not selected randomly, all other samples were taken randomly from the catches taken during the survey. Those two non-random samples were not included in the mean weight calculation.
- There was no specific difference in sex ratio between the three sources of data
- There were no monthly differences in mean weight at age in any of the data source which discard the potential impact of samples taken at a different time during the egg survey

Considering that there were not changes in the survey methodology regarding the collection of biological samples, the absence of any clear indication that the samples would give a biased perception of the population, WGWIDE decided not to exclude these samples from the stock weights calculation.

8.5.3 Natural Mortality and Maturity Ogive

Since the 2025 benchmark, natural mortality decreases by age as displayed in Table 8.7.1.4.

Since the 2025 benchmark, the maturity ogive for mackerel is fixed in time and is not recalculated each year (Table 8.7.1.5).

8.6 Fishery independent data

8.6.1 International Mackerel Egg Survey

The 2025 ICES triennial mackerel and horse mackerel egg survey was conducted from February to July. This survey has been carried out since 1977 to provide data for mackerel stock assessments. The final results of the 2025 survey were presented to WG WIDE in August 2026 (WD10: Korta et al., 2026).

The 2025 survey was divided into six sampling periods (Periods 2–7). In the Western area, the main sampling effort was concentrated between periods 3 and 7. Periods 3 to 6 have traditionally covered the main spawning season of mackerel and horse mackerel. In recent years, however, peak mackerel spawning has mainly been observed during periods 3–5. Since 2007, the spawning area has expanded, and particular emphasis was placed on obtaining full spatial coverage and defining the boundaries of the spawning area in 2025. A survey specifically targeting mackerel eggs was also conducted in the North Sea during period 6. Plankton and fecundity samples were processed and analysed following the WGMEGS sampling protocols (ICES, 2019a, 2019b).

8.6.1.1 Annual egg production for mackerel in 2025

Mackerel Stage I egg densities were converted to daily egg production following the WGMEGS protocols (ICES, 2019a). Figure 8.6.1.1 shows the spatial distribution of egg production in the Western Atlantic region by period, while Figure 8.6.1.2 shows the distribution for the North Sea region. The details of the survey area coverage are provided in WD10 (Korta et al., 2026), which has been submitted to WGWIDE.

Figure 8.6.1.3 shows the mean daily egg production curve by period for the Western area in 2025, together with the corresponding curves from previous surveys. The 2025 curve was similar to those observed in 2016 and 2022, but it showed one peak rather than the two observed in those years. This peak occurred during Period 5, which is consistent with the main spawning period identified in previous surveys. However, egg production in the Western area was found to be considerably lower than in previous surveys and was mainly concentrated along the shelf break. The northwestern expansion observed during Periods 5 and 6 in recent surveys was not evident in 2025. Total annual egg production (TAEP) in the Western area was estimated at 1.162×10^{15} eggs, which is a 36% decrease compared to 2022 (Table 8.6.1.1).

In the Southern area, the mean daily egg production curve for 2025 did not show a distinct peak (Figure 8.6.1.4). The estimated TAEP was 0.717×10^{14} eggs, which reflects a 78% decrease compared with 2022 (Table 8.6.1.1). This was the lowest value recorded in the time series.

The combined TAEP for the Western and Southern areas was estimated at 1.234×10^{15} eggs in 2025 (Figure 8.6.1.5; Table 8.6.1.1). This represents a 41% decrease compared to 2022, which is the lowest combined production estimate in the time series.

A dedicated DEPM (Daily Egg Production Method) survey of mackerel eggs was also conducted in the North Sea during Period 6. The survey design followed the WGMEGS protocols (ICES, 2019a). The spatial coverage was similar to that of the 2022 survey and DEP was estimated for the entire surveyed area (Table 8.6.1.4). The total DEP in 2025 was estimated to be 0.79×10^{13} eggs, which is a 14% increase compared with the 2022 estimate (Table 8.6.1.5).

8.6.1.2 Mackerel fecundity estimates

In 2025, 1279 ovary samples were collected from female mackerel in the western Atlantic region with the cooperation of the Pelagic Fishing Association (PFA). These samples provided the biological information required to estimate relative potential fecundity, and after accounting for atresia, realised fecundity, which was then used in the egg production assessment. Further details on sampling and fecundity analyses are provided in WD10 (Korta et al., 2026).

Fecundity estimates are expressed as realised fecundity, which is calculated by taking potential fecundity and adjusting for egg loss due to atresia. The relative potential fecundity estimated for 2025 was 1484 oocytes per g of female, which is slightly higher than the estimate for 2022. Using the estimated average atresia rate of 3%, the realised fecundity was found to be 1,443 eggs g^{-1} female in 2025 (Table 8.6.1.2). These values are used in combination with the estimated annual egg production to derive the spawning-stock biomass from the egg survey. Further details of the fecundity and atresia estimations can be found in WD10 (Korta et al., 2026).

8.6.1.3 Mackerel SSB estimation

The 2025 spawning-stock biomass (SSB) was estimated using the Annual Egg Production Method (AEPM) at 1.907 Mt for the Western area and 0.107 Mt for the Southern area (Table 8.6.1.3). The combined SSB estimate for both areas was therefore 2.014 Mt, which represents a 44% decrease compared to the 2022 estimate (Fig. 8.6.1.6). These results confirm the substantial decline in mackerel SSB observed between the 2022 and 2025 surveys.

A DEPM-based estimate of mackerel SSB was also derived from the 2025 survey data. This estimate is currently provisional and is presented separately from the standard AEPM estimate. The first results of the DEPM, together with information about how it was done and the estimates for adults used, can be found in WD10 (Korta et al., 2026).

8.6.1.4 2025 North Sea mackerel egg survey

A DEPM (Daily Egg Production Method) survey of mackerel eggs was conducted in the North Sea by Denmark and England during Period 6 (June) 2025. The survey covered the main mackerel spawning area of the North Sea and followed the sampling protocols (ICES, 2019a, 2019b). For the DEPM calculations, stations were restricted to the traditional North Sea survey boundaries.

The spatial coverage achieved in 2025 was similar to that of the 2022 survey. The spatial distribution of Stage Ia eggs was broadly similar in the two surveys, although the eggs appeared to be more evenly distributed across the surveyed area in 2025. No clear spatial pattern in egg density was observed (Figure 8.6.1.2).

Daily egg production (DEP) was estimated for the entire surveyed area. Total DEP in 2025 was estimated at 0.79×10^{13} eggs, which is a 14% increase on the 2022 estimate (see Table 8.6.1.4).

The analysis of the adult parameters required for DEPM estimation are still considered preliminary for 2025. Further details on survey coverage, egg production and adult parameters are provided in WD10 (Korta et al., 2026).

8.6.2 International Ecosystem Summer Survey in Nordic Seas (IESSNS, A7806)

IESSNS is an annual survey which covers the summer feeding distribution of mackerel in the Nordic Sea and the North Sea, and estimates swept-area abundance of mackerel using standardized trawl hauls in the surface. It provides two sets of age segregated abundance indices to the assessment; for ages 3-11 in Nordic Seas and a recruitment index, for age 2, using combined survey coverage for Nordic Seas and North Sea. The survey was successfully conducted in 2026. The zero-line for mackerel abundance was reached for the part of the survey area located north of latitude 60°N, but not on the European shelf where mackerel are present west of the British Isles. In the North Sea the survey is limited to areas with bottom depth greater than 50 m which limits coverage in the southern North Sea where mackerel is present. The IESSNS cruise report is available as a working document to this report (WD01) and a detailed survey description is available in the mackerel Stock Annex.

Abundance estimates by age are displayed in input data for the assessment (Table 8.7.1.8). Figure 8.6.2.1 displays estimated mackerel total stock abundance and stock biomass in Nordic Seas from 2007 to 2026. Annual mackerel recruitment index as abundance at age 2 for the Nordic Seas and the North Sea combined for years 2018-2026, is displayed in Figure 8.6.2.2. Figures 8.6.2.3-4 show the internal consistency and catch curves for abundance at age from 2012 to 2026. Figures 8.6.2.5-6 display swept area trawl catch rate and mean mackerel density per rectangle for 2026, and mean mackerel density per rectangle for years 2010 and from 2012 to 2026.

8.6.3 Tag data

Information from steel tagging experiments conducted by Institute of Marine Research in Bergen (IMR) on mackerel at spawning grounds west of Ireland and British Isles in May-June and the respective recaptures at Norwegian factories with metal detectors (Tenningen et al. 2011) was introduced to the NEAM assessment during ICES WKPELA 2014 (ICES, 2014). Data from release years 1980-2004, and recapture years 1986-2006 have been used in the update assessments following this benchmark. From 2011 onwards IMR changed tagging methodology to radio-

frequency identification (RFID), more specifically passive integrated transponder tags (PIT-tags). This allowed for more automated data processing with recaptures from scanned landings at factories also outside Norway now being updated in real time to an IMR database over internet.

The data format used was the same for both tag types; a table containing the numbers of tagged fish per year class in each release year, and the corresponding numbers scanned and recaptured of the same year classes in all years after release. The RFID data were treated as a separate time series with a different scaling factor (survival) than the steel tags and was used in update assessments following the ICES WKwide2017 benchmark (ICES, 2017). For steel tags data from ages 2-11 and all recapture years were used in the assessment. During the 2017 benchmark it was decided to use the same filtering for the RFID data from release year 2011 onwards. However, following the decisions made during ICES IBPNEAMac 2019 (ICES, 2019c) update assessments were only using RFID data from release years 2013 onwards, ages 5-11 and recapture year 1 and 2 after release (YearsOut = 1-2).

In the benchmark assessment in 2025 (ICES, 2025) the starting year of the assessment was changed to 1998. Hence the steel-tag time series was reduced to release years 1998-2004 and recapture years 1999-2006, else the data format was kept the same and treated the same way in SAM. However, for the RFID data it was agreed to change both the format and filtering, and now instead use tag-based abundance indices for ages 2-11, same decision as for NSSH. A full description of data collection and estimation behind the current tag-based abundance indices at age is given in WD02. In short, NEAM is tagged with RFID-tags along Ireland and The British Isles in April-June (Figure 8.6.3.1), and catches are scanned (Figure 8.6.3.2) for recaptures (Figure 8.6.3.3) at factories with RFID-antenna systems in Norway, Iceland, Scotland and Ireland. The proportion of total catch scanned has increased over the time series. Currently about 50% of biomass landed is scanned. Estimates used as input to the stock assessment (Figure 8.6.3.4) are means from bootstraps with 1000 iterations based on numbers released (R) of an age in a release year, and numbers scanned (Nscan) and recaptured (r) of the same year class in YearsOut = 1-2 after release using the Lincoln Petersen model ($N = R * Nscan / r$). The estimates come with CVs based on the uncertainty in both R, Nscan and r (Figure 8.6.3.5).

8.6.4 Other surveys

8.6.4.1 International Ecosystem survey in the Norwegian Sea (IESNS, A3675)

After the mid-2000s an increasing amount of NEA mackerel has been observed in catches in the Norwegian Sea during the International Ecosystem survey in the Norwegian Sea in May (IESNS) targeting herring and blue whiting.

Mackerel was present in the southern part of the Norwegian Sea in the beginning of May. However, there were also some hauls with mackerel along the Norwegian coast north to about 70°N. The two largest catches in the north were dominated by small mackerel (18-22 cm), the rest of the catches consisted of larger mackerel. No further quantitative information can be drawn from these data as this survey is not designed to monitor mackerel (WD11: Saltaug et al. 2026).

8.6.4.2 Acoustic estimates of mackerel in the Iberian Peninsula and Bay of Biscay (PELACUS, A2548)

PELACUS survey data was not available for WGwide 2026 and therefore, no new information from the Bay of Biscay on mackerel distribution and abundance during spawning time is available.

8.7 Stock assessment

8.7.1 Update assessment in 2026

The assessment this year was an assessment carried out by fitting the state-space assessment model SAM (Nielsen and Berg, 2014) using the R library *stockassessment* (downloadable at `install_github("fishfollower/SAM/stockassessment")`) and using the configuration of the 2025 benchmark described in the Stock Annex.

The assessment model is fitted to the following input data:

- catch-at-age data from the year 1998 to 2025 for the ages 2 to 12 (plus group). The catch data prior to 2000 are strongly down weighted.
- Tagging data:
- numbers released and recaptured from the steal tags for the release years 1998 to 2004.
- Abundance at age index derived from the RFDI tagging data for ages 2-11, covering the period 2013-2024.
- SSB indices from the mackerel egg survey every three years in the period 1998-2025
- Swept area survey: abundance estimates for ages 3 to 11 from the IESSNS survey (2010, 2012-2026) and the abundance at age 2 (2018-2026).

In addition, an age-varying natural mortality and a constant maturity ogive over the years are used. The mean weights-at-age in the stocks are calculated from samples from the catches, surveys and tagging programme taken at spawning time (first average per geographic area, and the averaged across areas using the relative proportion of the SSB in each area as a weighting factor). The proportion of fishing and natural mortality occurring before spawning, used to compute SSB at spawning time, are calculated from the annual egg production curves in the egg survey, and the proportion of catch per quarter.

Fishing mortality-at-age and recruitment are modelled as random walks, and there is a process error term on abundances at ages 3-11.

The differences in the new data used in this assessment compared to the benchmark were:

- Revision of the 2025 SSB index from the mackerel egg survey after the index was finalised by WGMEGS (ICES, 2026). The final index was 13% lower than the preliminary value used in the 2025 WGWIDE assessment.
- Addition of the 2026 abundance-at-age index from IESSNS.
- Addition of the 2024 abundance-at-age index from RFID tags
- Addition of the 2025 catch-at-age, weights-at-age in the catch and in the stock and maturity ogive, proportions of natural and fishing mortality occurring before spawning.

Input parameters and configurations are described in the stock annex. The input data are given in Tables 8.7.1.1-8.

8.7.2 Model diagnostics

Parameter estimates

The parameter estimates for the final model are shown in Figure 8.7.2.1 and Table 8.7.2.1. The model has low observation variances for the catches-at-age (as low as 0.069 for ages 4-10). This indicates that the model fits the catch data very (probably too) tightly, almost without error. The

tag index for ages 4-11 also has a low observation variance (0.17). For this data source, the model fit is also tight, but not as much as for the catches-at-age. Other data sources have moderate observation variances, such as the IESSNS recruitment at age 2 and at age 4-9 and the tag index for age 3 (around 0.3). For the other data sources, the fit is still good but with larger errors. For the other indices, the observation variance is larger than 0.5 and the fit to the model is poorer.

The estimate of the AR1 correlation structure gave a 0.65 correlation between adjacent ages for the IESSNS and 0.55 for the tag index (Figure 8.7.2.2).

The random walk variances for fishing mortality were estimated at between 0.20 for ages 4-10, to 0.27 for ages 11-12. The random walk variance on abundance-at-age 2 (recruitment variability) is high (0.62). The variance of the process errors on ages 3 to 12 is estimated at 0.10.

Catchabilities for the abundance-at-age indices (IESSNS and tag index) increase from younger ages to older ages. For the IESSNS, this could be interpreted by the fact that larger/older fish tend to migrate further north than younger fish, and consequently a larger proportion of the older age classes is sampled by the survey in the Nordic Seas. For the smaller/younger fish, on the other hand, it can be assumed that a larger part of the stock remains in areas further south and is not sampled by the survey. However, given the fast early growth there are no clear size differences after a certain age, and a leveling off of the catchability values at older ages could have been expected.

For the tag index, the observed differences in the catchability are more difficult to explain. The index is not based on a survey gear actually catching fish with a certain catchability, but it is derived from numbers of recaptured fish from a given pool of fish tagged, and a given volume of catches scanned. The fact that different ages have different catchability could be due to some factors influencing the calculation of the index being age related, such as the mortality rate of the fish after release, the rate of tag loss over the years. For example, a lower mortality rate after release or a lower chance of tag loss for the old fish would explain the higher catchability.

Parameter uncertainty

The catchability parameters are in general estimated more precisely than the other parameters (standard deviations generally lower than 0.15), except for the indices for young or old fish for which the catchability is more uncertain (Table 8.7.2.1). Process variances are also reasonably well estimated with standard deviations around 0.15.

Uncertainty on the observation variance is larger for the catch-at-age data and for the indices for the young fish (age 2 from the IESSNS and 2 and 3 from the RFID tag and from the catch) than for the other data sources. The uncertainty is lower for other data sources. The uncertainty on the observation variance estimates is not particularly high, especially for the data sources with the lowest observation variances, which are the most influential on the assessment (Figure 8.7.2.3).

There are some mild correlations between parameter estimates (Figure 8.7.2.4):

- Catchabilities are positively correlated. This simply represents the fact that all scaling parameters are linked, which is to be expected.
- The parameters related to the magnitude of the correlation in the AR1 matrix for the IESSNS and for the RFID index are correlated to the observation variance for these respective indices, which reflects the fact that a strong correlation for the errors is linked to lower weight of the surveys.

Residuals

The “one step ahead” (uncorrelated) residuals are presented on Figure 8.7.2.5. There are no strong patterns observed for any of the data sources that would indicate a model misspecification. A weak pattern is however observed in the residuals for the IESSNS with a predominance of positive residuals for the age 11, suggesting that a potential issue with the configuration regarding the catchability (set identical for age 10 and 11). There is also some temporal autocorrelation in the residuals for the egg survey, but this pattern is greatly reduced compared to the assessments previous to the 2025 benchmark.

Empirical correlations between ages in the one step ahead residuals for the catch-at-age are generally low, with some weak positive correlations occasionally observed between ages for the older fish, but overall, at a quite low level (Figure 8.7.2.6). This indicates that the current model configuration, not implementing any correlation structure for the catches, seems appropriate. Correlations between ages in the observation errors for the IESSNS survey and for the RFID tagging index are explicitly modelled in the assessment, and as a result, empirical correlations in the one step ahead residuals between ages are low (Figure 8.7.2.7).

Finally, in the residuals for the steel tags, there is a predominance of positive residuals for the recaptures of age 2 fish, and of negative residuals for the recaptures of age 10 fish. However, no specific pattern is observed for the other ages (Figure 8.7.2.8).

The comparison of model fitted values versus observations (Figures 8.7.2.9-13) shows a very tight fit to the catches-at-age, especially for ages 4 to 10 (age group with the lowest observation variance on Figure 8.7.2.1). The fit is also very good for the younger and older ages. The fit for the SSB index from the egg survey is poor, as the survey indicates an earlier decrease in the SSB (in 2016) than the assessment, and a temporary increase in 2022 while the assessment shows a continuous decline since 2015. The fit to the IESSNS index is rather good. The assessment follows the general trend in the abundances-at-age from the index, even though it does not fit well the fine scale variations, especially for the age 3. A similar fit is observed for the RFID tagging index, but with a slightly better ability of the assessment to follow the year-to-year variations of the index. The fit to the recruitment index from the IESSNS is also reasonably good, with some occasional larger discrepancies between the model and the observations (larger negative residual in 2024).

Leave one out runs

In order to visualise the respective impact of the different surveys on the estimated stock trajectories, the assessment was run leaving out successively each of the data sources (Figure 8.7.2.14).

Removing one of the indices had generally little impact on the estimated SSB, F_{bar} and recruitment. The only case where it affected substantially the assessment was when the RFID index was excluded. This run had a lower SSB and higher F_{bar} for the period of years when the stock was large (roughly 2008-2017) and a lower recruitment for the period 2007-2013. Removing the egg survey had only a marginal effect, with differences in the opposite direction and leaving out the IESSNS had noticeable impact.

This indicates that the assessment is mainly driven by the catch-at-age data, and that the only other source of information that is influential and provide contrasting information is the RFID tagging data. Including the RFID tagging index leads to a steeper recent decline and a stock culminating at a lower value than for the assessment using all the data. The fact that leaving out either the IESSNS or the egg survey indices has very little impact on the assessment could mean either that these data sources do not inform the assessment, or that the information they provide

is generally in agreement with the information provided by the catches. The fact that the assessment fits quite well the observation for these indices (Figures 8.7.2.11-13) suggests the latter.

Based on the values of the observation variances, and the inspection of the model fit (predictions vs. observations, see below), there are strong signs that the model over-fits the catch-at-age data. However, this does not seem to lead to particular issues regarding model fit to the other data, which are either also very well fitted (tag index, IESSNS recruitment and IESSNS for ages 4 to 9) or fitted more loosely but still with a good general agreement in the temporal trends between the data and the model (tag and IESSNS for the younger ages).

Removing the recruitment index from the IESSNS had a strong impact on the 2026 recruitment and SSB values. The recruitment index indicates an improved recruitment in 2026. As this is the only source of information available for the model on this recruitment, the model estimate is strongly driven by the index value. As age 2 fish are approximately 80% mature, this also impacts the SSB in 2026.

8.7.3 State of the Stock

The stock summary is presented in Figure 8.7.3.1 and Table 8.7.3.1. The stock numbers-at-age and fishing mortality-at-age are presented in Tables 8.7.3.2-3. The spawning stock biomass is estimated to have increased almost continuously from just above 2 million tonnes in the early 2000s to above 12 million tonnes between 2013 and 2015 and subsequently declined to reach a level just above 3.07 million tonnes in 2025, which is below $MSY B_{trigger}$, and just above B_{lim} . The fishing mortality first increased until 2003 and declined after that to levels under F_{MSY} (0.191) during the 2010s and increased after that to 0.29 in 2025, above F_{MSY} . The recruitment time series shows a general increase in recruitment at age 2 until 2013, with several particularly large year classes (2005, 2006, 2010 and 2011). Recruitments since 2017 have been much lower, with particularly low values from 2023 to 2025. The 2026 recruitment is higher than the previous three.

There are clear indications of changes in the selectivity of the fishery over the assessment period (Figure 8.7.3.2). In the 2000s, the fishery seemed to have had a steeper selection pattern (more rapid increase in fishing mortality with age), with a plateau after age 6. After 2008, the selection started to increase on the older ages, but reverted back to a selection pattern with an increased selection on the younger ages and a plateau after age 6. In the recent years (after 2016), the selection on the older ages increased again.

8.7.4 Quality of the assessment

Parametric uncertainty

The uncertainty on both SSB and F_{bar} is low (standard deviation under 0.1) for most of the assessment period except in the first two years for F_{bar} , and at the end of the assessment period, when it increases strongly (especially for F_{bar} , Figure 8.7.4.1). The uncertainty from the updated assessment is lower than the previous assessment in most years (see also the section below).

Model instability

The retrospective analysis was carried out for 7 retro years (or peels) by fitting the assessment using the 2026 data, removing successively 1 year of data (Figure 8.7.4.2.). There was some retrospective pattern found in F_{bar} with some retrospective peels showing a downward revision,

with a corresponding Mohn's rho of 0.265. For SSB, there was an upward rescaling of values for the period around 2014, but this pattern is greatly reduced compared to the previous assessment. The terminal year SSB values are not substantially revised and the associated Mohn's rho is -0.076. Recruitment estimates are consistent for all retrospective peels, with a Mohn's rho of 0.17.

The parameters of the different retrospective runs are shown in Figure 8.7.4.3. Some parameters appear to be estimated consistently, mostly those related to observation with long, or old, time series, such as the observation variance for the catches, or the overdispersion of the recaptures for the steel tags. Some parameters are, however, systematically revised in the same direction. That is the case for example of the observation variance of the tagging index for age 2 and age 3. For several parameters (observation variances and catchabilities for the IESSNS index at age 2 for the tagging index at age 2 and age 3) the confidence intervals become narrower each time a new year of data is added to the assessment. This decrease in the model uncertainty is also visible for the uncertainty on SSB and F_{bar} estimates (Figure 8.7.4.4). While adding more years of data, the standard deviations on SSB and F_{bar} become lower for most of the time series.

Overall, the model produces consistent output, and as the newest time series (tagging index, 10 years, and IESSNS age 2, 8 years) become longer, the estimates of associated parameters become more precise and the general model uncertainty decreases. In this context, WGWIDE agreed that the high retrospective pattern in F_{bar} was the sign of a model adapting to maturing data source and was not a major source of concern. A retrospective pattern on F_{bar} has also little consequence for the reliability of the advice, as long as there is no pattern on stock size.

Process error

The realisation of the process error in the model was also inspected. The process error expressed as annual deviations in mortality-at-age (Figure 8.7.4.5) appears to be generally random, with no strong pattern in the deviations. Only for age 11, there is a predominance of negative deviations in the recent years however it is not the case for other ages.

8.8 Short term forecast

8.8.1 Basis for the recruitment assumption

Mackerel recruitment considerably decreased from high levels in the 2000's and 2010's to low current levels in the recent period. Given this change in productivity of the stock, it is important that the assumption made for future years in the forecast represent the current productivity level. During WGWIDE, analyses were conducted to identify the start of the current low productivity period.

Different methods and R packages were used to find changes in the mean value and in the trend of the mackerel recruitment and recruit per spawner time series. Some of these methods are illustrated in Figures 8.8.1.1-4 and a summary of the analyses and the change points detected is given in the Table 8.8.1.1.

The binary segmentation from the R package *changepoint* detected numerous changes in the mean recruitment with the main one occurring in 2017, followed by 2007 and 2014, while for the recruits per spawner, a single change point was detected in 2014 (Figure 8.8.1.1). Other methods implemented in this package gave generally similar results (Table 8.8.1.1).

The probabilistic approach implemented in the R package *bcp* detected a main change in the mean recruitment in 2012 and 2014, and secondary changes in 2007 and 2017 (Figure 8.8.1.2). The change points detected in the recruits per spawner occurred in 2014, 2009, 2005 and 2007.

The *Rbeast* method, detecting changes in the local trend, identified 2014 as the main change point for both recruitment and recruits per spawner (and 2009 as change point of secondary importance for the recruits per spawner, Figure 8.8.1.3-4)

Conclusions

Both recruitment and recruits per spawner were considered as potential measures of stock productivity. For practical reasons - the short-term forecast being based on recruitment and not recruits per spawner - WGWIDE made the pragmatic decision to consider only change points in the recruitment time series. Furthermore, the aim of this exercise was to identify the year when the current low recruitment regime started, which is better described by a comparison of means than a change of trend (the main change in trend occurs in 2014 when recruitment starts to decrease, but it reaches its current low level after 2017). The results of the test for changes in mean recruitment were therefore considered more relevant. Most tests identified both 2017 and 2014 as potential start of the ongoing recruitment period, with a slight majority of methods supporting 2017 rather than 2014, especially the more intuitive ones. Based on this, and also to maintain consistency with the assumption made for the 2025 advice, WGWIDE agreed to use the recruitment from 2017 onwards.

8.8.2 STF configuration

The short-term forecast (STF) provides estimates of SSB at spawning time in 2026 (given an assumed catch for the current (intermediate) year) and both SSB and catch in 2027 and 2028 for a range of management options for 2027.

A stochastic forecast was conducted in SAM. The forecast configuration and assumptions were addressed during the benchmark, and the benchmark decisions were applied at WGWIDE. The only departure is the choice of the reference period for recruitment, explained above.

Intermediate year catch

The estimation of the catches in the intermediate year (2026) is based on declared quotas, inter-annual transfers and information from the fisheries in Section 8.1. The estimate of the 2026 catch is 398 186 tonnes. In the recent years, the accuracy of the WGWIDE intermediate year catch estimate has decreased, but this year's forecast is not very sensitive to this value (see section below).

Initial abundances at age

The starting year for the STF was 2026, and the abundances-at-age estimated by SAM for 2026 were used as starting numbers for the STF, including for the recruitment at age 2.

Recruitment assumption for 2027 and 2028

Recruitment for these two forecast years are resampled from the SAM estimates of recruitment for the period 2017-2026 (see above for justification).

Biology and fishery's selection

There is a clear decreasing trend in the mean weight at age in the stock (and a similar one for the catch weights), starting around 2005 and lasting until around 2017 (Figure 8.5.2.1). The mean weights-at-age have since then recovered slightly, but remain low in comparison to the earlier part of the assessment period. For practical reasons (e.g. the impossibility to use different year periods as the basis for the biology and for the fishery's selectivity in the SAM forecast), the future weights-at-age in the STF were based on the average of the last 3 years of data (2023-2025). The same assumption was used for the other biological parameters, and for the fishery's selectivity.

Number of simulations

Several trials were conducted at WGWIDE in 2025 and it appeared that 20 000 simulations led to an acceptable results stability.

8.8.3 Results

Intermediate year

Applying the catch constraint of 398 186 t for 2026 led to a fishing mortality for 0.167 in 2026 (Table 8.8.3.1). The corresponding SSB at spawning time is 3. 204 mt, above B_{lim} ($p(SSB_{2026} < B_{lim}) = 0.40$).

ICES MSY advice rule

The mackerel stock spawns at roughly 34% of the year, and therefore the reference SSB value to apply the ICES MSY advice rule is the SSB in 2026 (SSB 2027 being conditional to advice given for 2027). Applying the ICES MSY advice rule leads to a F_{target} for 2027 of 0.149, corresponding to 78% of F_{MSY} (Table 8.8.3.2). The resulting catch for 2027 is 352 938t which represents a 102% increasing in the advice compared to last year. Applying the same fishing mortality again in 2028 lead to a probability of the stock remaining below B_{lim} of 33%.

The forecasted SSB, F_{bar} and recruitment for this scenario are shown in Figure 8.8.2.1.

Figures 8.8.2.2 and 8.8.2.3 show the contribution of the resampled future recruitments to the 2027 catch and to the 2028 SSB under this management option. The resampled recruitment for 2027 accounts for 6.8% of the catch advised for 2027. For the SSB in 2028, the resampled recruitments of 2027 and 2028 represent 41% of the SSB. This implies that the SSB in 2028 and the associated probability of the SSB to remain below B_{lim} are highly conditional to the recruitment assumption (year period used as basis) in the short-term forecast.

Other options:

Applying a fishing mortality equal to F_{MSY} (0.191) in 2027 leads to a catch advice of 443 198t for 2027, and a probability of the stock remaining below B_{lim} in 2028 of 38%. Maintaining the current level of fishing mortality leads to a slightly higher advice than the ICES Advice Rule, at 392 517t, with a probability of remaining below B_{lim} in 2028 of 35%. The maximum catch that would lead to a probability of remaining below B_{lim} of less than 50% is 675 632t, corresponding to a F_{bar} of 0.309. Even without fishing, the stock cannot recover to above MSY

$B_{trigger}$ in 2028. Without fishing, the probability of the SSB remaining below B_{lim} remains at least 17%, and it is not possible to achieve a 5% probability of being below B_{lim} in 2028.

Given the value of SSB in 2026, all the variants of the rebuilding harvest control rules requested by the UK, Norway, the Faroes, Iceland and Greenland lead to a fishing mortality equal (for HCRA) or lower (for HCRb) than the ICES Advice Rule.

8.8.4 Sensitivity of the STF results to the Intermediate Year Catch estimate

WGWIDE estimates the catch for the intermediate year by summing the declared TACs and consulting representatives of each party on their expected TAC uptake for the year. The estimate also accounts for interannual transfers and assumes that discard levels remain unchanged.

Historically, this estimate has been a good predictor of the realised catch (minor differences from 2010 to 2019, Figure 8.8.4.1). Between 2020 and 2024, differences between -5% and -10% were observed (intermediate year catch was an overestimate). The estimate from last year was, on the contrary, underestimating the realised catches.

The intermediate year catch is used in the forecast to determine the level of fishing mortality in the current year, which affects the size of the stock at the start of the year for which the advice is given. All the STF output are influenced by this catch value.

In order to explore the sensitivity of the STF output to uncertainties on the intermediate year catch, a sensitivity test was conducted. A set of 1000 random draws were made from a uniform distribution between 0.8 and 1.2 and used as multiplicative error to this year's intermediate year catch estimate. This corresponds to applying a $\pm 20\%$ uniformly distributed error on the intermediate year catch (Figure 8.8.4.2). The STF was run for each of these 1000 values and the sensitivity of the output was measured as the relative difference with the WGWIDE 2026 STF values.

The SSB in 2026 is not very sensitive to the intermediate year catch value, with a range of variation in the sensitivity lower than $\pm 1\%$. The catch in the advice year is more sensitive, with a range of variation of $\pm 4\%$. The probability of being below B_{lim} in 2028 is slightly more sensitive, with a range of variation of $\pm 8\%$.

The generally low sensitivity of the STF output can be explained by the fact that only 23% of the fishing mortality occurs before spawning, and the SSB is calculated too early in the year to be strongly impacted by the catch. Additionally, current fishing mortality (0.167) is relatively low compared to natural mortality, especially for the younger fish, which contribute a larger part of the SSB 2026 due to the improved 2026 recruitment. Therefore, numbers at age at the start of the advice year, are only moderately impacted by the intermediate year catch.

The sensitivity might be low this year as the intermediate year catch corresponds to a relatively low F_{bar} (0.167). In previous years, the fishing mortality corresponding to the intermediate year catch was considerably higher (0.29 last year) and a higher sensitivity to the intermediate year catch can be expected in these conditions.

8.8.5 Sensitivity to the 2025/2026 stock weights-at-age

The mean weights in the stock in 2025 show a marked increase compared to 2024 for several age-groups, and this is not observed with the same magnitude in the catch weights. In section 8.5.2, inspection of the biological sampling data showed that this increase was mainly caused by the

samples collected during the 2025 egg survey, while the other sources of data did not indicate such an increase. However, due to the scarcity of samples from other sources of data, and after discussing the validity of samples collected during MEGS, WGWIDE concluded that there was no basis to exclude these samples.

Here the sensitivity of the stock assessment and STF to the inclusion or not of the samples from the egg survey is tested. The assessment and the STF are rerun using stock weight-at-age in 2025 not based on those samples.

As expected, the SSBs estimates in 2025 and 2026 are lower when the alternative stock weights-at-age are used (Figure 8.8.5.1) and they are below B_{lim} . A comparison of the STF output is shown in Table 8.8.5. The forecast SSB in 2026 for the alternative stock weights-at-age remains below B_{lim} . Applying the ICES Advice Rule leads to a target fishing mortality for 2027 of 0.142, corresponding to an advice catch of 338 698 t. The corresponding probability of being below B_{lim} in 2028 is 0.36.

The stock assessment and forecast are sensitive to the stock weights used and the stock status with respect to B_{lim} is also affected. However, with the lower stock weights calculated without the MEGS samples, the advice would still be based on the ICES MSY Advice Rule, without further reduction of F as the probability of $SSB < B_{lim}$ in 2028 is lower than 50%. The difference with the current advice would be only -4%.

8.9 Biological reference points

Reference points for mackerel were updated at WKBMACNSSH in early 2025. Full details of this update are given in the stock annex.

The table below summarises the currently used reference points.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	4 119 337	B_{pa} ; tonnes	ICES (2025)
	F_{MSY}	0.191	Stochastic simulations, capped at F_{pa}	ICES (2025)
Precautionary approach	B_{lim}	3 067 017	Lowest SSB level that in the past has resulted in good recruitment (2002, 2004, 2005); in tonnes	ICES (2025)
	B_{pa}	4 119 337	$B_{lim} \times \exp(1.65 \times \sigma)$, $\sigma = 0.179$; tonnes	ICES (2025)
	F_{pa}	0.191	The F that provides a 95% probability for SSB to be above B_{lim} ($F_{0.95}$ with advice rule)	ICES (2025)

8.10 Comparison with previous assessments and forecast

Stock assessment output

The last available assessment that is comparable to the 2026 WGWIDE assessment is the 2025 WGWIDE assessment, which does not include the new data added at WGWIDE in 2026.

The 2026 WGWIDE update assessment gives a perception of the stock consistent with last years assessment (Figure 8.10.1). The addition of a new year of data led to small revision of the estimated SSB and Fbar values, and a small revision the recruitment for 2025. The model parameter estimates are slightly revised (Figure 8.10.2). The observation variances for the catches are similar as for last year's model, except for ages 2 and 3, which increased slightly. The observation variances for the main ages in the tagging index is stable, while it decreased slightly for the ages 2 and 3. The observation variances for the IESSNS are stable, except for the recruitment index at age 2 for which it increased.

As discussed in section 8.7 about the retrospective analysis, the time series for some data sources are still short and the model re-estimated the corresponding parameters as the time series become longer. This, however, has little impact on the estimated SSB and Fbar, as most of the information is provided by the catch-at-age information. The slight revision in the 2025 recruitment estimates might be related to is increased observation variance for the age 2 IESSNS index, making the new estimates relying less on this index. Also, as mentioned in section 8.7, the uncertainty in the estimated quantities (parameter values and stock estimates) is lower in the update assessment compared to the benchmark assessment.

Overall, model stability is very high, but that might be a consequence to the very tight fit to the catch data.

Short term forecast

A comparison of output of the assessment and forecast from WGWDE 2025 and WGWIDE 2026 is shown in Table 8.10.1 and Figure 8.10.3-5.

Last year, the forecasted SSB values were lower than B_{lim} (for 2025 and 2026), and at B_{lim} (2027), which determined the basis for the advice for 2027. Based on this year's assessment and forecast, the SSB for the period 2025 onwards is estimated, and forecasted, to be above B_{lim} .

The difference for the 2025 SSB is not related to a wrong intermediate catch assumption made in 2025. The 2025 catch assumed in the 2025 STF was indeed even slightly lower than the realised catch (Figure 8.10.3) and the forecasted fishing mortality in 2025 was close to this year's estimate. The SAM estimates of the abundances-at-age in 2025 were very consistent between the 2 assessments, except for the recruitment, which is estimated lower in the 2026 assessment (Figure 8.10.4). The main cause for the difference in the 2025 SSB value is the different weights-at-age in the stock (Figure 8.10.5). The stock weights for 2025 used in this year's assessment are markedly higher than in last year's assessment. The 2025 stock weights used last year were the same as the 2024 stock weights. By convention for this stock, all biological input data used in SAM for the current year are set equal to those in the previous year, the last year for which data are available. In the 2026 assessment, the 2025 stock weights are based on data and show an increase for most age classes (see discussion in section 8.5). This is the main explanation for the higher 2025 SSB in the 2026 assessment compared to the 2025 STF.

For 2026, there is still a difference in mean weight-at-age, although less pronounced than for 2025. In addition to that, there are differences in the abundances at age: the estimated 2026 recruitment is much higher than the forecast assumption from last year. Age 3 abundance is however slightly lower in the 2026 assessment, due to the downward revision of the 2025 recruitment estimate (Figure 8.10.1). The combination of these factors explains the higher 2026 SSB value in this year's forecast compared to last year's forecast.

The weights-at-age in the catch for 2025 are higher in the 2026 assessment than the assumption used in the 2025 STF (average 2022-2024, Figure 8.10.6). This also leads to a high weight-at-age in the catch assumption in the 2026 STF compared to the 2025 STF.

8.11 Management considerations

Details and discussion on quality issues in this year's assessment is given in Section 8.7 above.

From 2001 to 2007, there was an internationally agreed arrangement covering most of the distribution area of the Northeast Atlantic mackerel. From 2008 to 2014, no agreement was reached among the Coastal States on the sharing of the mackerel quotas. In 2014, three of the Coastal States (European Union, Norway and the Faroe Islands) agreed on a sharing arrangement for 2014 to 2018. In November 2018, the 2014 agreement was extended for a further two years until 2020. No agreement on the share of the stock was reached between 2021 and 2024. In 2024, three of the Coastal States (UK, Norway and the Faroe Islands) agreed on a three year (2024-2026) sharing arrangement of mackerel. However, in late 2025 Iceland joined in forming a four-party sharing arrangement for 2026 onwards.

Despite agreeing to abide by the ICES advice, the total declared quotas in each of the years from 2015 to 2025, each year has significantly exceeded the advised catch by ICES (Figure 8.11.1).

Using the recommendations from WKEVALMAC (ICES, 2024) the NEA mackerel stock is considered as a single unit for the purposes of assessment, advice and management in ICES.

Further, ICES considered that given the single stock structure, there is no justifiable scientific reason for considering closed areas, area specific closed seasons or spatial quota measures for this widely ranging stock. In addition, any reference to minimum landing sizes should apply to the whole stock equally.

Conservation aspects

The most recent stock assessment shows that the SSB is below $MSY B_{trigger}$, B_{pa} , but above B_{lim} .

Atlantic Mackerel was evaluated by IUCN in 2015 as a species of least concern (<https://www.iucnredlist.org/>) and it is neither found on OSPAR's list of threatened and declining species nor on the HELCOM Red List. Furthermore, the WGWIDE has not identified any anthropogenic pressure threatening the stock. Therefore, ICES has not identified any conservation aspects.

8.12 Ecosystem considerations

An overview of the main ecosystem drivers possibly affecting the different life-stages of North-east Atlantic mackerel and relevant observations are given in the Stock Annex. The discussion here is limited to recent features of relevance.

Production (recruitment and growth)

Mackerel spawning has a preference at depths between 100 m and 200 m, on the shelf-edge from the north of the Iberian Peninsula to the west of Scotland, with a maximum west of Ireland (Brunel et al., 2018; Costas, 2025). The most important nursery areas are around Ireland, north and west of Scotland, in the northern North Sea north of 59°N and, to some extent, also in the Bay of Biscay (Jansen et al., 2015).

The rapid increase in stock size up until around 2015 was suggested to drive the expansion of the spawning northward into new areas (Jansen, 2016). There have been several indications of a northward shift and/or expansion in spawning and nursery area towards northern and north-eastern areas since 2016 (ICES, 2016; Nøttestad *et al.*, 2018; Bjørdal, 2019; Bjørdal et al. 2022). This northerly shift seems to have continued (Nøttestad *et al.*, 2018; ICES 2022). This is further supported by Costas (2025), who documented a preference for cooler waters in recent years. However, spawning in the Norwegian Sea was shown to be of little quantitative significance in 2021 (Burns and O'Hea, WD 15 to WGWIDE 2021 (ICES, 2021)). Nevertheless, both increased biomass

and extended distribution based on a more northward extension of the mackerel egg survey in Norwegian offshore and coastal waters in 2022 (Anon, 2022) and poleward spawning of NEA mackerel, up to 75°N (dos Santos Schmidt *et al.* 2023) clearly document that mackerel have been spawning in increasing numbers in recent years in the Norwegian Sea. An on-going extension of spawning activities into the Norwegian Sea feeding area (62-75°N), reached stable levels around 2012 onwards. This poleward expansion of spawning increased as more fish entered the area, whilst the maximum proportions of spawners concurrently dropped from about 75 to 15% from May to July (dos Santos Schmidt *et al.* 2023). The synoptic survey of mackerel distribution in the summer time in 2023-2025 shows a marked contraction in both the north and west distribution of the stock compared to 2019-2022.

Growth (*i.e.* length- and weight-at-age) showed clear declines for all ages up to around 2015 (*e.g.* 0-3 year-old in 1998-2012, Jansen and Burns, 2015; all ages in 2005-2015, Jansen and Burns, 2015; Ólafsdóttir *et al.*, 2015), and gradual increases since then to present. This is consistent with the knowledge that variations in growth of mackerel in all ages are correlated with mackerel density, *e.g.* mean weight-at-length have been shown to be positively related to location, day-of-year, temperature and SSB. Furthermore, the density dependent regulation of growth from juvenile to adult mackerel, appears to reflect the spatial dynamics observed in the migration patterns during the feeding season. As such, growth rates of the juveniles were tightly correlated with the density of juveniles in the nursery areas (Jansen and Burns, 2015) and growth for adults (age 3-8) were correlated with the combined effects of mackerel and herring stock sizes (Ólafsdóttir *et al.*, 2015). During the period of high mackerel abundance around 2013-2015, conspecific density-dependence was most likely mediated via intensified competition associated with greater mackerel density, possibly also coinciding with decreased prey availability. The increases in weight-at-age of mackerel both from the catches and the surveys shown during the last years, coincide with significantly reduced abundance of mackerel in recent years.

Drivers of the spatial distribution of mackerel

In the mid-2000s, the summer feeding distribution of mackerel in Nordic Seas began expanding both westwards into Icelandic and Greenlandic waters and further north in the Norwegian Sea (Nøttestad *et al.*, 2016). The centre-of-gravity shifted westward by 1650 km and northward by 400 km (Ólafsdóttir *et al.*, 2019) and the distribution area increased from 1.3 mill km² in 2007 to at least 2.9 mill km² in 2014 when it peaked (ICES, 2022; Ólafsdóttir *et al.*, 2019). However, a substantial shift in mackerel concentrations and distribution during summers of 2020-2025, when no mackerel were registered in Greenland waters, and a substantial decline was documented in Icelandic waters. In 2025-2026, the distribution was limited to the Norwegian Sea, with the highest concentrations in the central/eastern part of the Norwegian Sea (WD 01). Overall, we have witnessed that mackerel had a much more eastern distribution in 2018-2025 compared to 2014-2017 (ICES, 2018; Nøttestad *et al.*, 2019; 2020a; 2021).

Ólafsdóttir *et al.* (2019) modelled (GAM) IESSNS data (2007-2016) and found that mackerel was present in temperatures ranging from 5 °C to 15 °C, but preferred areas between 9 °C and 13 °C. The model showed that both mackerel occurrence and density were positively related to location, temperature, meso-zooplankton density and SSB. Thus, geographical expansion of mackerel during the summer feeding season in Nordic Seas was driven by increasing mackerel stock size and constrained by availability of preferred temperature and abundance of meso-zooplankton. However, these results are limited by the length of the time-series (1997-2016; Olafsdottir *et al.*, 2019). Notably, this seems to have changed during the most recent period from 2019 and onwards (*e.g.* high mackerel concentrations in 2020 at lower temperatures of 7-8 °C; Nøttestad *et al.*, 2019; 2020a; WD09 in ICES 2021).

It is not clear what causes this distributional shift, but the SST were 1–2°C lower in the western and south-western areas as compared to a 20-years mean (1999–2009), and substantially lower zooplankton concentrations in Icelandic and Greenland waters in 2019 and 2020 might partly explain such changes (ICES, 2018; Nøttestad *et al.*, 2019; 2020a). Marine climate with multi-decadal variability might also have affected the observed distributional changes but were not evaluated. Furthermore, tagging data suggest that when mackerel grow older and larger, they seem to cover a progressively wider area of its annual migration cycle, although large inter-annual variability in the recapture patterns likely reflect changes in environmental conditions such as prey availability and ocean currents (Ono *et al.* 2022). A joint spatio-temporal distribution model of mackerel (ages 3–10) was developed to investigate the age-based responses of mackerel to three environmental drivers: sea surface temperature (SST), mixed layer depth, and chlorophyll-a concentration during the summer months 2010–20 in the Nordic Seas (Ono *et al.* 2024). The study showed that SST was the most important variable amongst the ones tested and had the strongest impact on the distribution of the younger age classes (3–5), which had a narrower range of favourable SST and a stronger aversion to cold temperatures than older individuals. Individuals in the south were likely not constrained by temperature and perhaps more influenced by other variables, such as food availability or ocean current (throughout their migration path), for which appropriate data are lacking. Moreover, the model showed that older mackerel were distributed more to the north and west, and their migration pattern changed when the 2013 year-class no longer migrated to the west compared to previous year-classes. Additionally, all-year classes started migrating more eastward from summer 2018 (Ono *et al.* 2024).

Trophic interactions

There are strong indications for interspecific competition for food between mackerel, NSS-herring and blue whiting (Huse *et al.*, 2012), where the competition between mackerel and herring being the best studied relationship. Both higher stomach fullness and prey shift for mackerel compared to herring during low stock size periods indicates that herring may suffer from this competition. Thus, an opportunistic (i.e. rapid shift in diet) and more generalist diet (i.e. wider range of prey) may be advantageous for mackerel in periods with low zooplankton abundances (Langøy *et al.* 2012; Debes *et al.* 2012; Óskarsson *et al.* 2015; Bachiller *et al.* 2016). Feeding activity seem to be highest in areas associated with colder water masses (Bachiller *et al.*, 2016), and bioenergetics indicate that mackerel consumption may be as high as both herring and blue whiting in some years (122–135 mill t year⁻¹, Bachiller *et al.* 2018). Distribution overlap between mackerel and NSS herring during the summer feeding season is generally highest in the south-western part of the Norwegian Sea (Faroe and east Icelandic area) (Nøttestad *et al.*, 2016; 2017; Ólafsdóttir *et al.*, 2017). This spatiotemporal overlap between mackerel and herring have been present from 2016–2019 (ICES, 2018, Nøttestad *et al.*, 2016; 2017; 2019). In addition, increasing distribution overlaps in the north-western parts of the Norwegian Sea have also been observed since 2019 and onwards, which is in contrast to previous years (Nøttestad *et al.*, 2019; 2020a). Overlapping distributions of mackerel and Norwegian spring-spawning herring (NSSH) were particularly present in the western and north-western part of the Norwegian Sea in 2022.

A number of predators have been highlighted as potential sources of mortality for mackerel. Although limited spatial overlap between marine mammals and mackerel during summers in the Nordic Seas (Nøttestad *et al.*, 2019; Løviknes, 2019), orcas have been observed to actively search and hunt for mackerel schools (Nøttestad *et al.*, 2014; Nøttestad *et al.*, 2020a; 2021, 2022). Furthermore, the increases of 0- and 1-groups mackerel found along major coastlines of Norway (2016–2018, Nøttestad *et al.*, 2018; Bjørddal, *et al.* 2022) have coincided with predation by increasing numbers of adult Atlantic bluefin tuna (*Thunnus thunnus*, Bøge, 2019; Nøttestad *et al.*, 2020b). Furthermore, both in 2023 and 2024 Atlantic puffins hatching in the archipelago Røst in Lofoten (~68°N) have been documented to feed extensively on 0-group mackerel, for the first time since

1974, contributing extensively to the first two years of hatching success and chick survival of Atlantic puffins in the area for more than 15 years. Additionally, stomach samples from several species document that smaller sized mackerel is now eaten by different predators in northern waters (e.g. cod, saithe, marine mammals and seabirds; Bjørdal, 2019). Although, fewer 1-groups have been observed in coastal Norway waters in recent years (2019-2023, IESSNS; Nøttestad *et al.*, 2019; 2020b; 2021; 2022) predation by the Atlantic bluefin tuna is still evident (Ferber *et al.* 2024). The predation pressure and associated mortality from various predators on NEA mackerel (both juveniles and adults) are still unknown but could have ecological impact in both time (i.e. population) and space (i.e. local and regional) (ICCAT, 2019; Nøttestad *et al.*, 2020b). There are also indications that the predation pressure may have increased over the last decade, due to increased abundance of both marine mammals and Atlantic bluefin tuna. This could have increased the natural mortality by increased predation on the mackerel stock in recent years.

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8.14 Figures

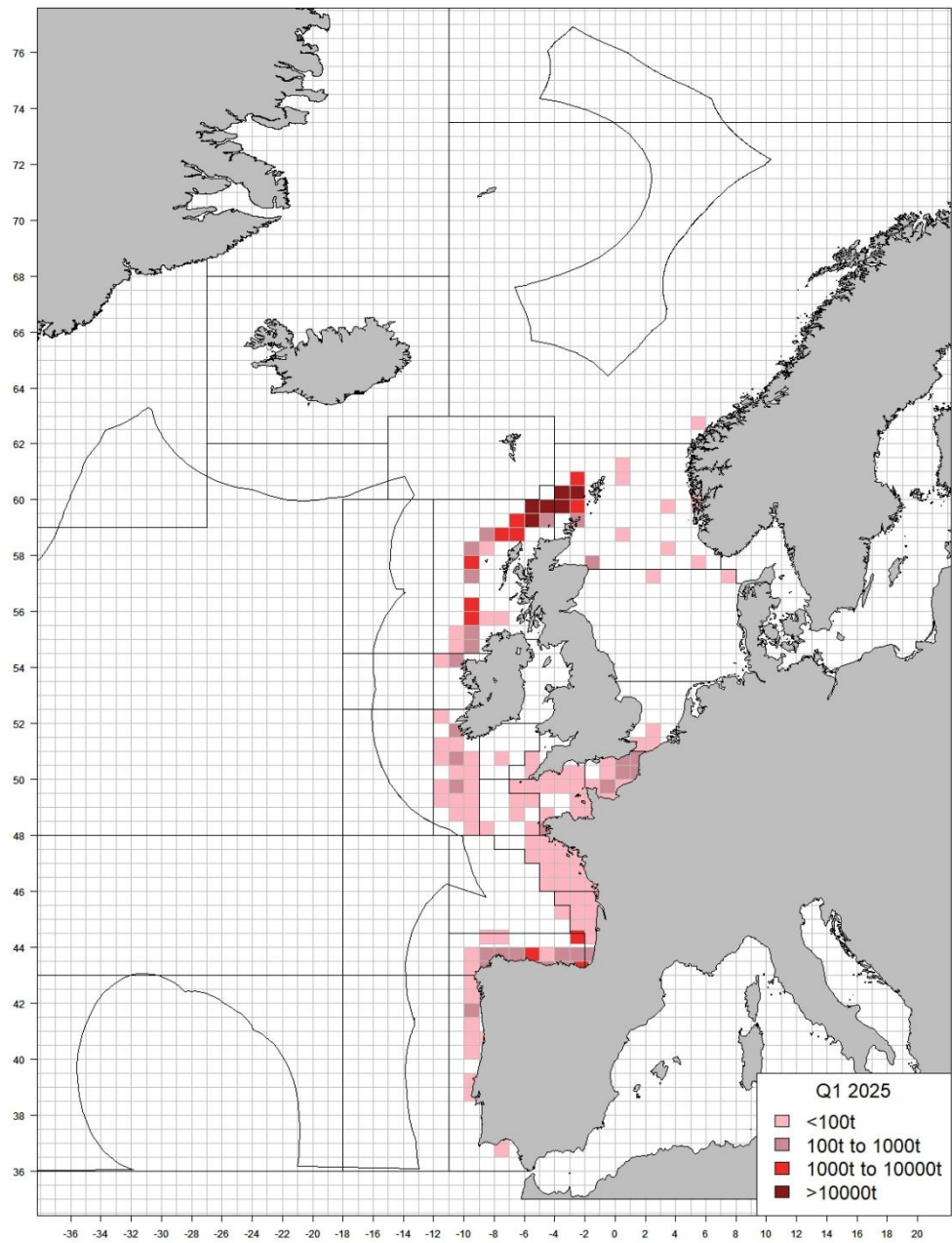


Figure 8.2.2.1. NE Atlantic Mackerel. Commercial catches in 2025, quarter 1.

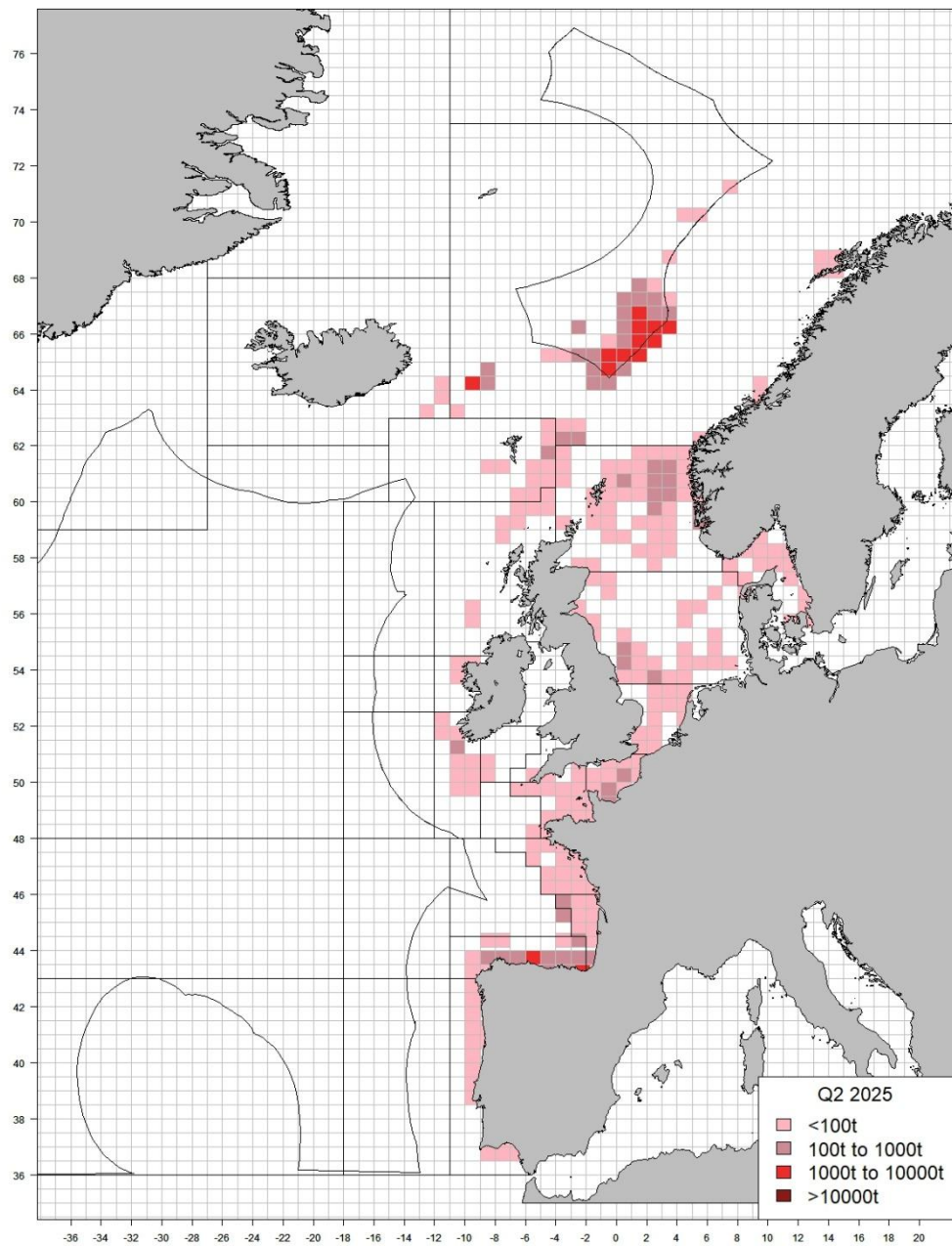


Figure 8.2.2.2. NE Atlantic Mackerel. Commercial catches in 2025, quarter 2.

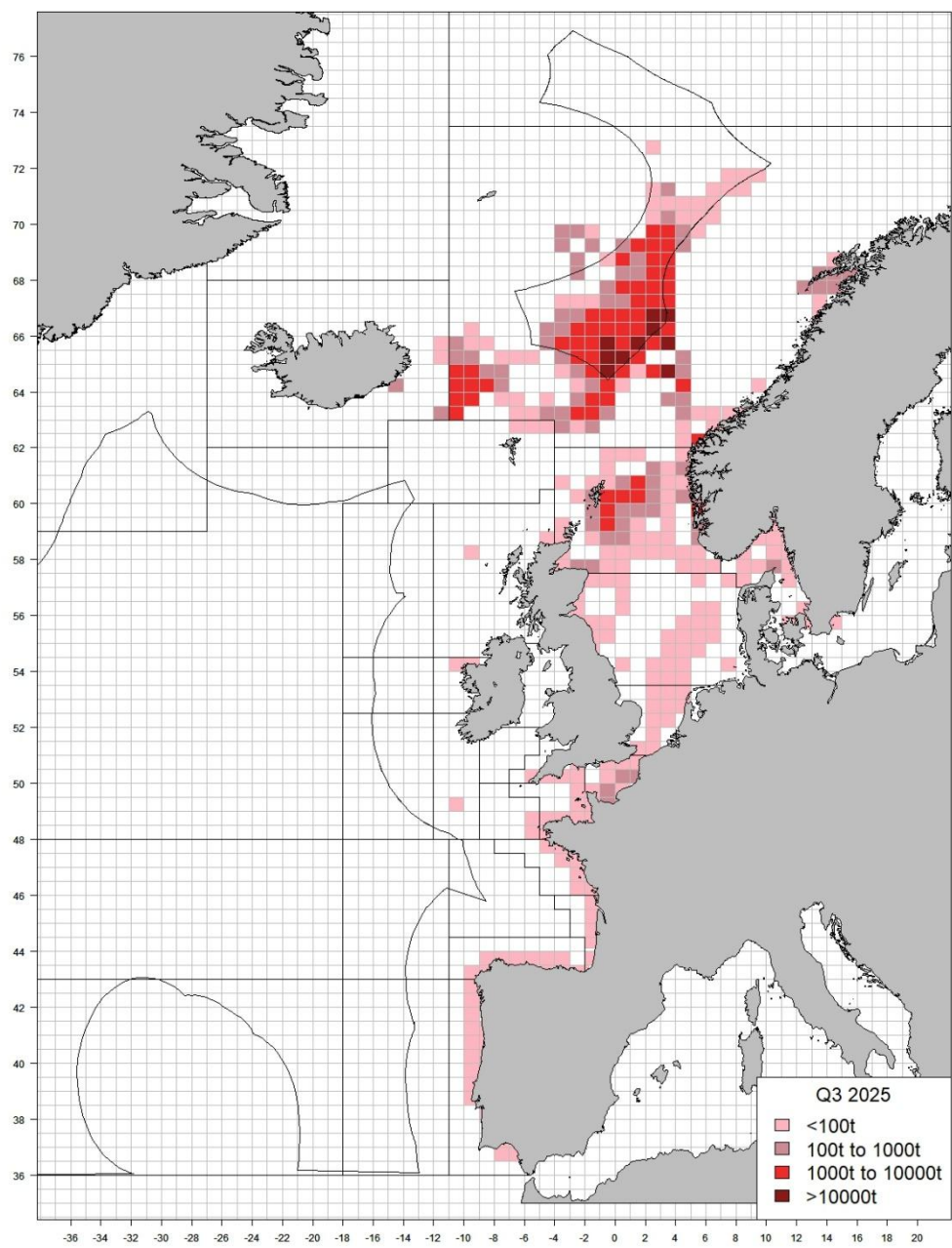


Figure 8.2.2.3. NE Atlantic Mackerel. Commercial catches in 2025, quarter 3.

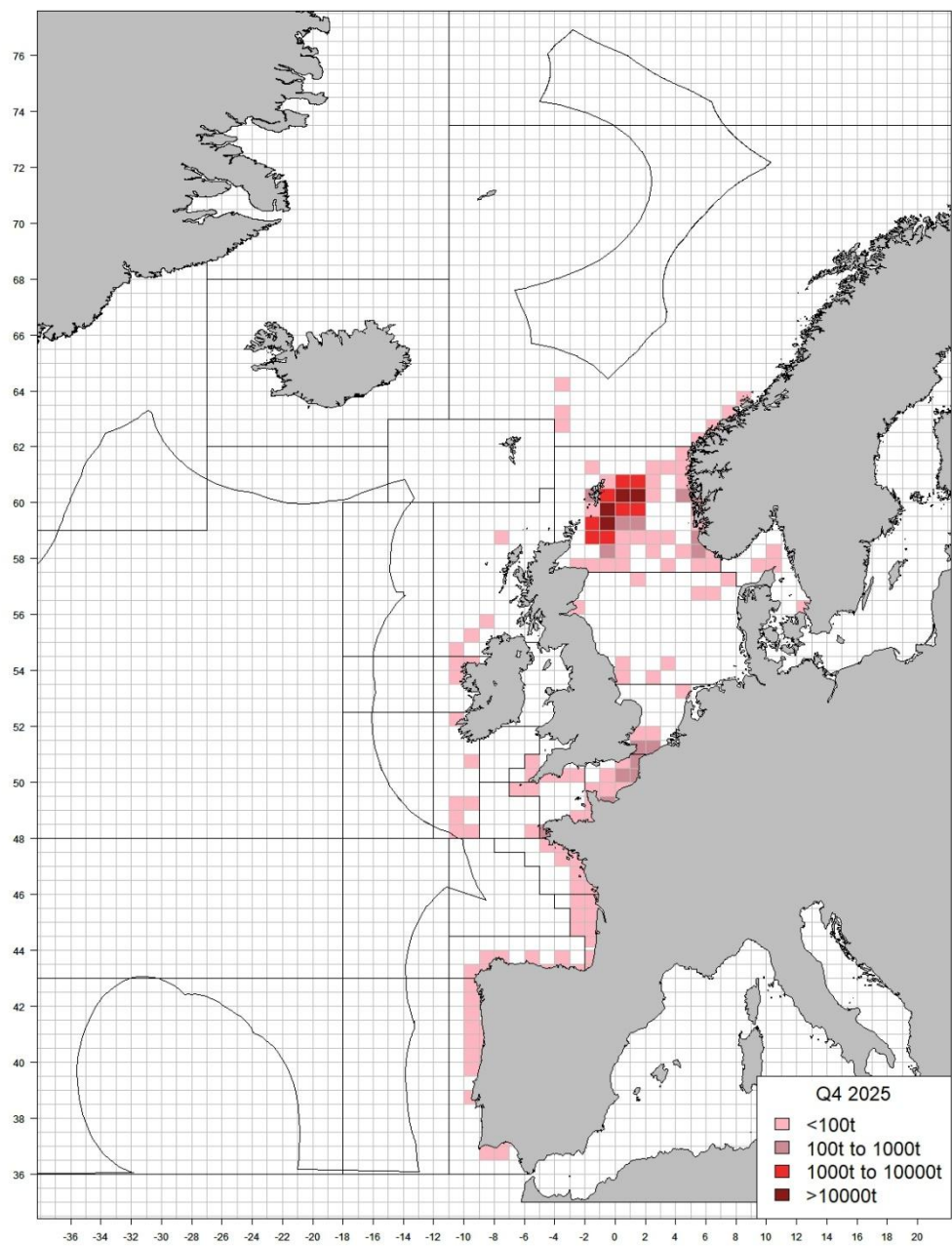


Figure 8.2.2.4. NE Atlantic Mackerel. Commercial catches in 2025, quarter 4.

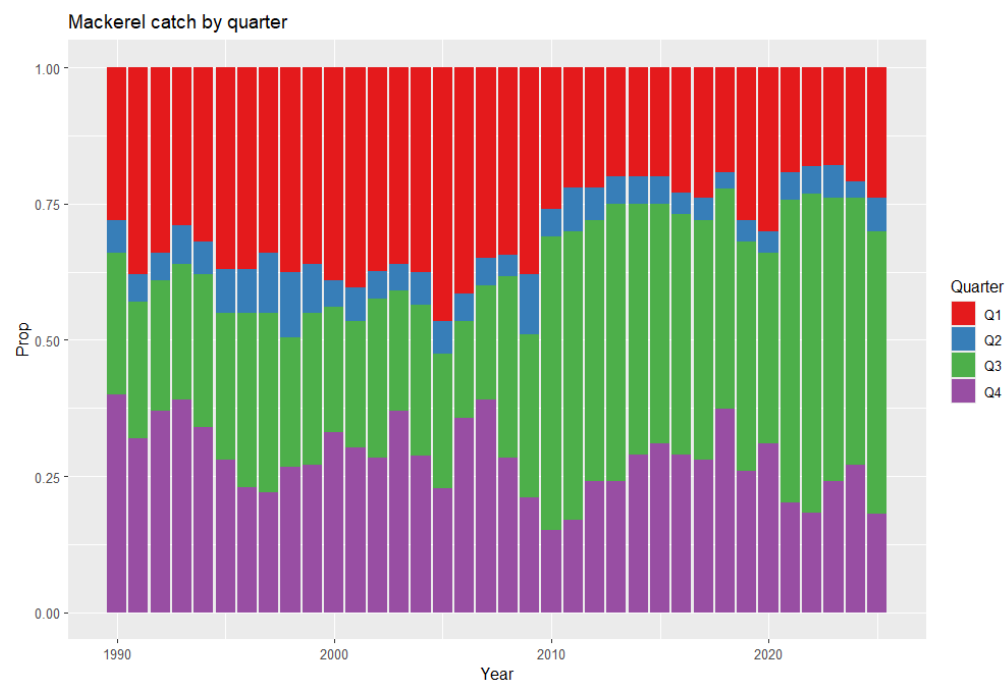


Figure 8.2.3.1. NE Atlantic Mackerel. Proportion of the catch by quarter by year.

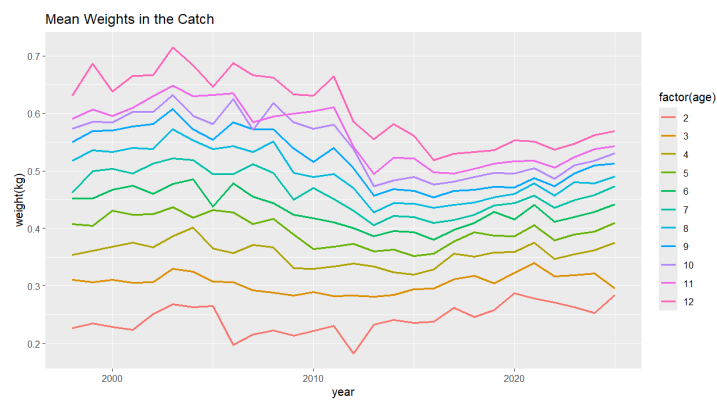


Figure 8.5.2.1. NE Atlantic mackerel. Weights-at-age in the catch from 1998.



Figure 8.5.2.2. NE Atlantic mackerel. Mean weight at age in the stock and in the catches

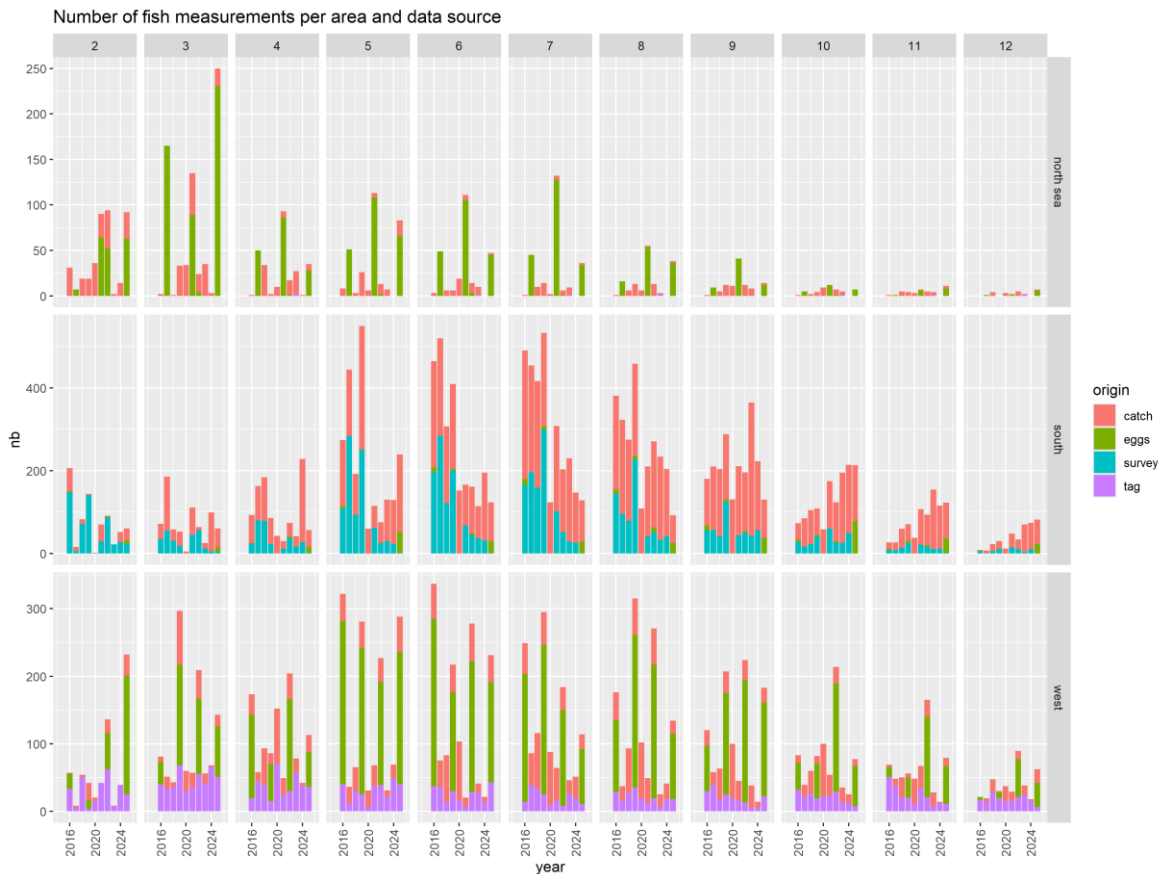


Figure 8.5.2.3. NE Atlantic mackerel. Number of fish measurements available in the recent years for the calculation of the mean weight at age in the stock, per spawning area and data source.

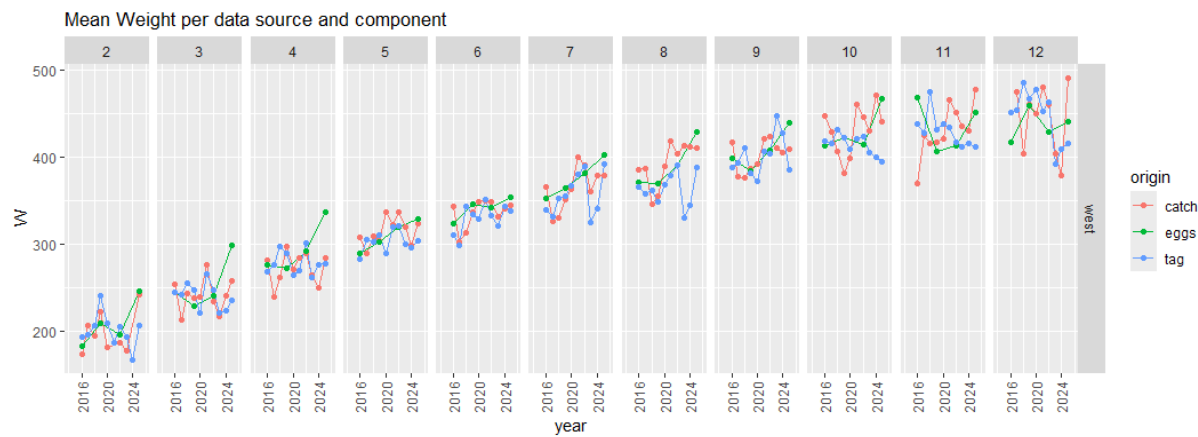


Figure 8.5.2.4. Mean weight at age in the stock per data source (catch, egg survey and tagging survey samples) for the recent years.

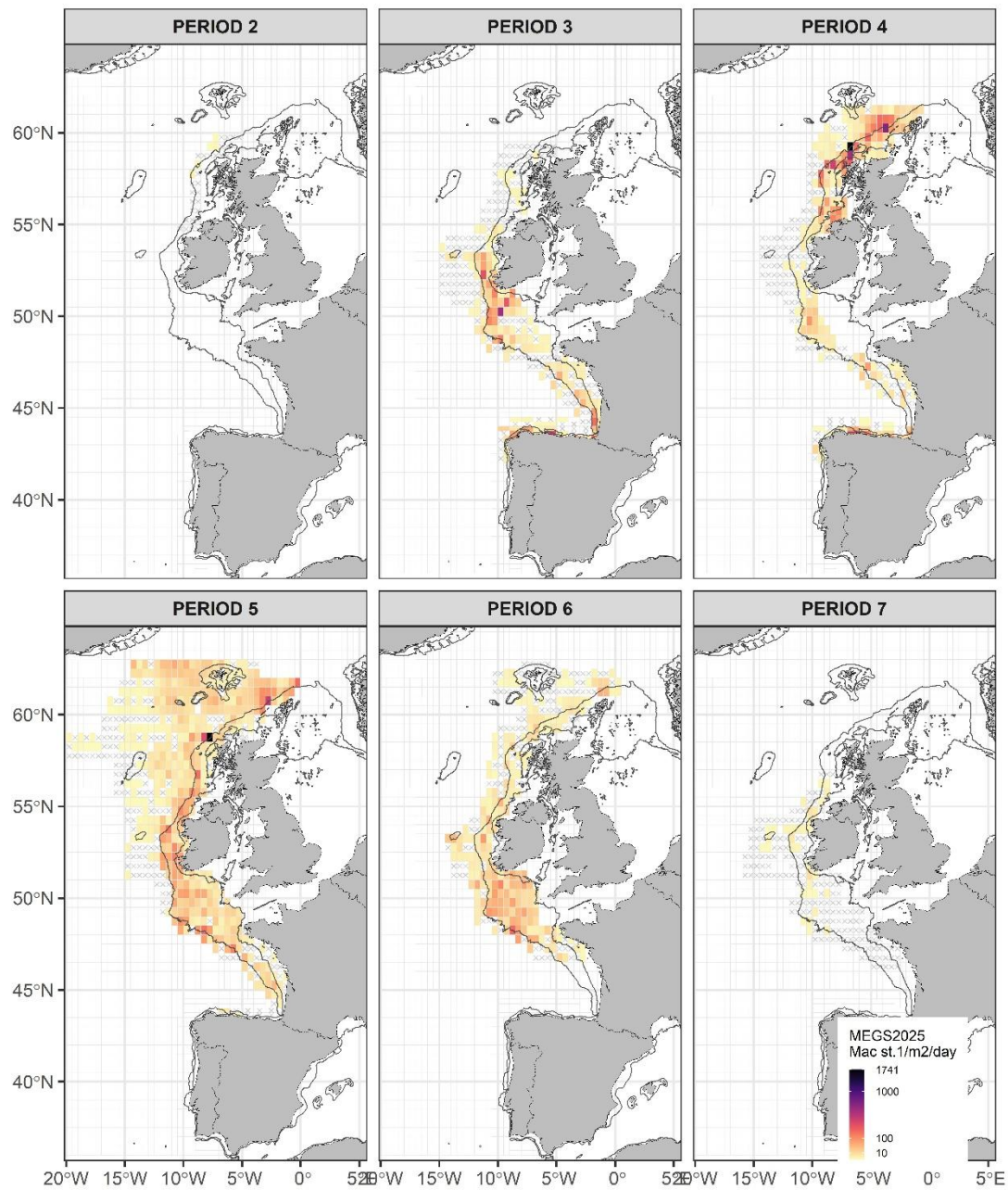


Figure 8.6.1.1: Mackerel daily egg production by half rectangle by period during 2025 survey. Color scale represents mackerel stage I eggs/m2/day by half rectangle. Crosses represent zero values.

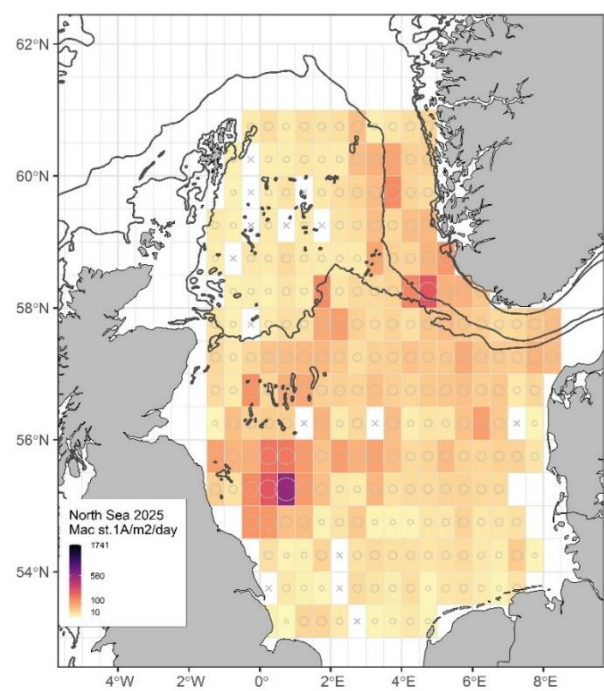


Figure 8.6.1.2: Heat map of Stage 1A mackerel daily egg production (eggs. m-2. day-1) by half rectangle for the North Sea areas, 2025. Grey circles represent daily egg production values; crosses represent zero values.

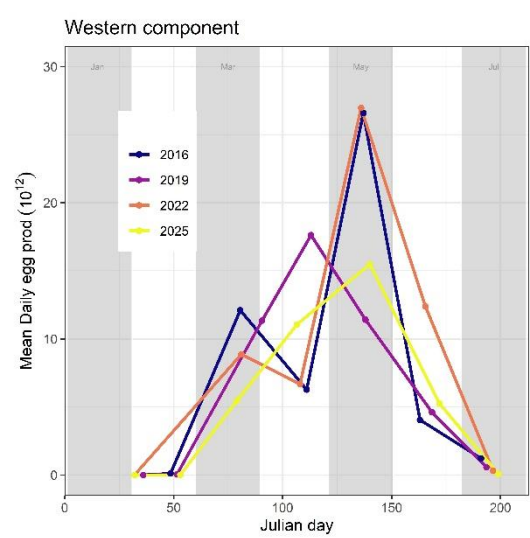


Figure 8.6.1.3. Mean daily egg production by period curve for mackerel in the western component in 2025, (yellow line). The curves for 2016, 2019 and 2022 are included for comparison.

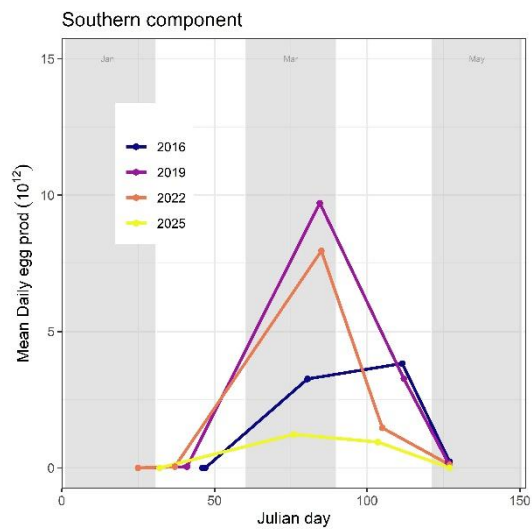


Figure 8.6.1.4. Mean daily egg production by period curve for mackerel in the southern component for 2025, yellow line). The curves for 2016, 2019 and 2022 are included for comparison.

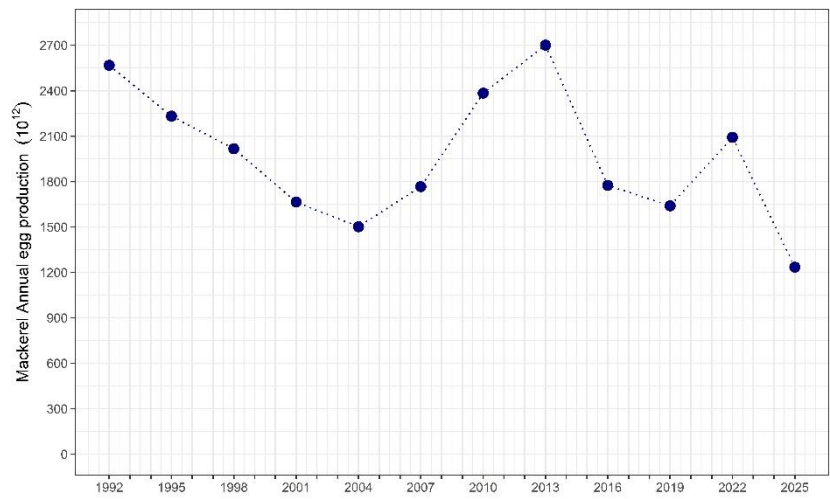


Figure 8.6.1.5 Total annual egg production for the combined Western and Southern components since 1992.

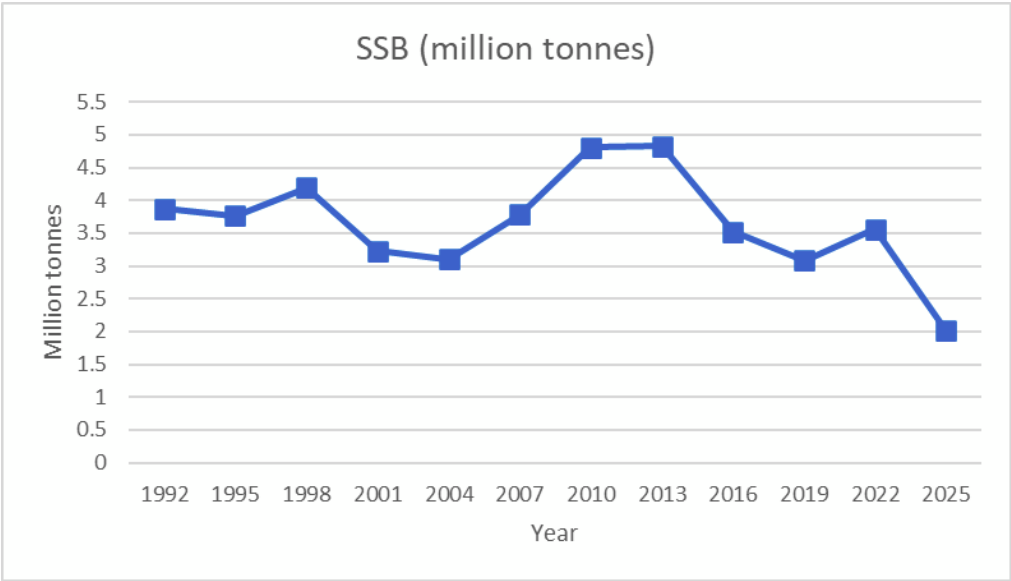


Figure 8.6.1.6 Combined mackerel SSB estimates (*106 tonnes) - 1992 – 2025.

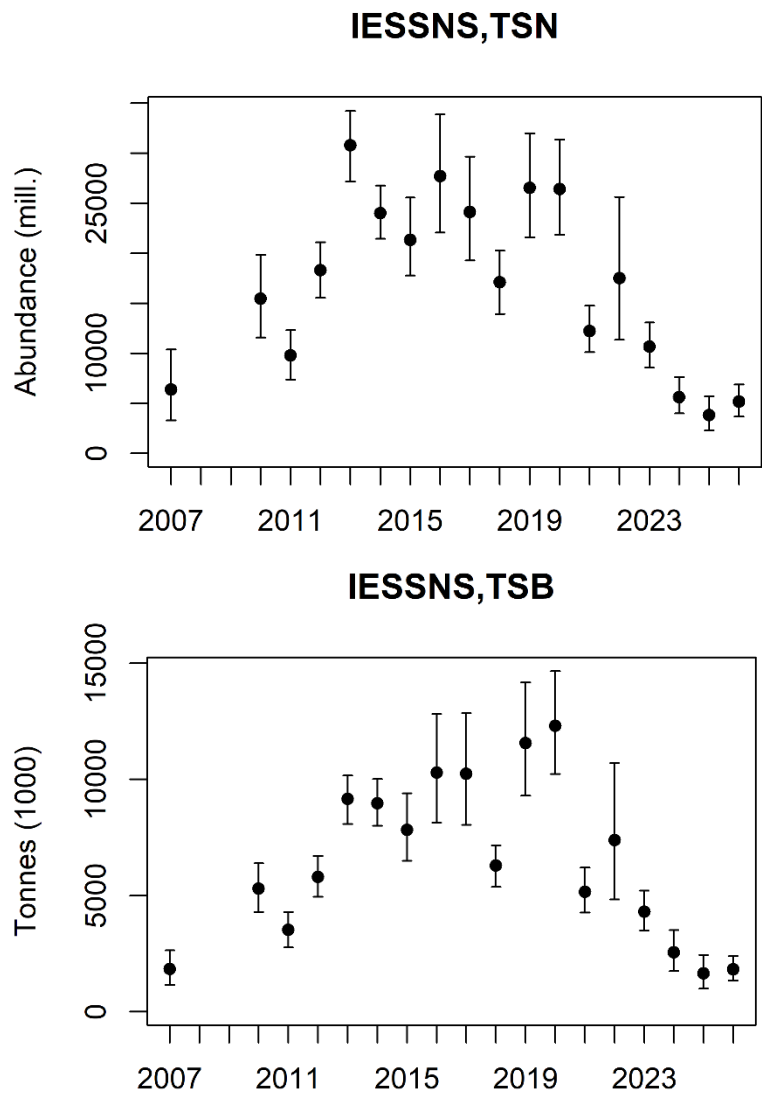
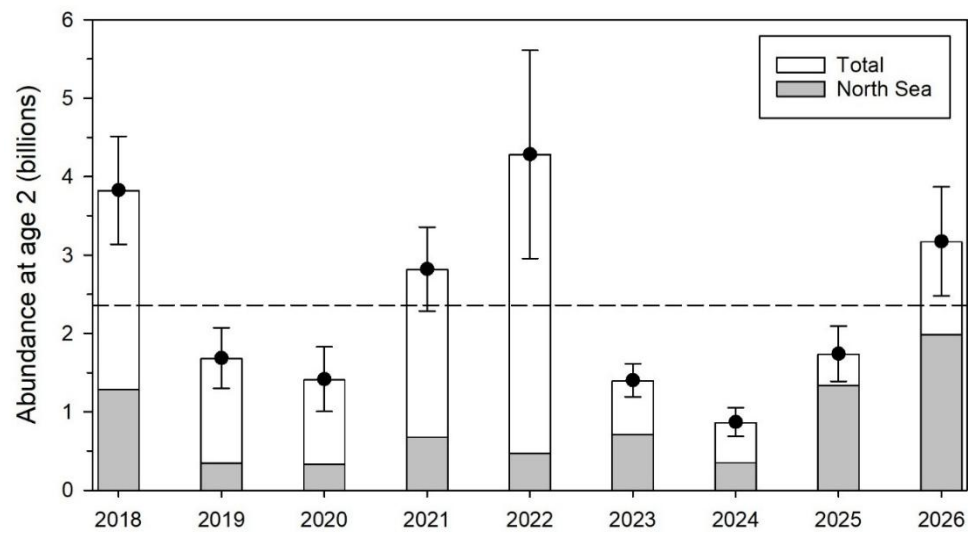


Figure 8.6.2.1. Mackerel in Nordic Seas. Estimated total stock numbers (upper panel) and total stock biomass (lower panel) of mackerel from IESSNS calculated for the years 2007 and from 2010 to 2026. Abundance/biomass is calculated as mean of 1000 bootstrap replicas (black filled circle) presented with 90% confidence intervals. Note, in 2011 the northern part of the Norwegian Sea was not surveyed, hence the estimate for that year is not representative of mackerel stock size. See IESSNS 2011 cruise report for details.



Figure

8.6.2.2. Annual mackerel recruitment index is shown as abundance at age 2 (billions) for the Nordic Seas and the North Sea combined (StoX bootstrap estimates of mean and standard error (SE), dashed line: average 2018-2026).

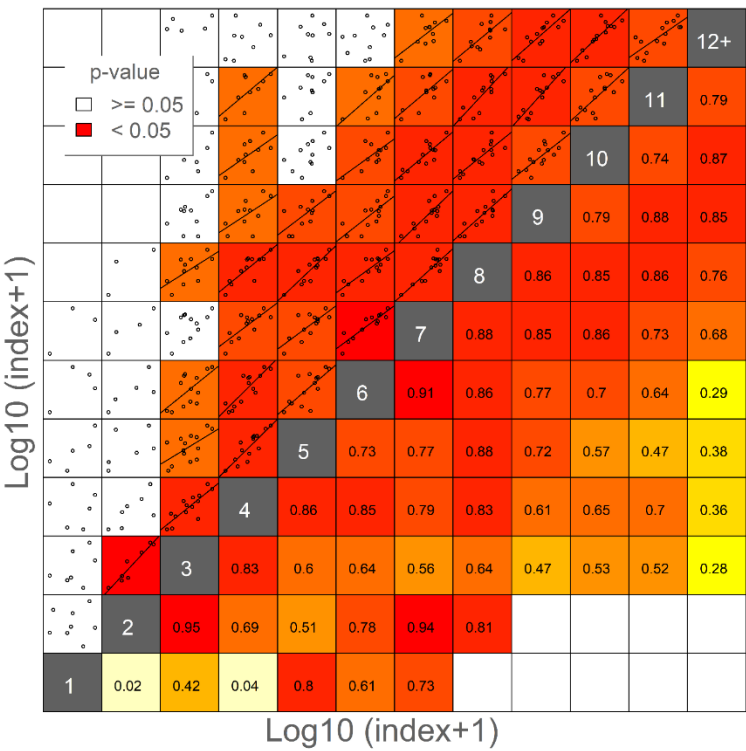


Figure 8.6.2.3. Internal consistency of the mackerel abundance index from the IESSNS survey including data from 2012 to 2026, from the Nordic Seas, incl. the North Sea for ages 1 and 2 only. Ages indicated by white numbers in grey diagonal cells. Statistically significant positive correlations ($p<0.05$) are indicated by regression lines and red cells in upper left half. Correlation coefficients (r) are given in the lower right half.

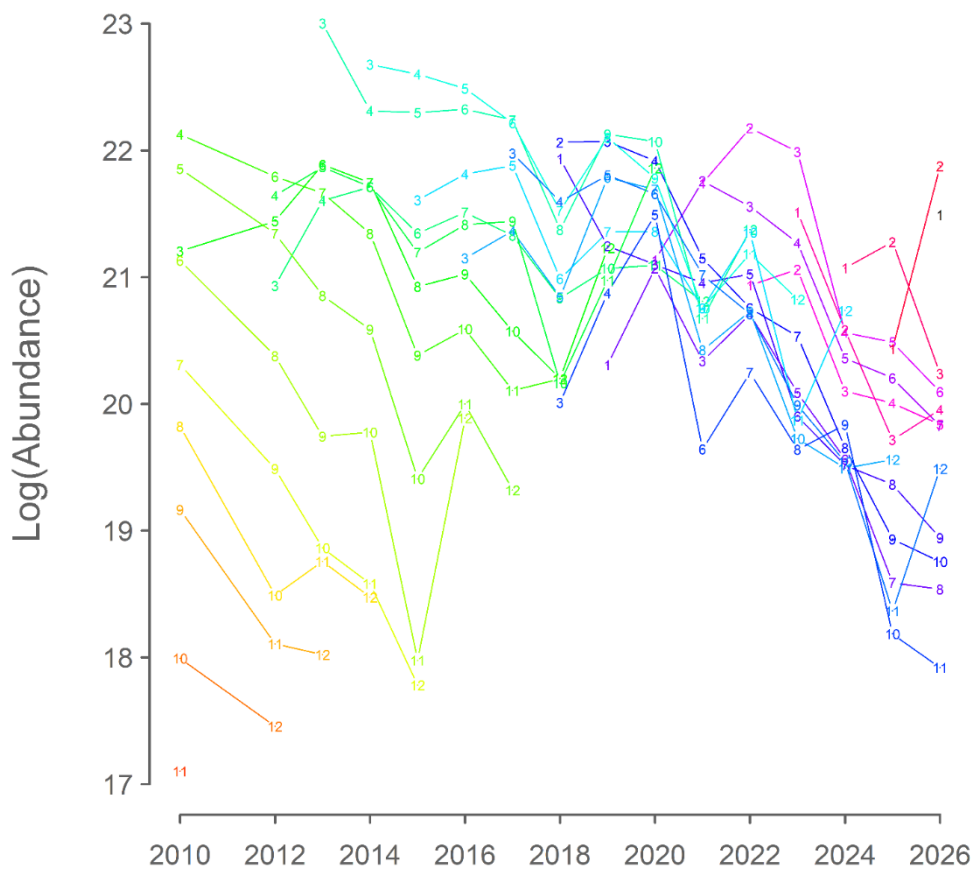


Figure 8.6.2.4. Mackerel catch curves of the IESSNS abundance estimates of mackerel in the Nordic Seas, incl. the North Sea for ages 1 and 2 only, in 2010 and from 2012 to 2026. Each cohort of mackerel is marked by a uniquely coloured line that connects the estimates indicated by the respective ages.

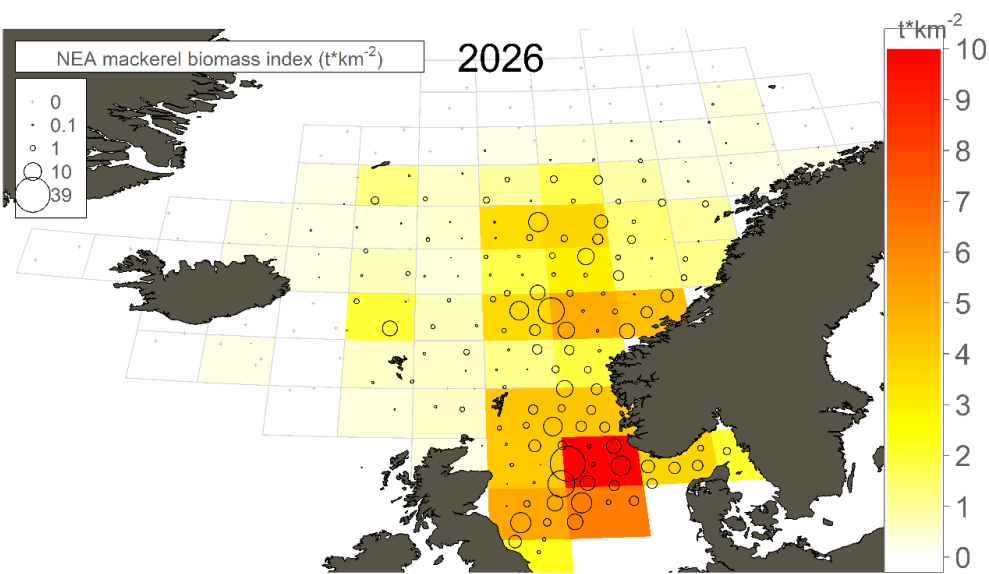


Figure 8.6.2.5. Mackerel catch rates from predetermined surface trawl stations (circle size represents catch rate in kg/km2) overlaid on mean catch rate per standardized rectangle (2° lat. x 4° lon.) from IESSNS 2026, including North Sea. Zero mackerel catches are displayed as grey crosses.

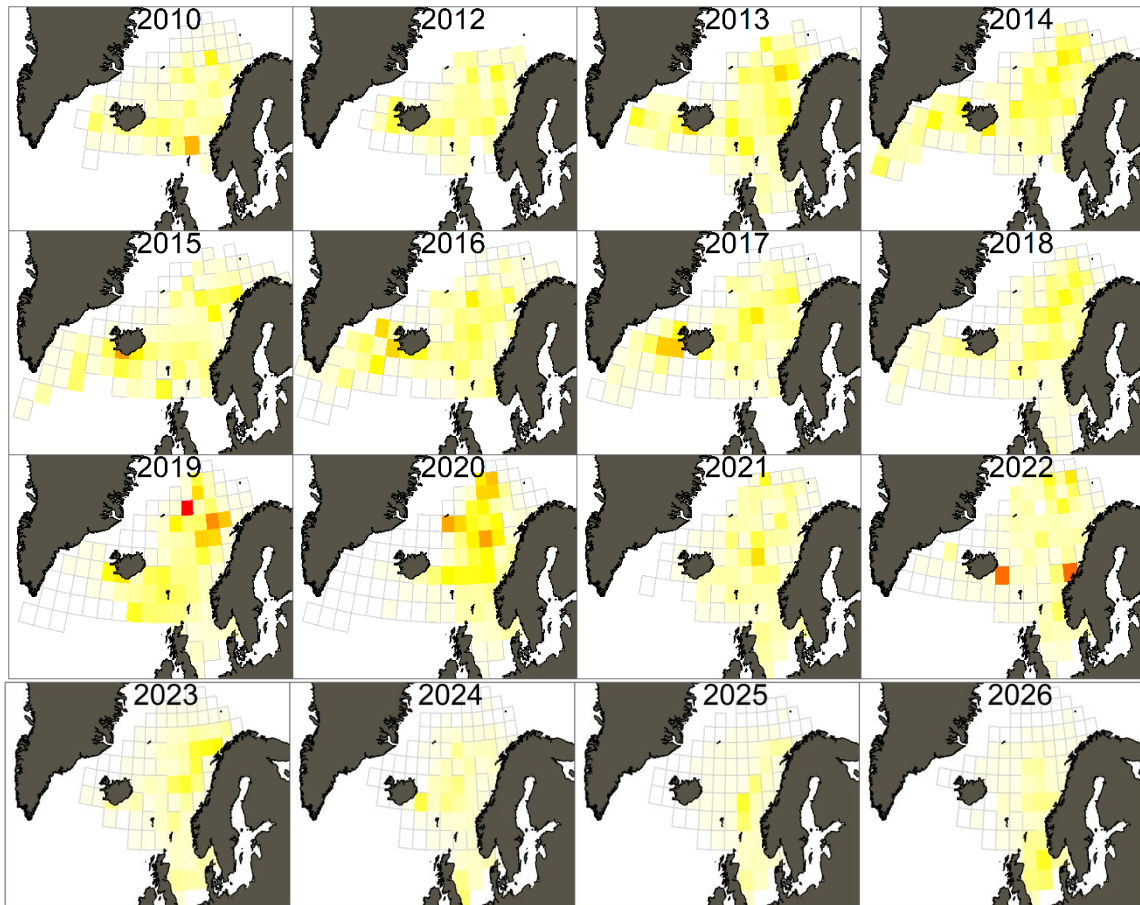


Figure 8.6.2.6. Mackerel annual distribution proxied by the absolute distribution of mean mackerel catch rates per standardized rectangles (2° lat. x 4° lon.), from predetermined surface trawl stations from IESSNS in 2010 and from 2012 to 2026, including North Sea. Colour scale goes from white (= 0) to red (= maximum value for the given year).

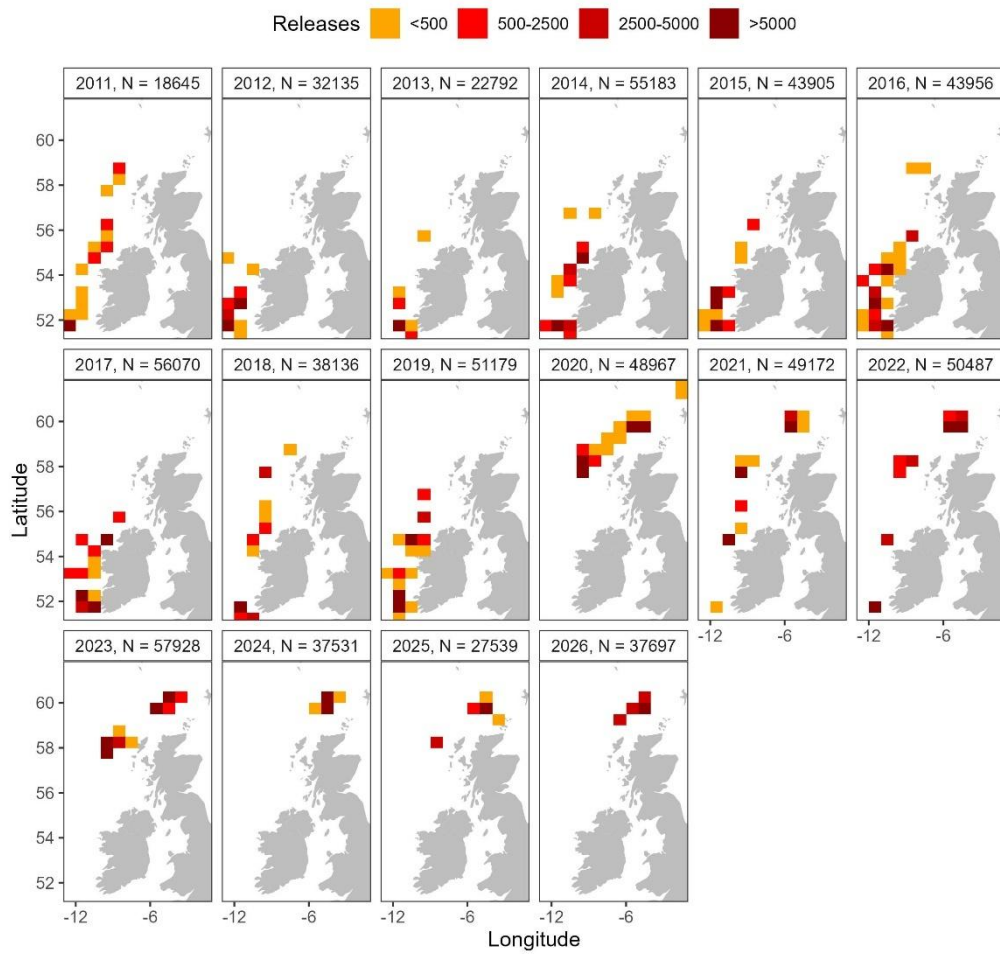


Figure 8.6.3.1. Yearly distributions of tagged NEAM along Ireland and The British Isles. Release years 2011-2012 are excluded from the assessment, as the distribution of catches scanned (Figure 8.6.3.2) and recaptures (Figure 8.6.3.3) were limited relative to subsequent years, yielding biased estimates of abundance at age with higher uncertainty (Figures 8.6.3.4-5).

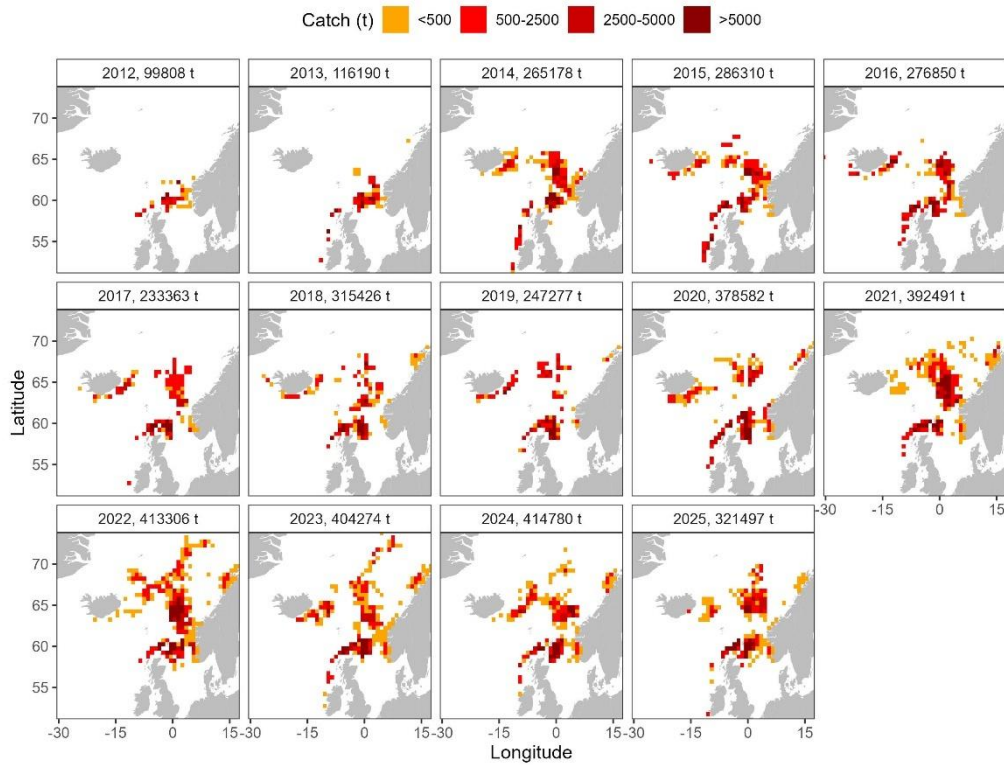


Figure 8.6.3.2. Yearly distributions of catches scanned for tags in NEAM. Note that all catches are included in the maps, also from factories excluded from estimation of the age-based abundance indices due to low efficiency. Catch years 2012-2013 with reduced distribution and lower biomass scanned, as only the Norwegian fishery was covered, are excluded from the assessment.

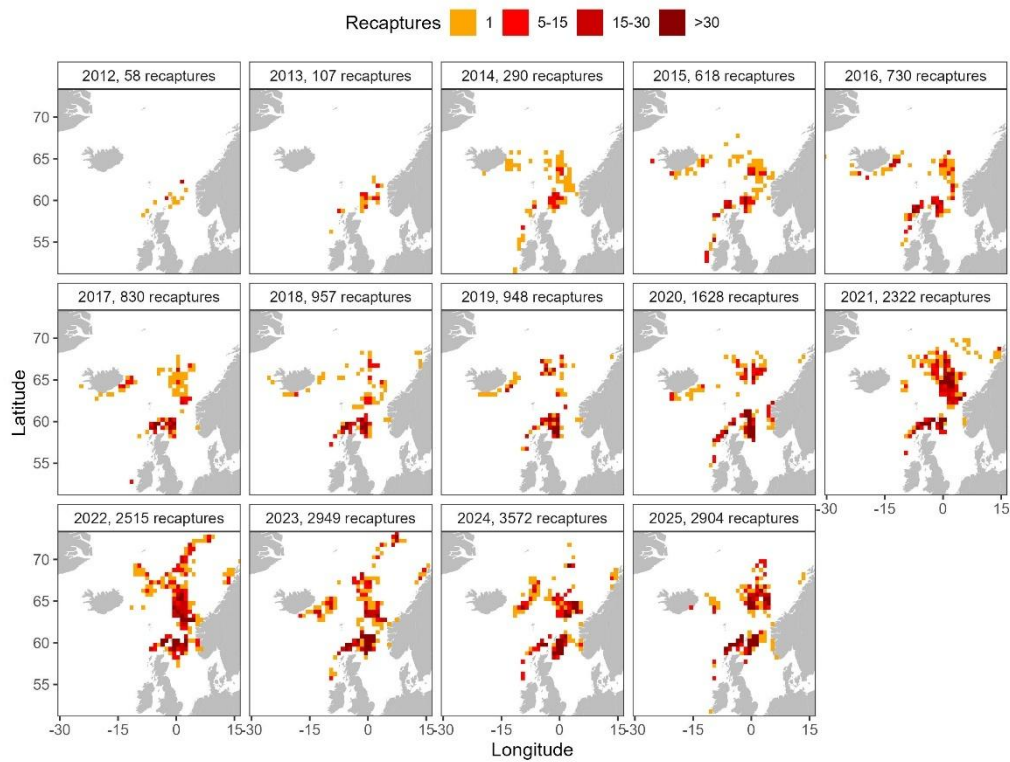


Figure 8.6.3.3. Yearly distributions of recaptured NEAM from releases shown in Fig. 8.6.3.1, and catches shown in Fig.8.6.3.2. All recaptures up to 2025 are included, also recaptures in same year as release (YearsOut = 0 - n) and from factories excluded from estimation of the age-based abundance indices due to low efficiency. Recapture years 2012-2013 with reduced distribution and low number recaptured, as only the Norwegian fishery was covered, are excluded from the assessment.

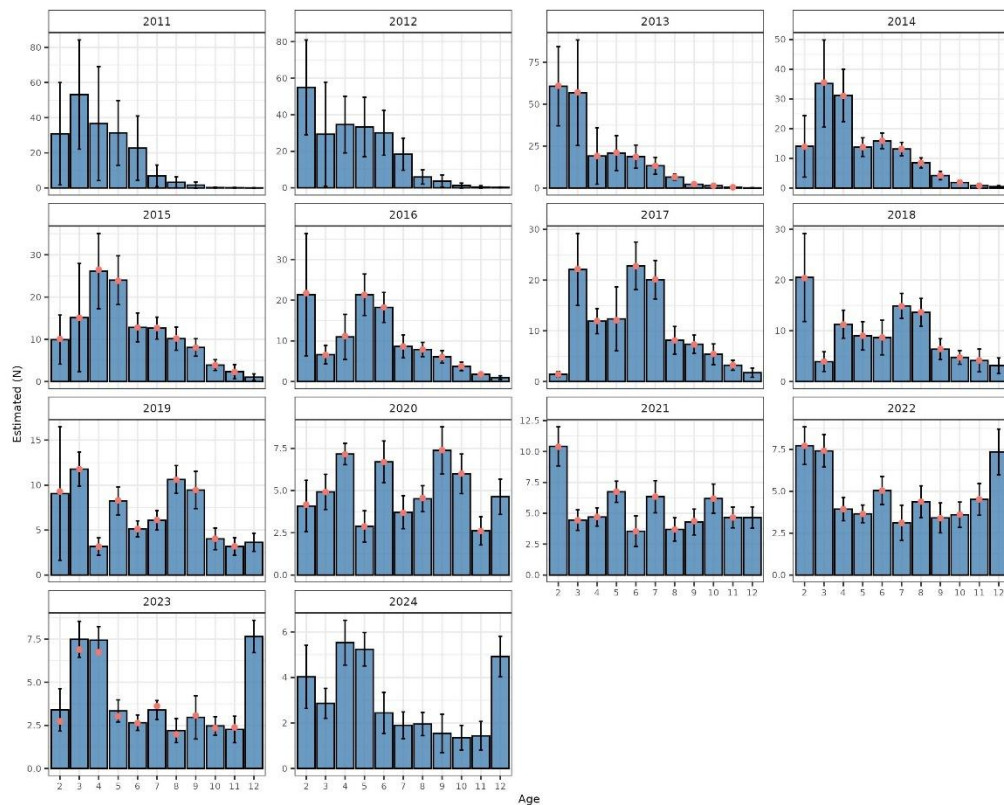


Figure 8.6.3.4. Yearly tag-based abundance estimates at age for NEAM based on the Lincoln Petersen model ($N = R * N_{scan} / r$). Estimates are means with 95 % CIs from bootstraps with 1000 iterations based on R of an age in a release year, and N_{scan} and r of the same year class in YearsOut = 1-2 after release. Age 12 is plus group. Note that red dots represent last year's official input (WGwide 2025) data for comparison. Small adjustments in 2023 is due to one additional year with N_{scan} and r . Estimates are only based on N_{scan} and r from factories and periods with accepted efficiencies. Due to a limited distribution of scanned catch (Figure 8.6.3.2) and recaptures (Figure 8.6.3.3), release years 2011-2012 are biased yielding higher CIs in the abundance estimates, and they are excluded from the assessment.

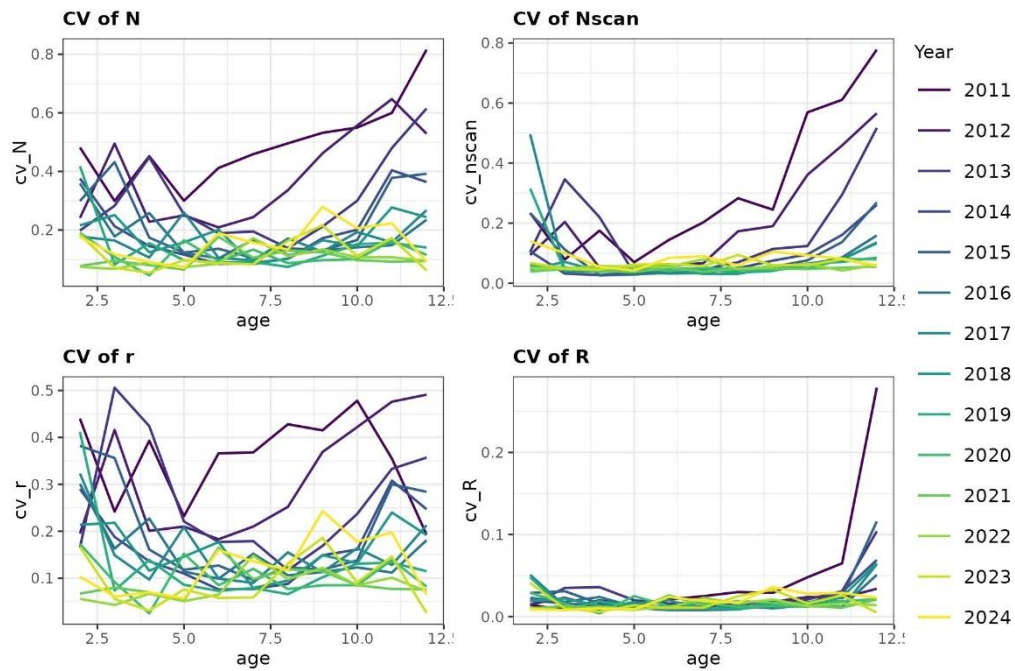


Figure 8.6.3.5. Yearly CVs at age for NEAM for Lincoln Petersen abundance estimates, and for the specific input data to the model (R, Nscan and r). CV-estimates are based on bootstraps with 1000 iterations based in YearsOut = 1-2 after release. Age 12 is plus group. Release years 2011-2012 with high CVs of abundance estimates linked to a limited distribution of catches (Figure 8.6.3.2) and recaptures (Figure 8.6.3.3) are excluded from assessment.

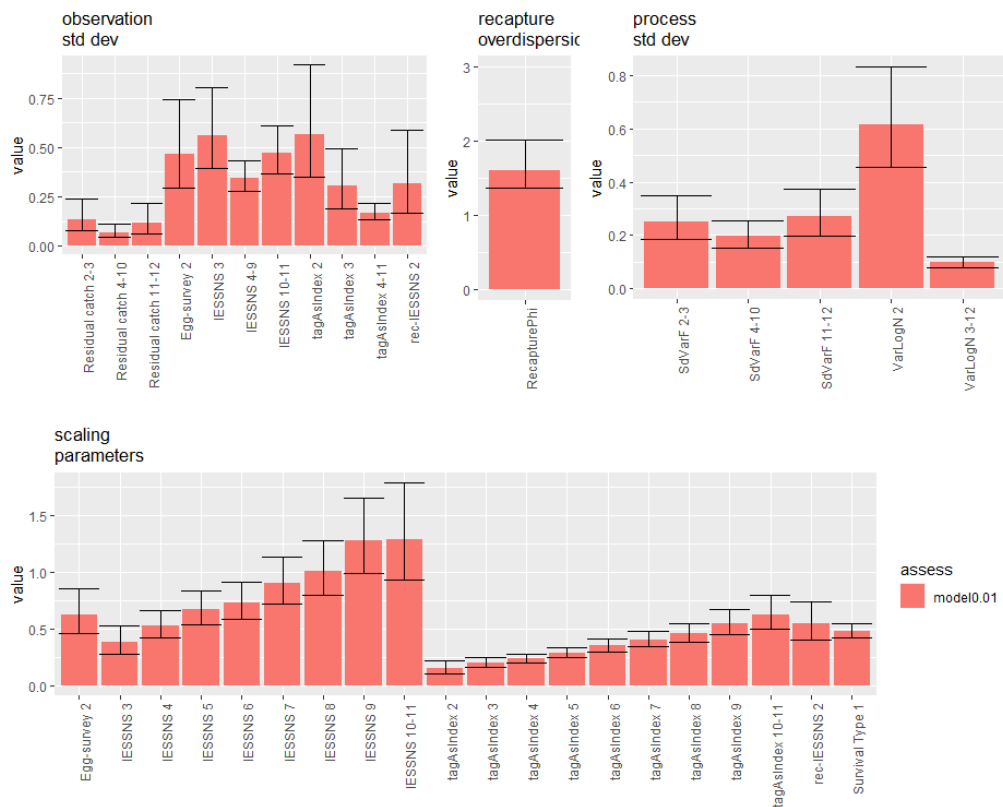


Figure 8.7.2.1. NE Atlantic mackerel. Parameter estimates from the SAM model (and associated confidence intervals) for the WGWISE 2026 update assessment. top left: estimated standard deviation for the observation errors, top centre: estimated overdispersion for the errors on the tag recaptures, top right: standard deviation for the processes, bottom: survey catchabilities and post-release survival of tagged fish.

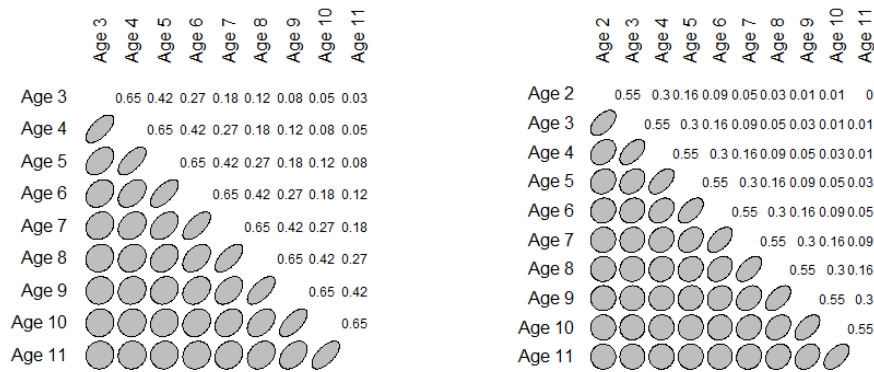


Figure 8.7.2.2. NE Atlantic mackerel. Estimated AR1 error correlation structure for the observations from the IESSNS survey age 3 to 11 (left) and RFID tagging index ages 2 to 11 (right).

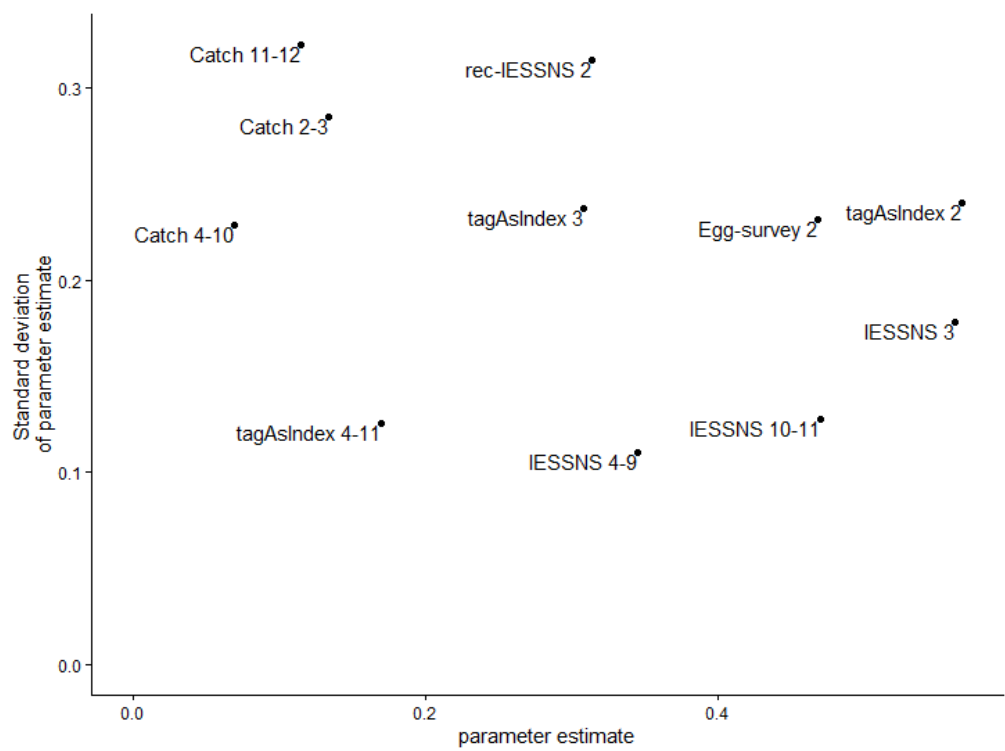


Figure 8.7.2.3. NE Atlantic mackerel. Parameter uncertainty (standard deviation of estimate) versus parameter value for the observation variances.

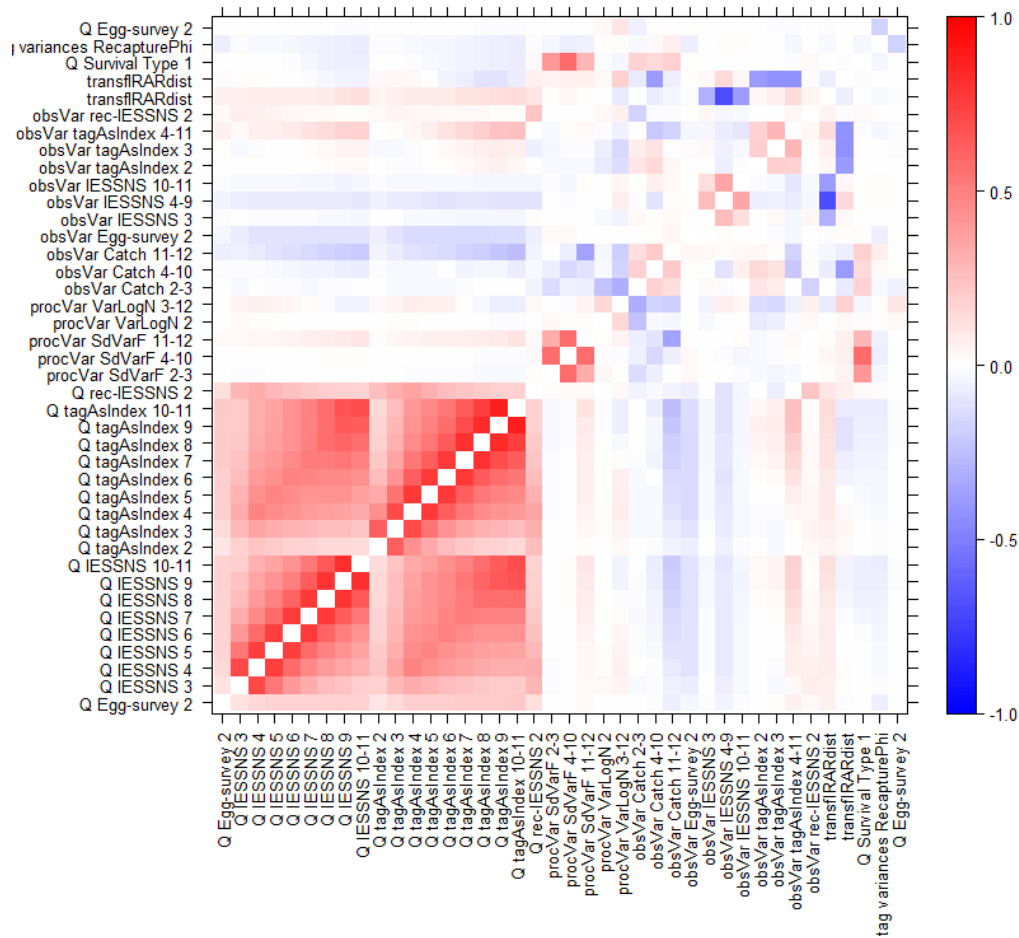


Figure 8.7.2.4. NE Atlantic mackerel. Correlation between parameter estimates from the SAM model for the WGwide 2026 update assessment

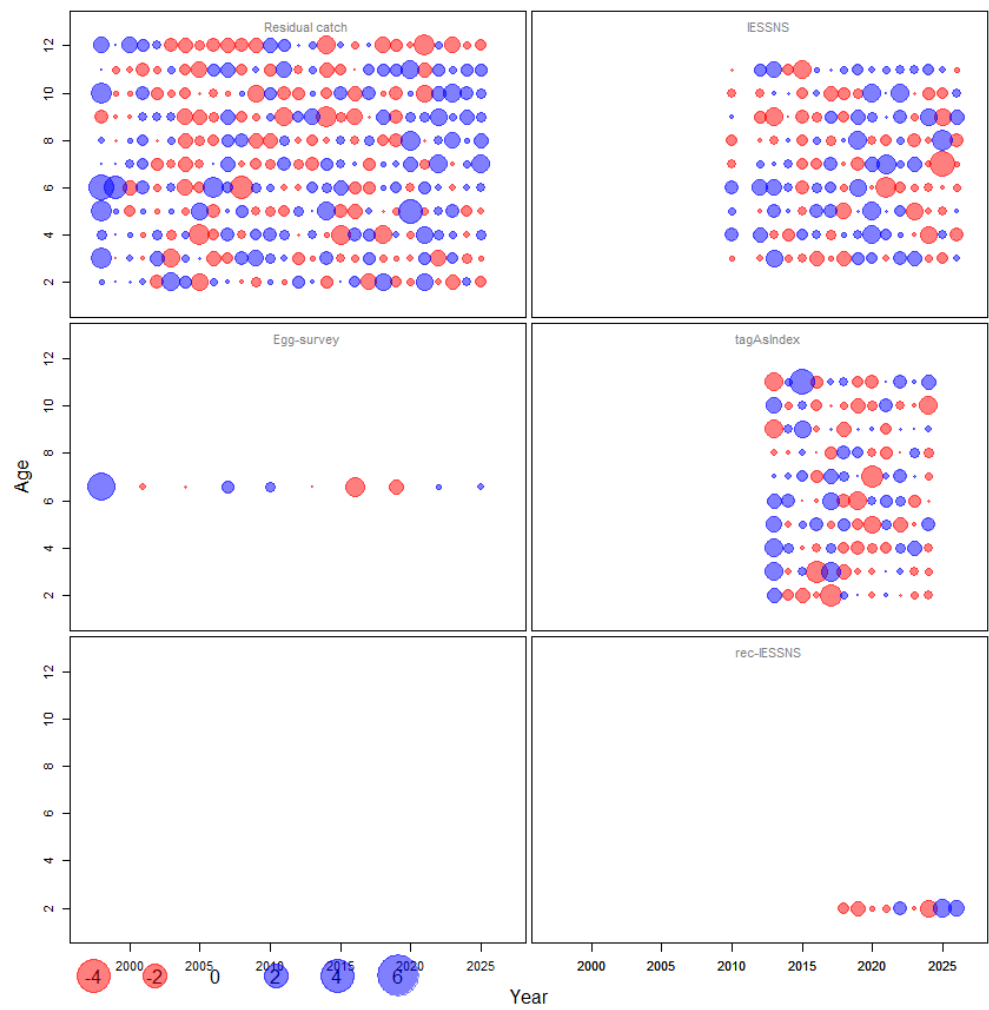


Figure 8.7.2.5. NE Atlantic mackerel. One Step Ahead Normalized residuals for the fit to the catch data (catch data prior to 2000 are not used to fit the model). Blue circles indicate positive residuals (observation larger than predicted) and filled red circles indicate negative residuals.

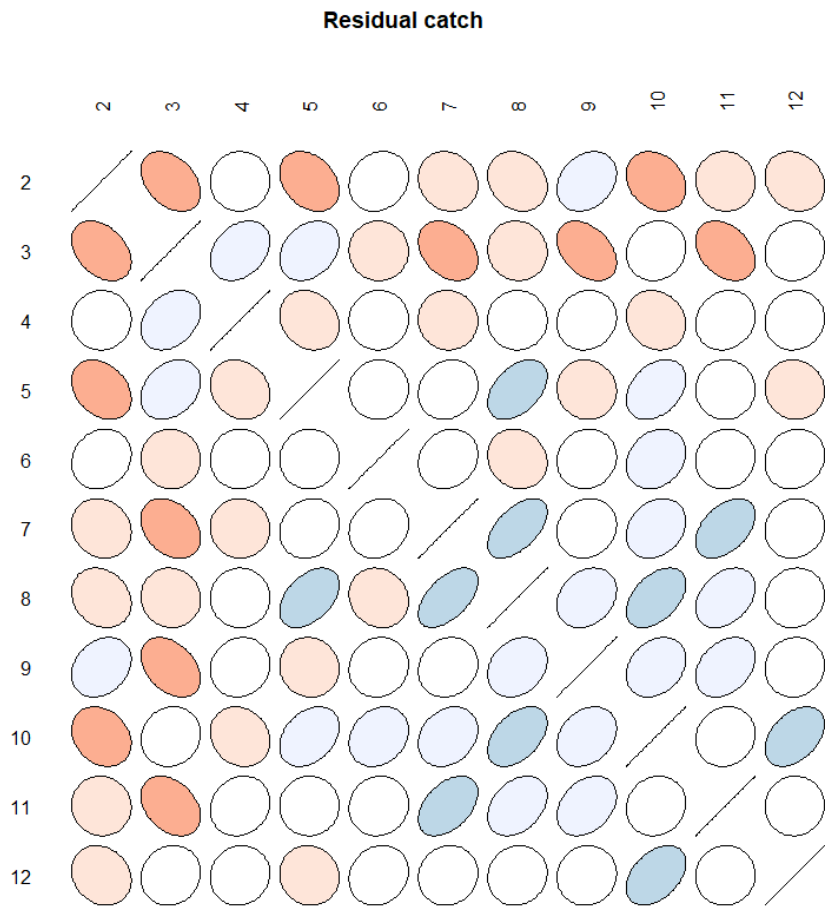


Figure 8.7.2.6. NE Atlantic mackerel. Empirical correlations between ages in the One Step Ahead residuals for the catch-at-age data.

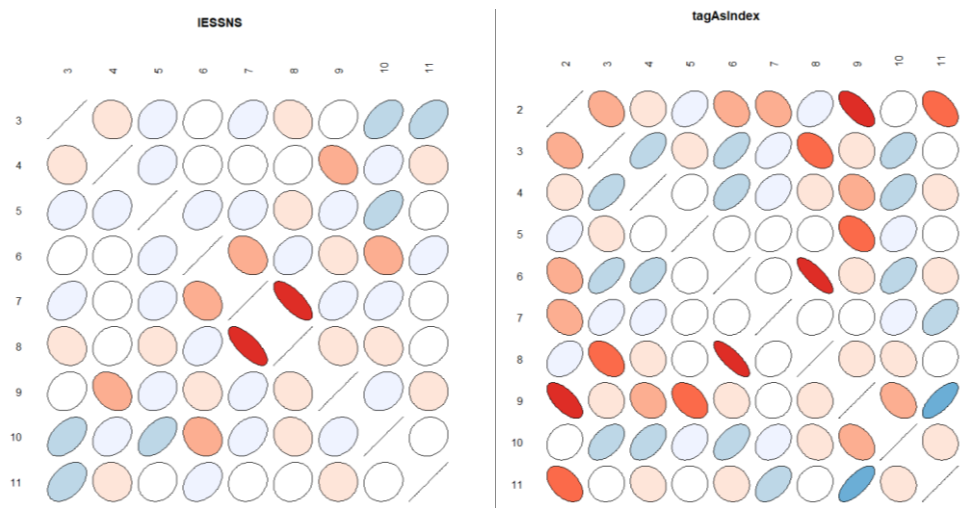


Figure 8.7.2.7. NE Atlantic mackerel. Empirical correlations between ages in the One Step Ahead residuals for the IESSNS abundances-at-age (left) and for the RFID tagging index (right).

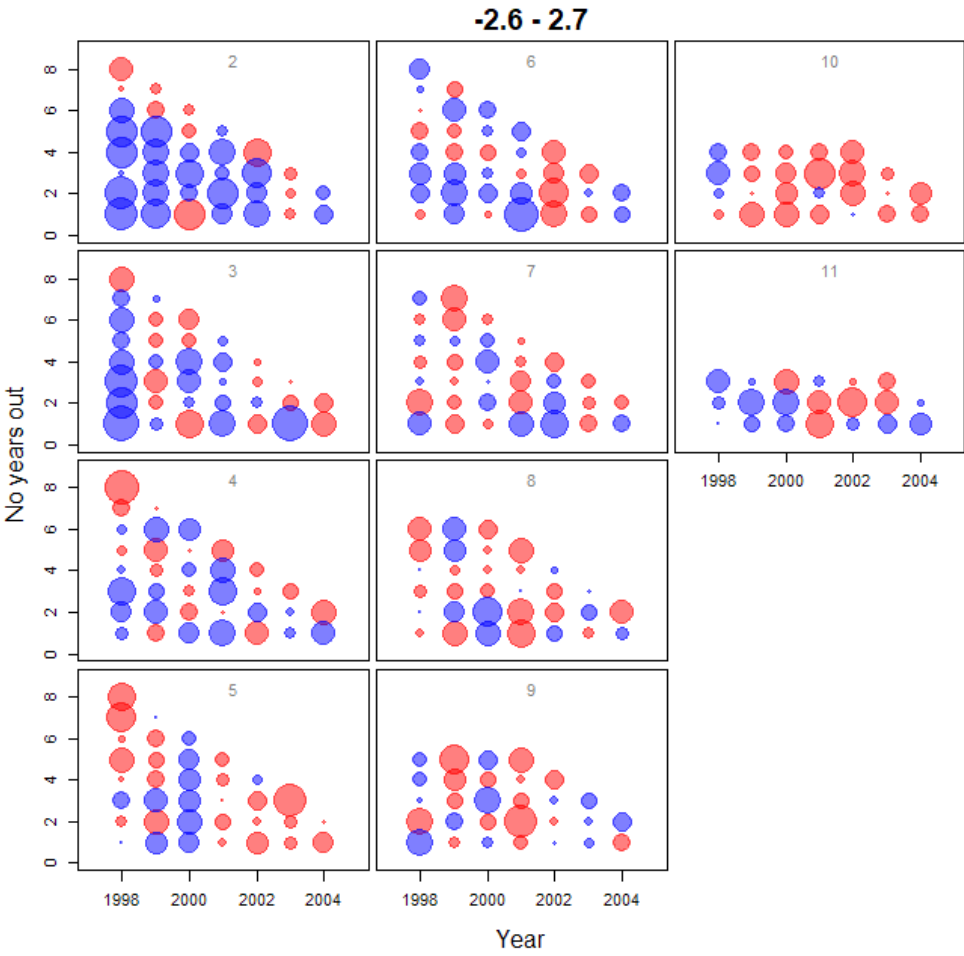


Figure 8.7.2.8. NE Atlantic mackerel. One step ahead residuals for the fit to the recaptures of steel tags in the final assessment. The x-axis represents the release year, and the y-axis is the number of years between tagging and recapture. Each panel correspond to a given age at release. Blue circles indicate positive residuals (observation larger than predicted) and filled red circles indicate negative residuals.

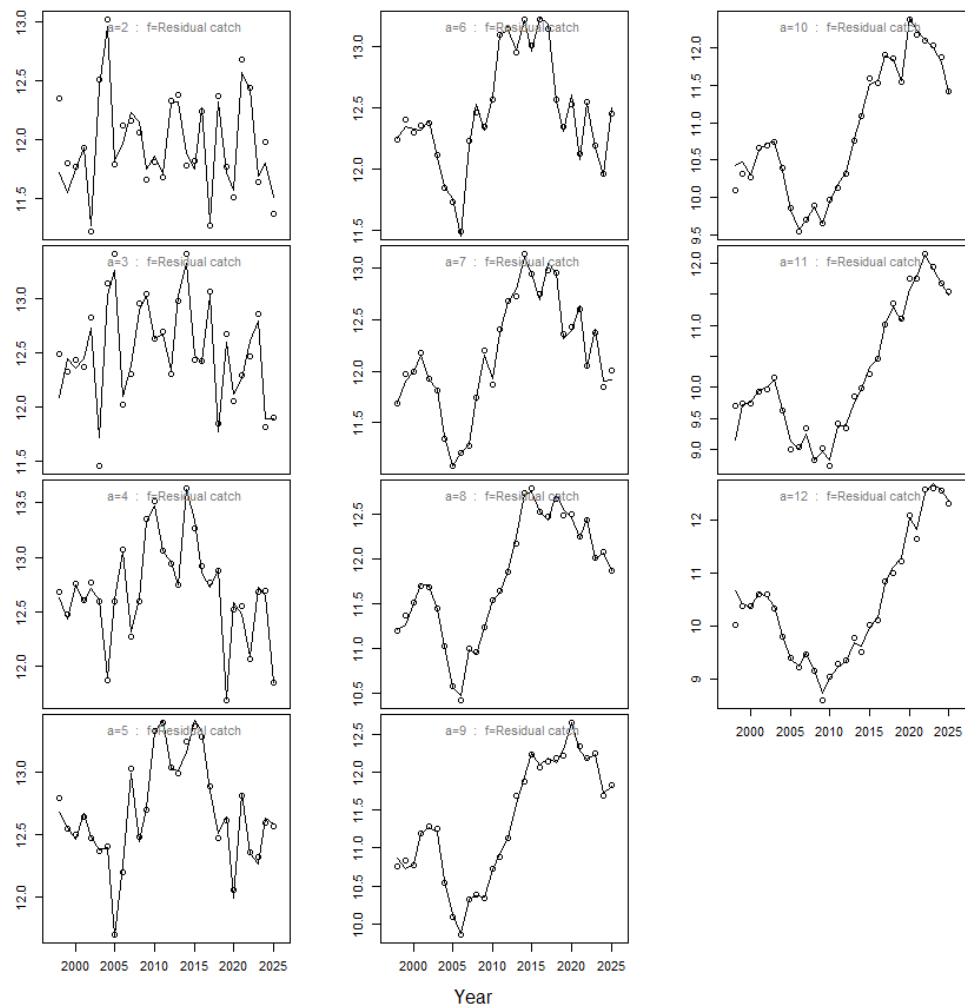


Figure 8.7.2.9. NE Atlantic mackerel. Observed catch-at-age numbers (dots) versus model fitted values (solid line). In log scale.

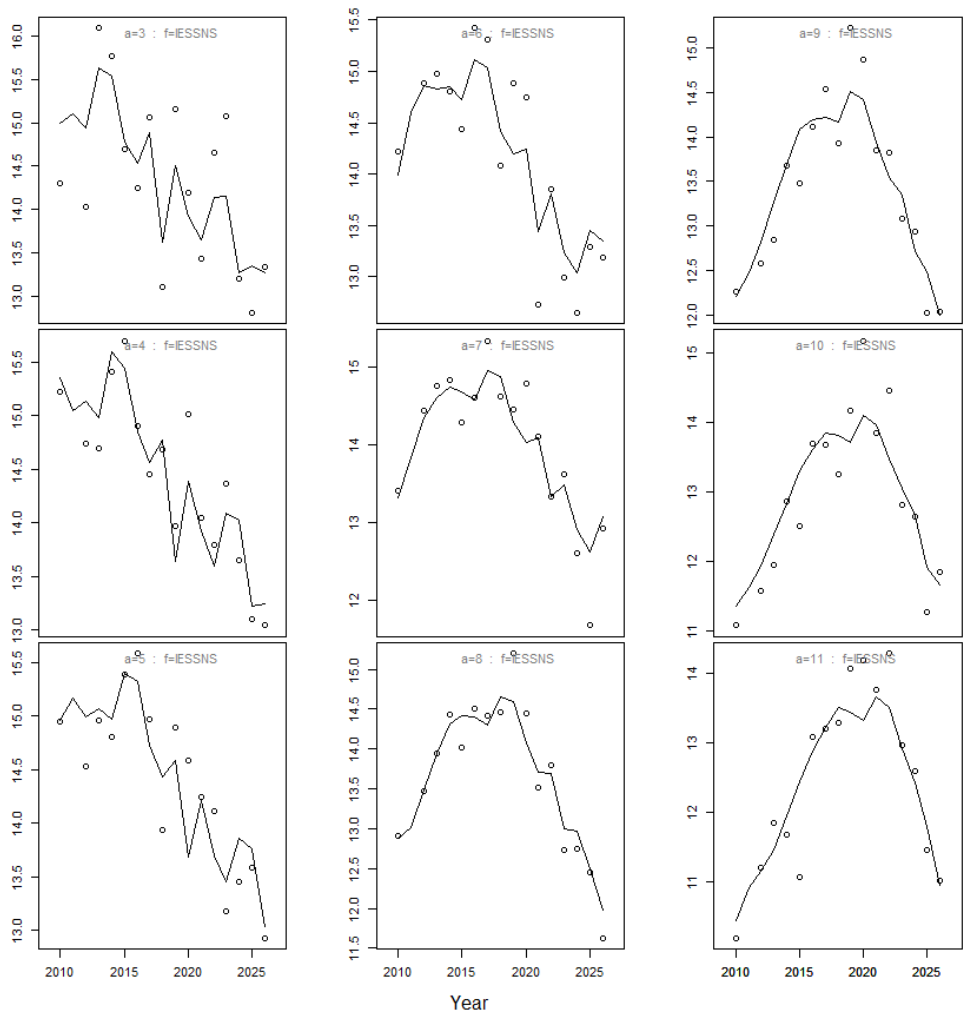


Figure 8.7.2.11. NE Atlantic mackerel. Observed abundance-at-age index from the IESSNS (dots) versus model fitted values (solid line). In log scale.

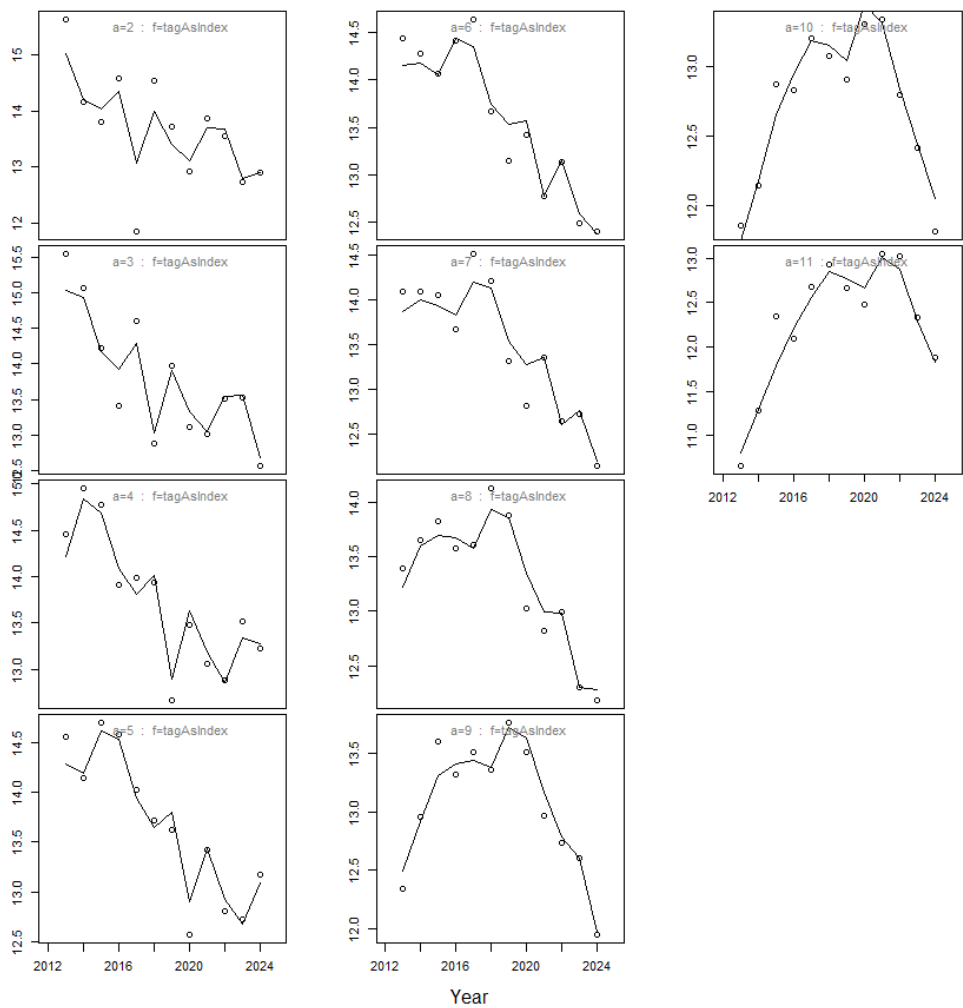


Figure 8.7.2.12. NE Atlantic mackerel. Observed abundance-at-age index from the RFID tags (dots) versus model fitted values (solid line). In log scale.

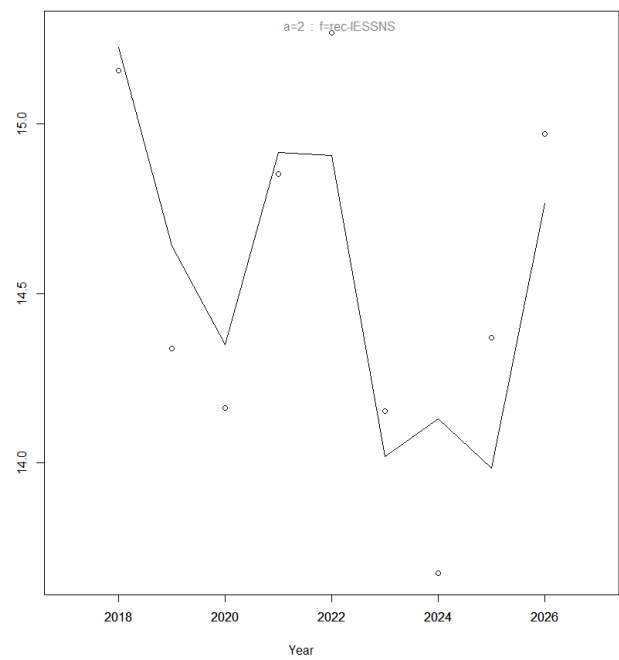


Figure 8.7.2.13. NE Atlantic mackerel. Observed abundance-at-age index from the IESSNS at age 2 (dots) versus model fitted values (solid line). In log scale.

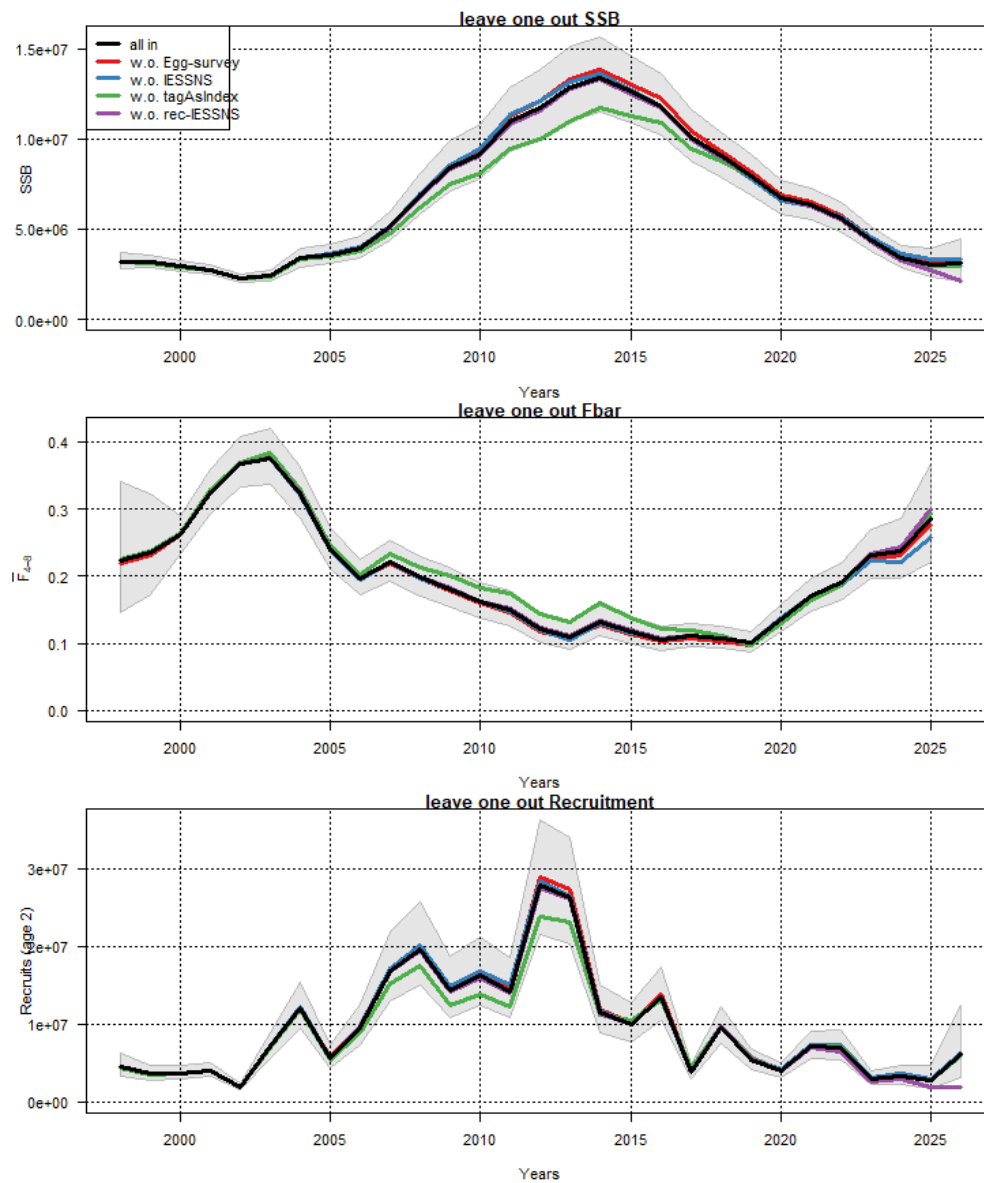


Figure 8.7.2.14. NE Atlantic mackerel. Leave one out assessment runs. SAM estimates of SSB, Fbar and recruitment, for assessments runs leaving out one of the observation data sets.

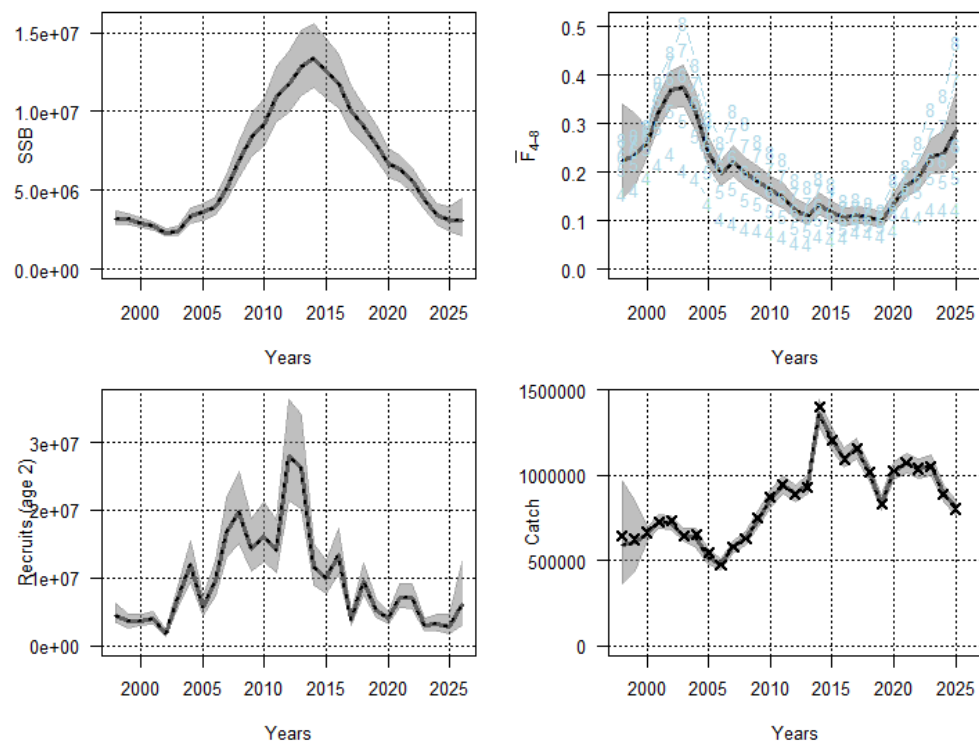


Figure 8.7.3.1. NE Atlantic mackerel. Perception of the NEA mackerel stock, showing the SSB, F_{4-8} and recruitment (with 95% confidence intervals) from the SAM assessment.

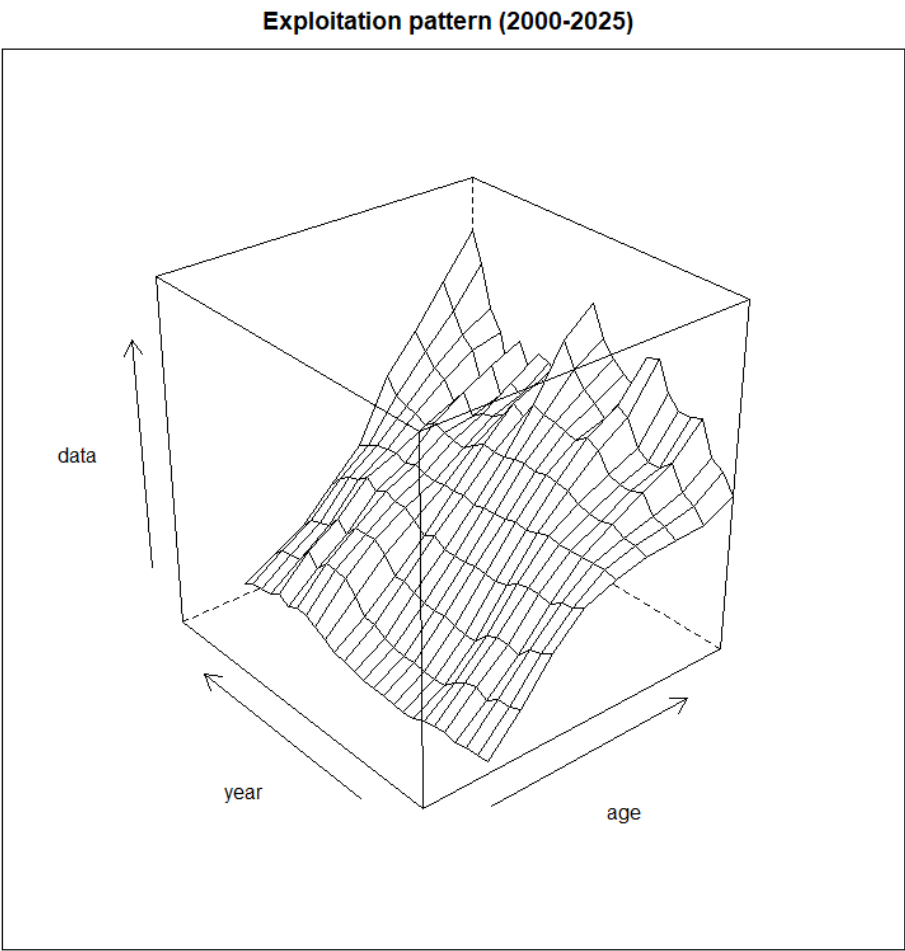


Figure 8.7.3.2. NE Atlantic mackerel. Estimated exploitation pattern for the period 1998 to 2025, calculated as the ratio of the estimated fishing mortality-at-age and the Fbar4-8 value in the corresponding year.

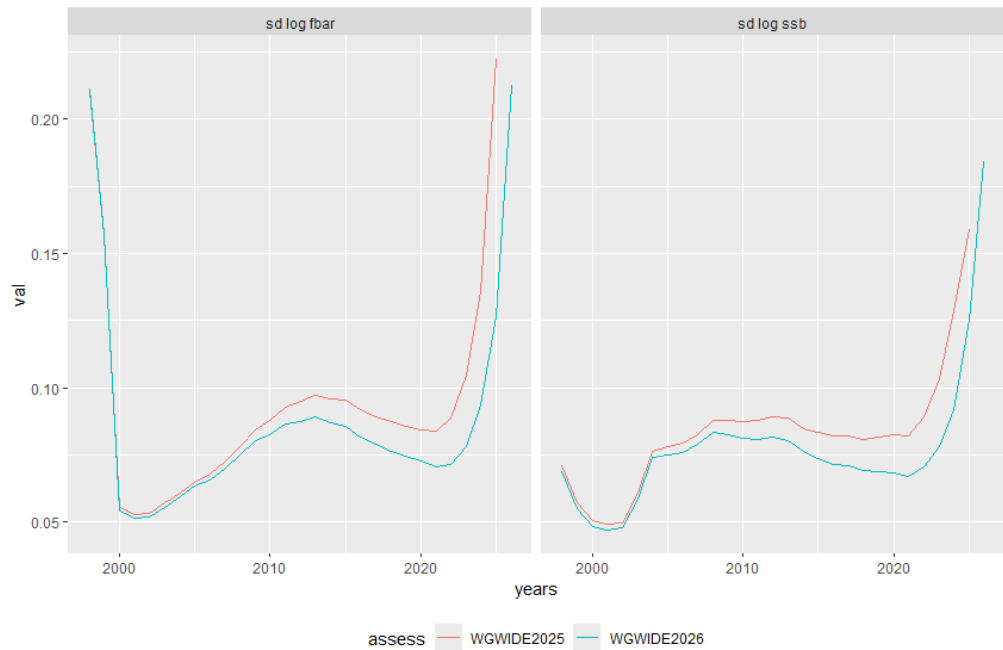


Figure 8.7.4.1. NE Atlantic mackerel. Uncertainty (standard deviation of the log values) of the estimates of SSB and Fbar from the SAM for the 2025 and 2026 WGwide assessments.

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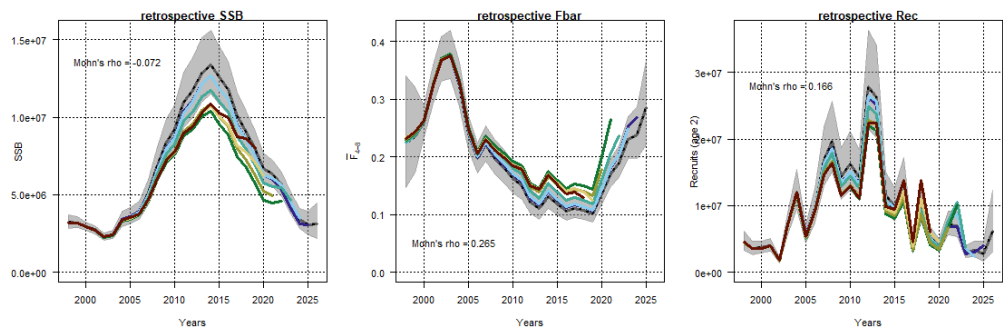


Figure 8.7.4.2. NE Atlantic mackerel. Analytical retrospective patterns (7 years back) for SSB, Fbar and recruitment. Mohn's rho values are calculated over the last 5 peels.

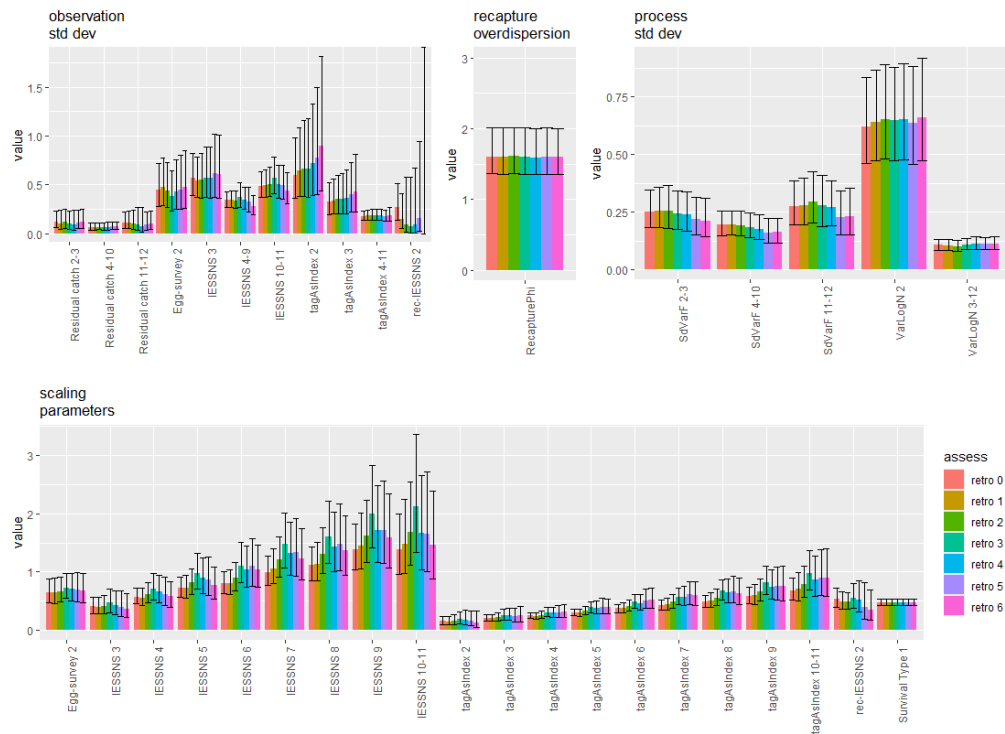


Figure 8.7.4.3. NE Atlantic mackerel. Analytical retrospective patterns (7 years back). Parameters values and uncertainty, with retro 0 corresponding to the current assessment retro 6 with the last 6 years of data removed.

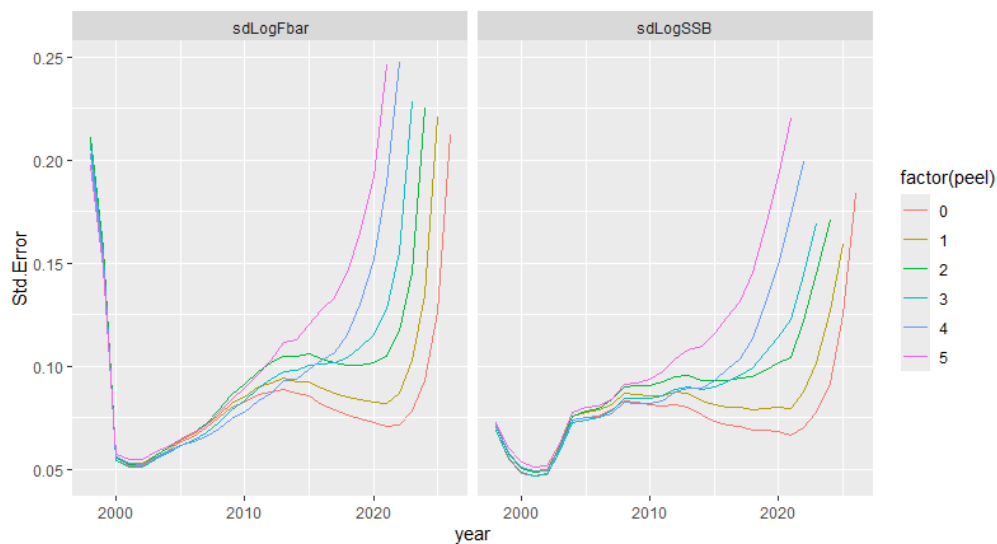


Figure 8.7.4.4. NE Atlantic mackerel. Analytical retrospective patterns (7 years back). Uncertainty on SSB and Fbar from the current assessment (peel 0) and from the retrospective analysis (peels 1 to 5).

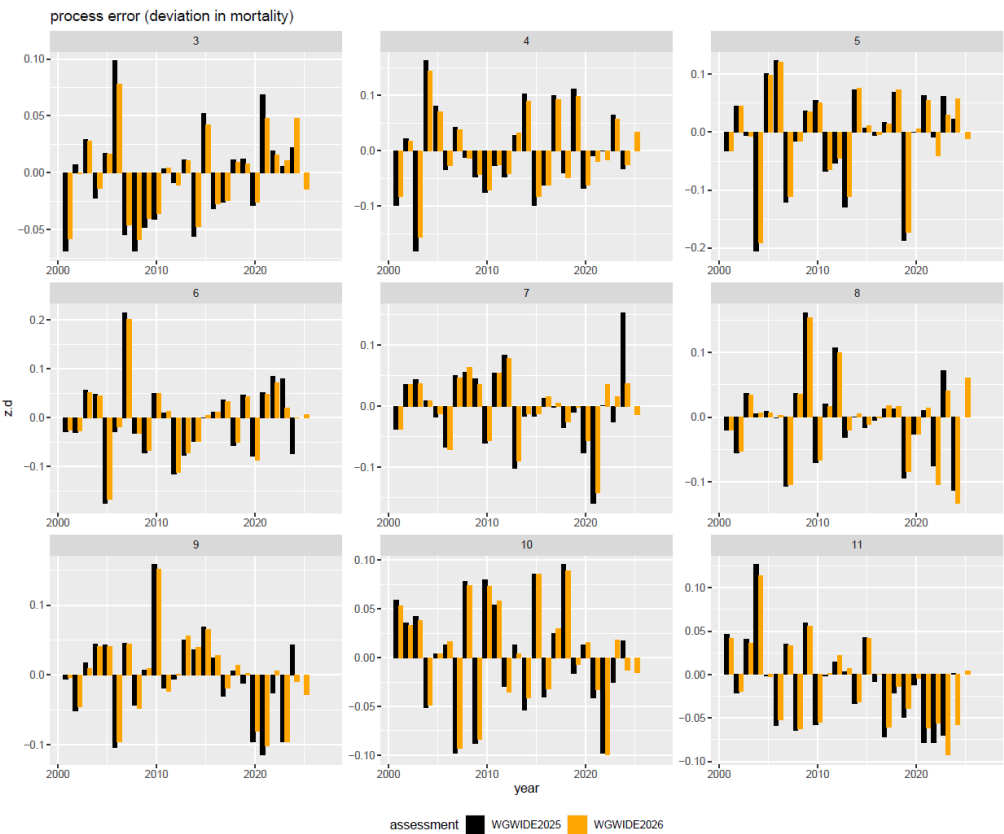


Figure 8.7.4.5. NE Atlantic mackerel. Process error expressed as annual deviations in mortality at age, for the 2025 and 2026 WGWIDE assessment.

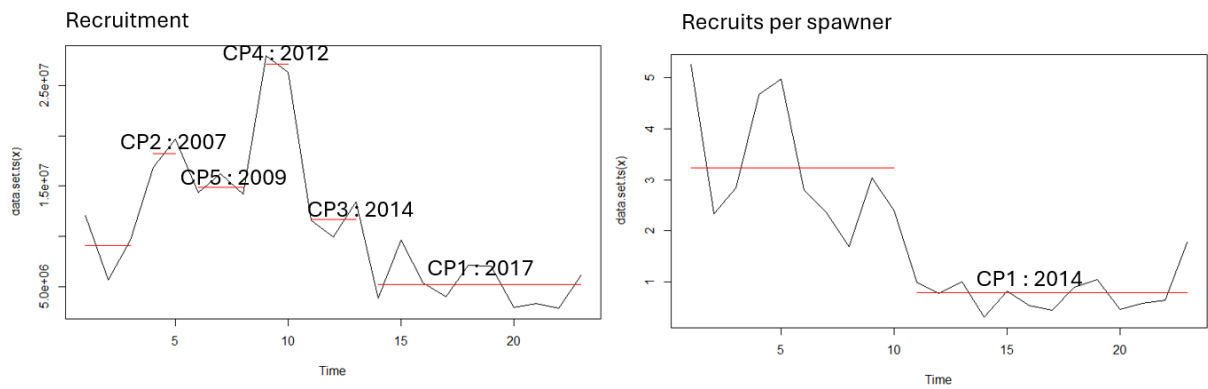


Figure 8.8.1.1. Change point analysis using the binary segmentation method from the R package *changepoint*. The change point detected (and their order of importance) are indicated above the horizontal red line corresponding to the average values during the period following this change point.

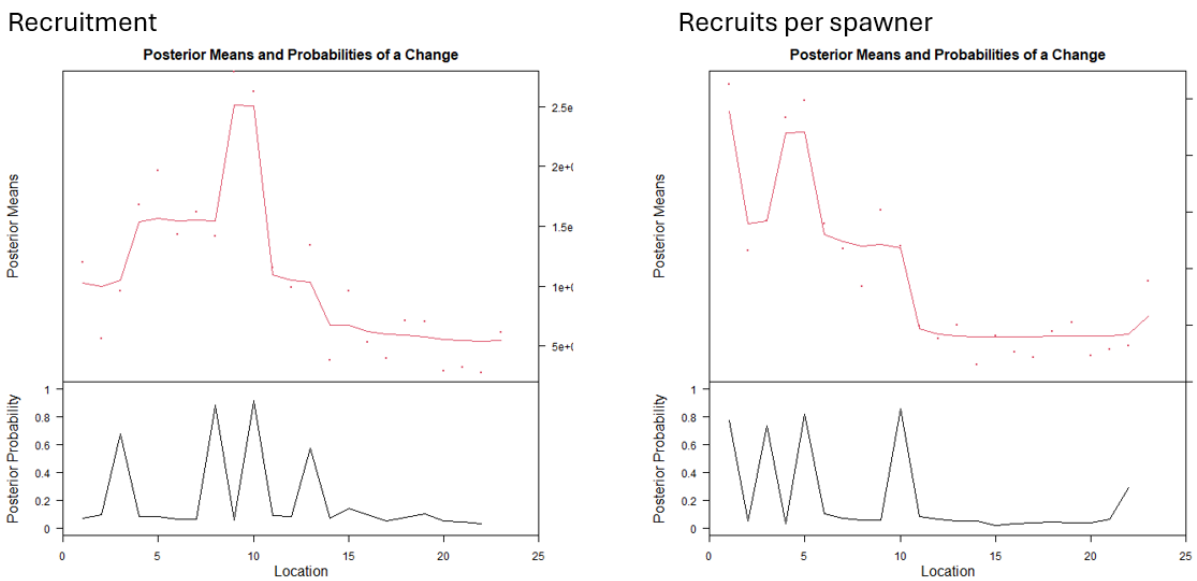


Figure 8.8.1.2. Change point analysis using the R package *bcp*. The top panels show the posterior mean value in the period detected by the change point analysis and the lower panels indicate the probability of a change having occurred in any given year.

Recruitment

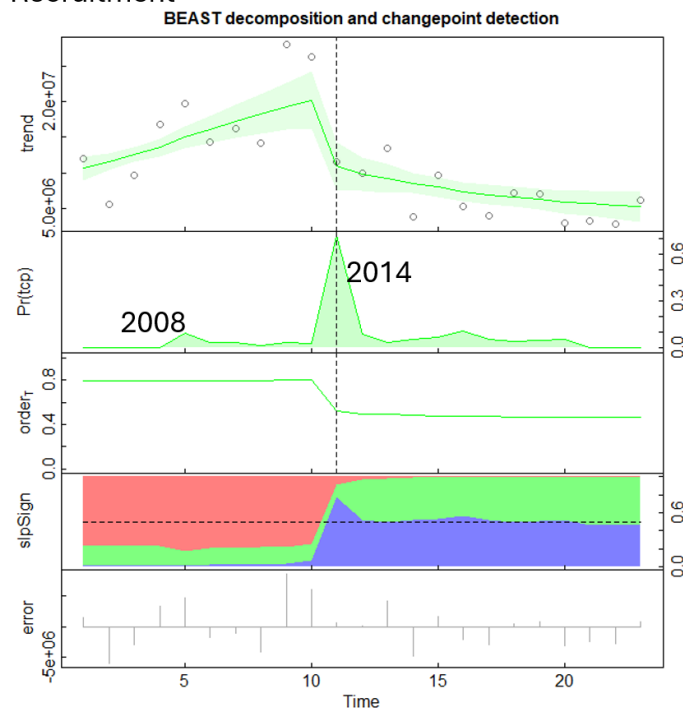


Figure 8.8.1.3. BEAST decomposition and changepoint detection of mackerel recruitment. The upper panel shows the estimated recruitment trend (green line) with its uncertainty interval (shaded area), while the points represent the observed recruitment estimates. The second panel shows the posterior probability of a changepoint ($Pr(tcp)$), with the dashed vertical line indicating the most probable changepoint. The third panel shows the estimated change in trend slope (dTr), and the fourth panel illustrates the posterior probability of the trend component (slope sign, red : increase, green : not trend, blue: decrease). The bottom panel shows the residuals from the BEAST model.

Recruitment per SSB

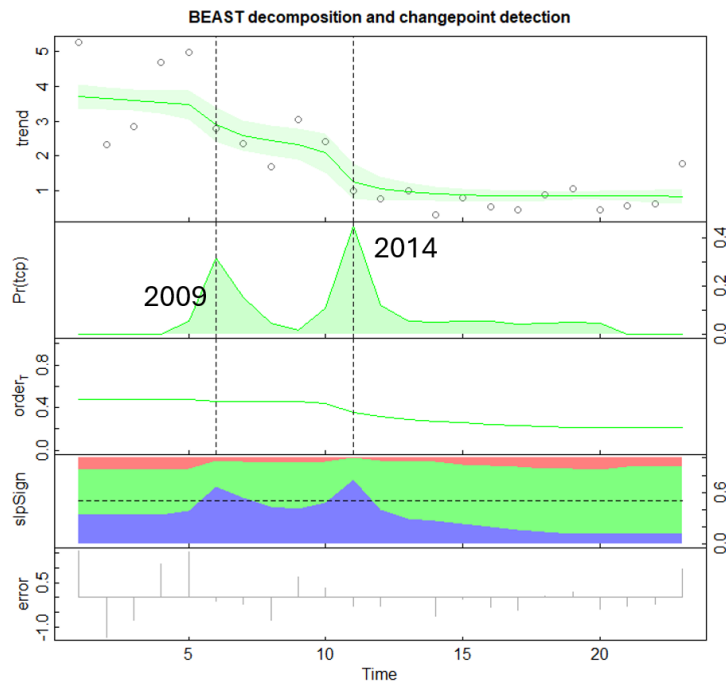


Figure 8.8.1.4. BEAST decomposition and changepoint detection of mackerel recruits per spawner. The upper panel shows the estimated R/SSB trend (green line) with its uncertainty interval (shaded area), while the points represent the observed R/SSB values. The second panel shows the posterior probability of a changepoint ($Pr(tcp)$), with the dashed vertical line indicating the most probable changepoint. The third panel shows the estimated change in trend slope (dTr), and the fourth panel illustrates the posterior probability of the trend component (slope sign, red : increase, green : not trend, blue: decrease). The bottom panel shows the residuals from the BEAST model

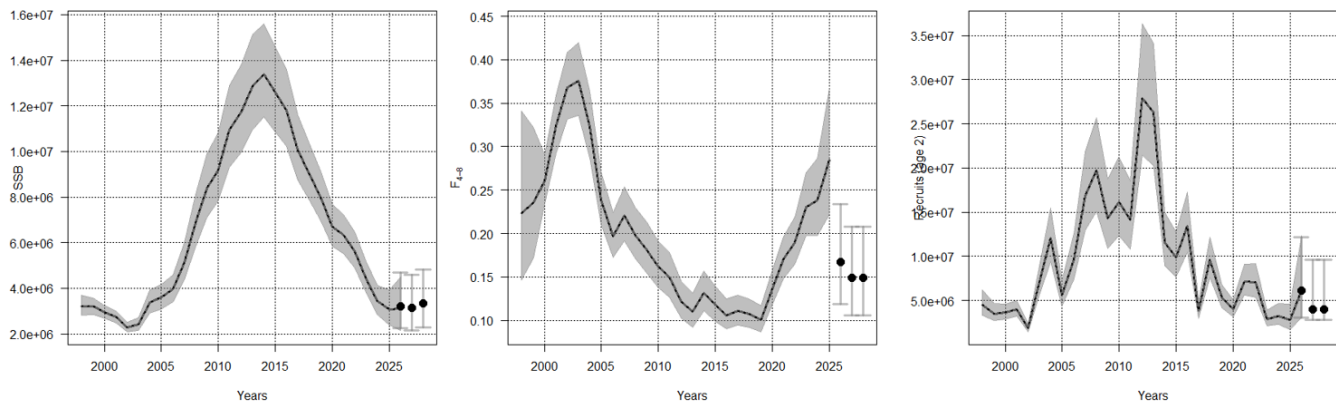


Figure 8.8.2.1. NE Atlantic mackerel. Historic and forecasted future SSB, Fbar and recruitment trajectories for the short-term forecast corresponding to the application of the ICES MSY advice rule.

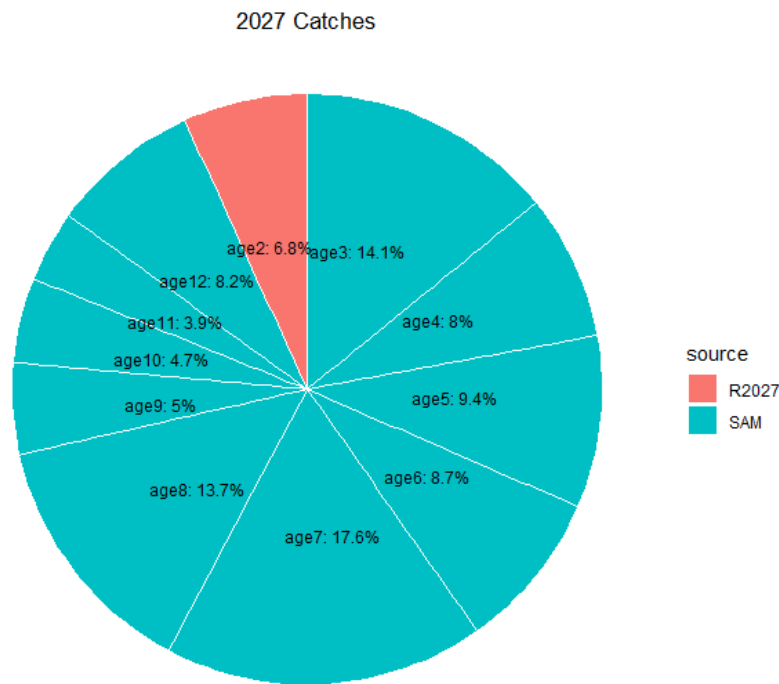


Figure 8.8.2.2. NE Atlantic mackerel. Contribution of the different age groups to the catches in 2027 in the mackerel forecast. The management option for 2027 is the MSY advice rule. Year classes that are derived from abundances estimated by the stock assessment model in 2026 are depicted in blue. The Year class based on forecast assumption is depicted in red.

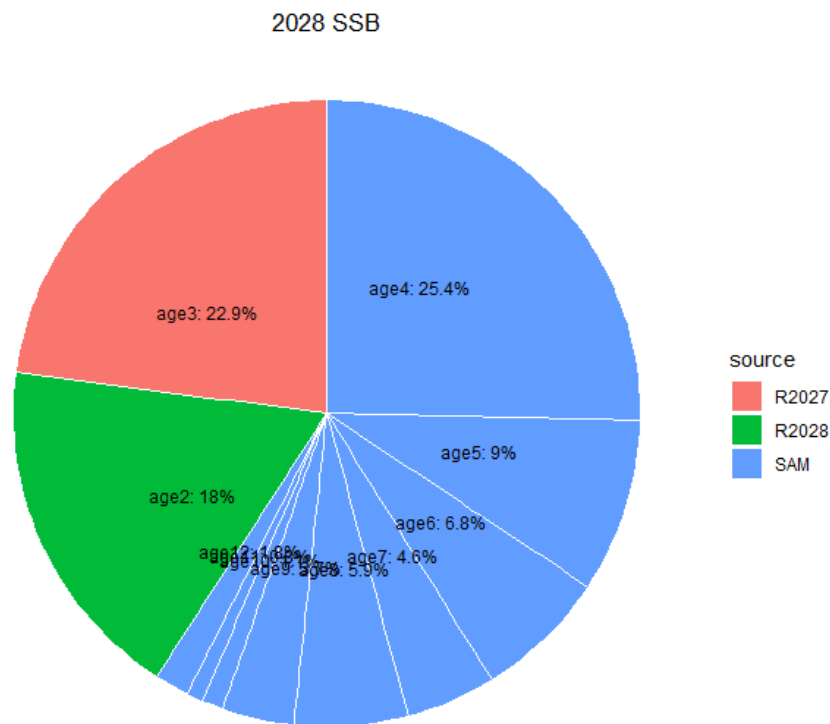


Figure 8.8.2.3. NE Atlantic mackerel. Contribution of the different age groups to the SSB in 2027 in the mackerel forecast using the benchmark set up. The management option for 2027 is the MSY advice rule. Year classes that are derived from abundances estimated by the stock assessment model in 2026 are depicted in blue. Year class based on forecast assumption are depicted in red and in green.

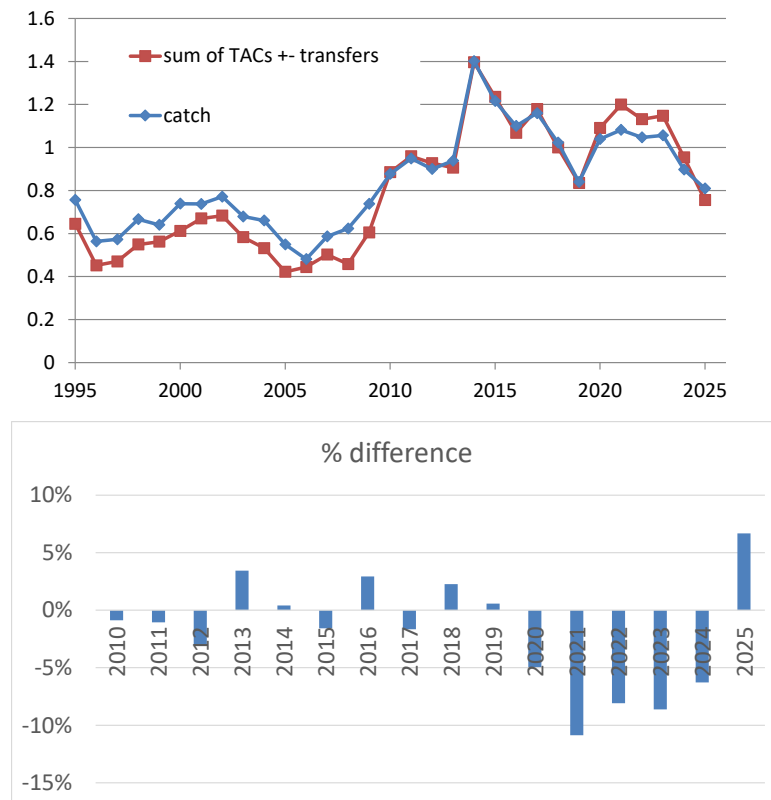


Figure 8.8.4.1. NE Atlantic mackerel. Comparison of the WGwide intermediate year assumption (sum of TACs +/- transfers) with the realised catch (top panel) and accuracy of the WGwide estimate (% difference).

error on IYC

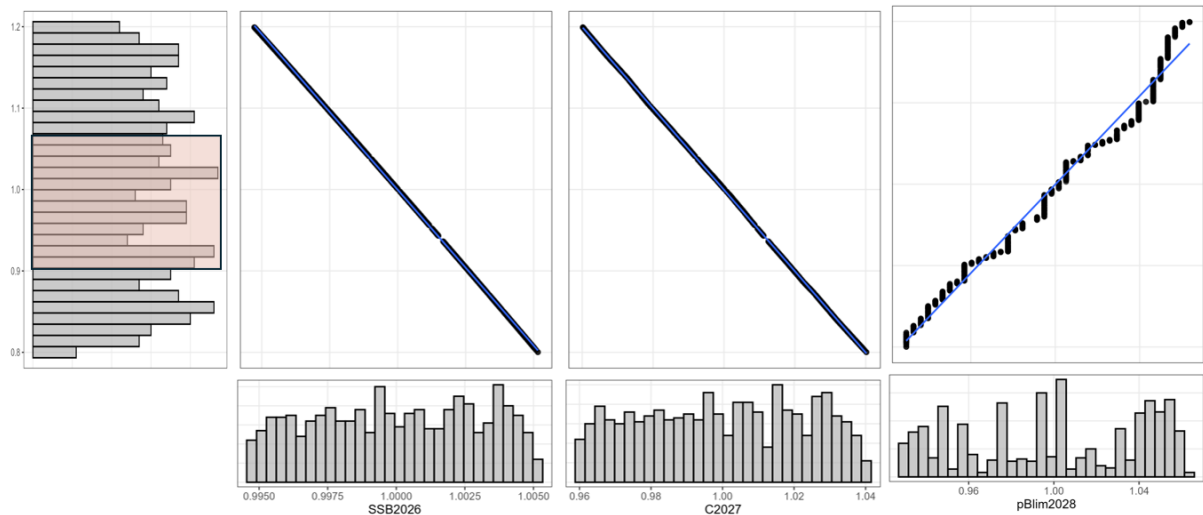


Figure 8.8.4.2. NE Atlantic mackerel. Sensitivity (proportion error) on the SSB in 2026, catch in 2027 and probability of SSB being below Blim in 2028 to errors on the Intermediate Year Catch (IYC, the range of values observed in the recent years are highlighted in red).

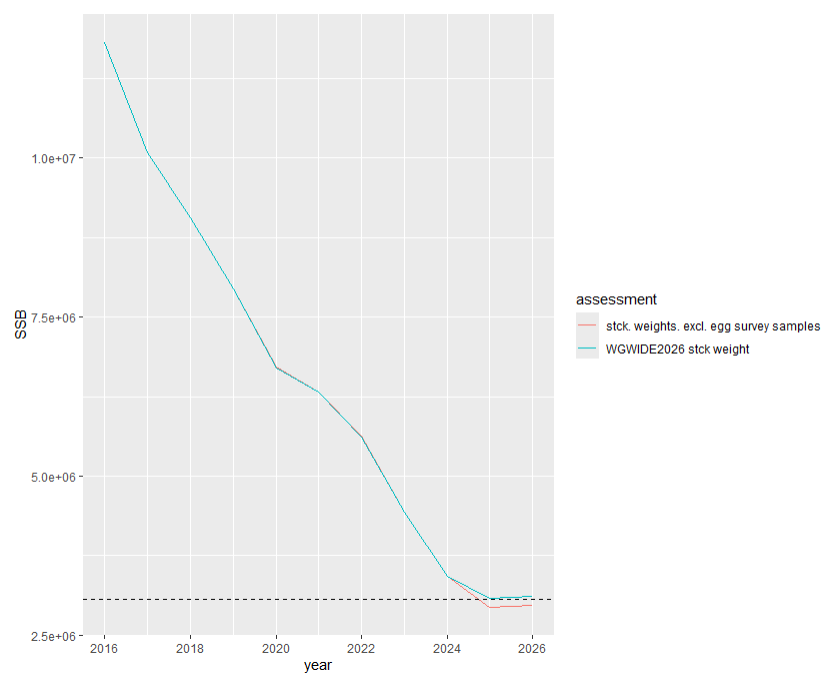


Figure 8.8.5.1. NE Atlantic mackerel. Comparison of the estimated SSB based on stock weight-at-age calculated without the egg survey samples, compared to the WGWIDE 2026 assessment.

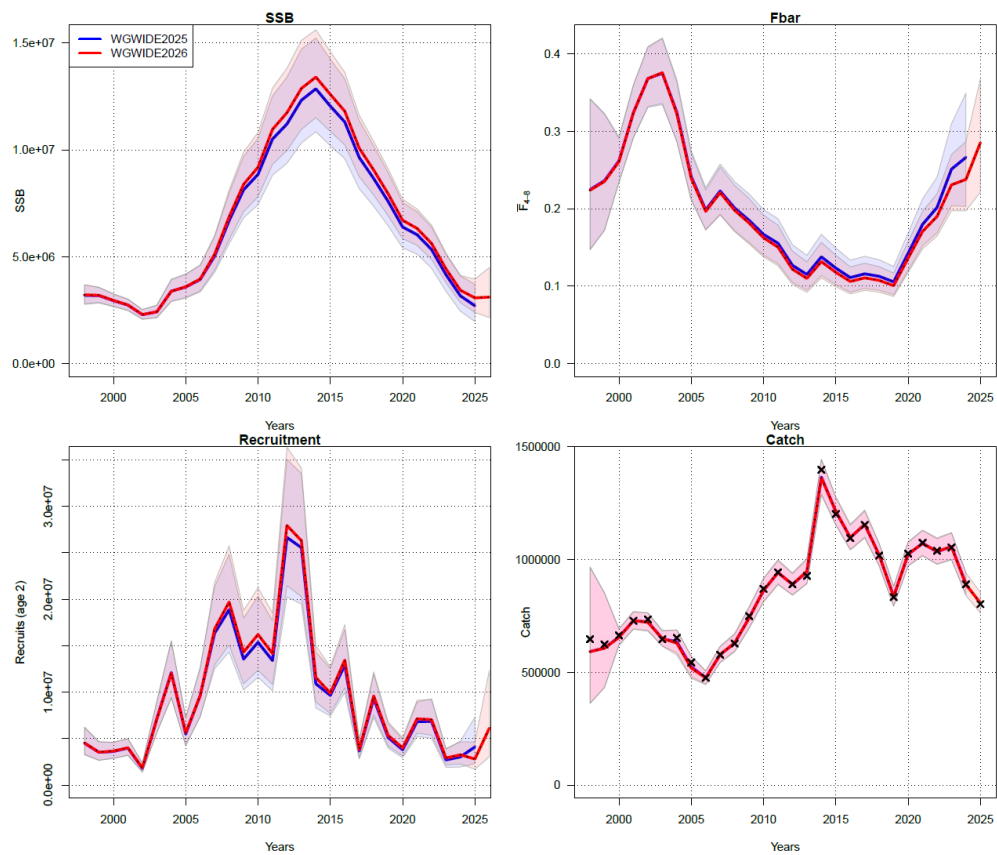


Figure 8.10.1. NE Atlantic mackerel. Comparison of the stock trajectories between the 2025 and 2026 WGWISE assessments.

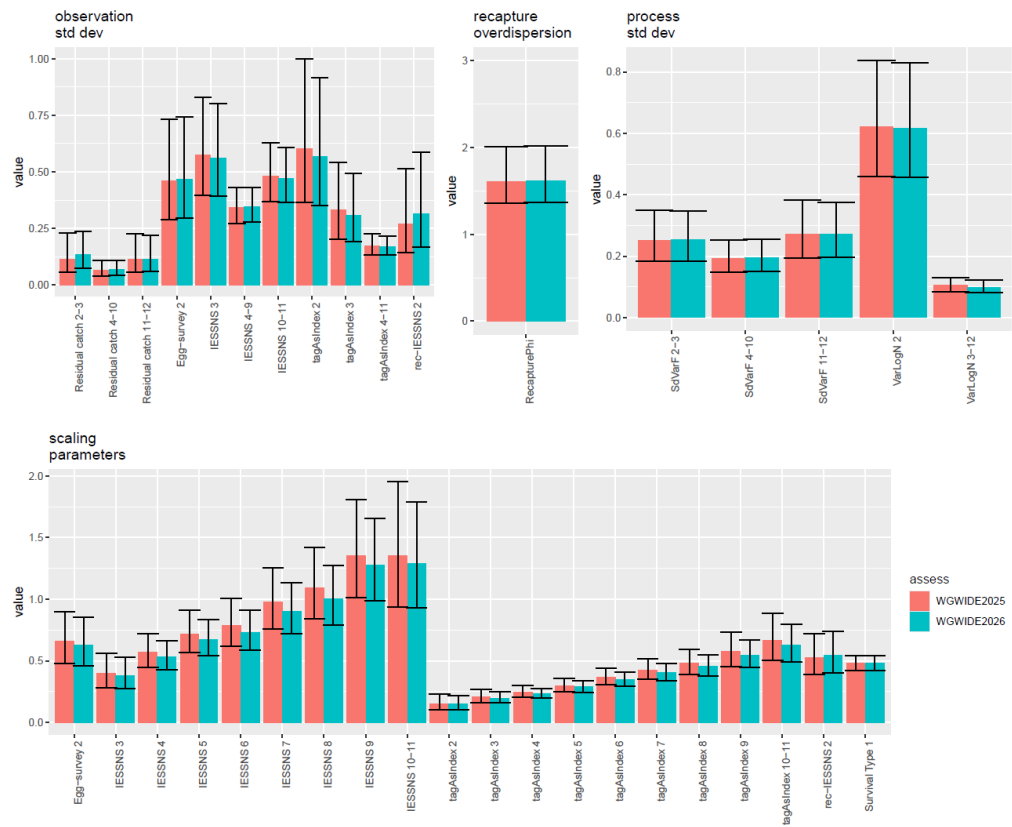


Figure 8.10.2. NE Atlantic mackerel. Comparison of model parameters and their uncertainty for the 2025 and 2026 WGwide assessments.

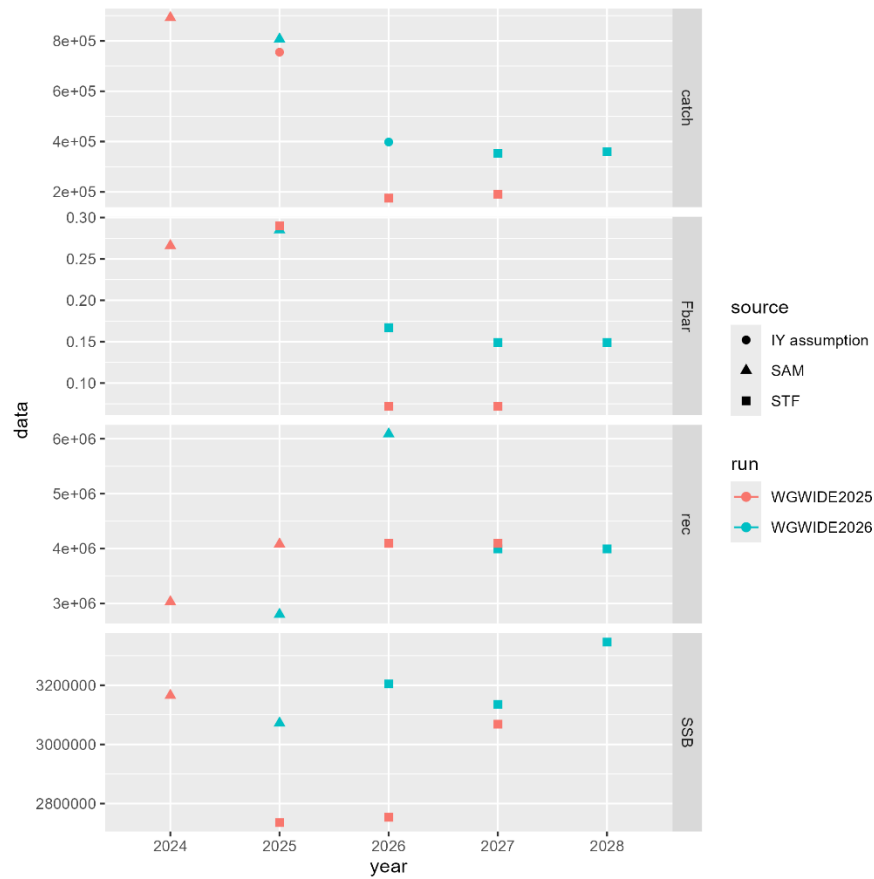


Figure 8.10.3. NE Atlantic mackerel. Comparison of the catch, Fbar, Recruitment and SSB values in the assessment and forecast from the WGWISE 2025 and WGWISE 2026

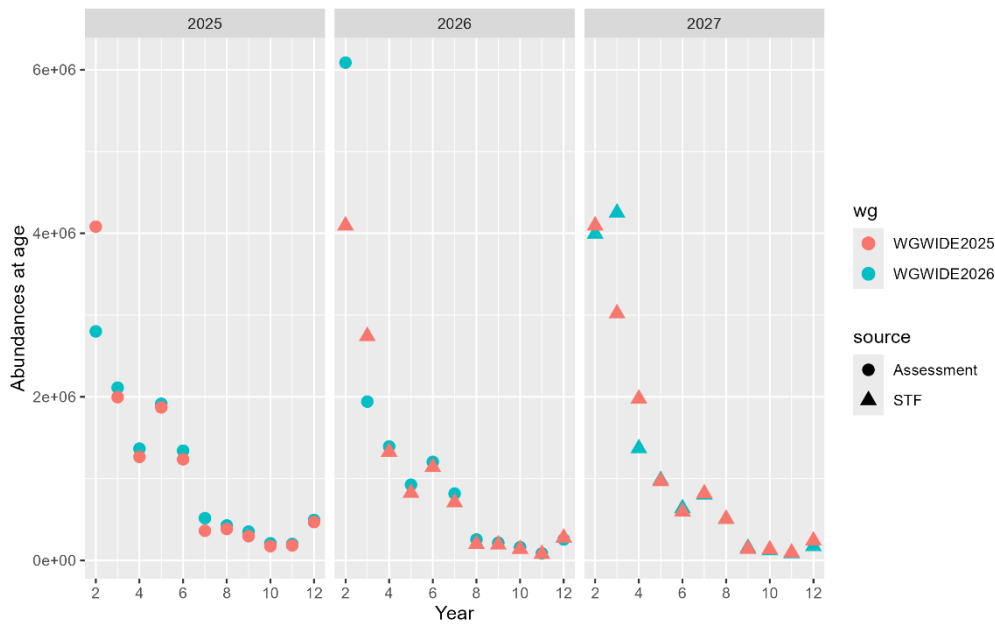


Figure 8.10.4. NE Atlantic mackerel. Comparison of the abundances-at-age in the assessment and forecast from the WGWISE 2025 and WGWISE 2026.

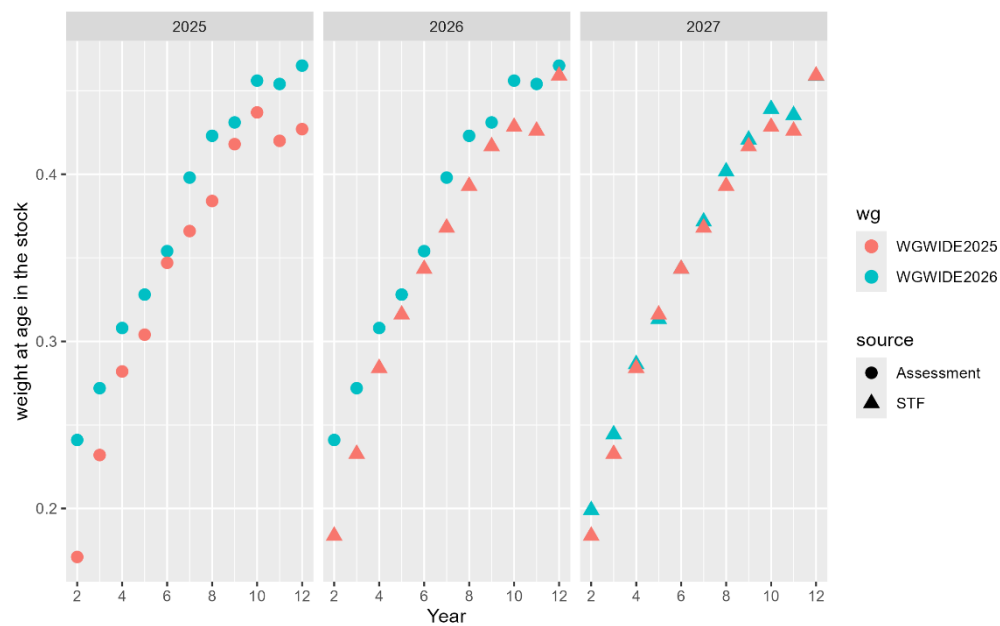


Figure 8.10.5. NE Atlantic mackerel. Comparison of the mean weight-at-age in the stock used in the assessment and forecast from the WGWIDE 2025 and WGWIDE 2026

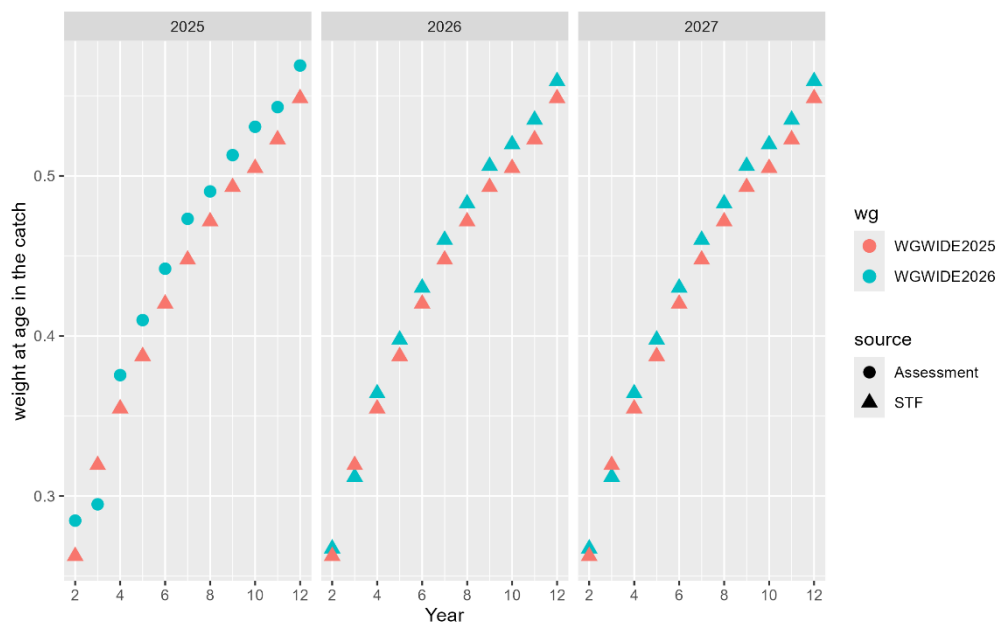


Figure 8.10.6. NE Atlantic mackerel. Comparison of the mean weight-at-age in the catch used in the assessment and forecast from the WGWIDE 2025 and WGWIDE 2026

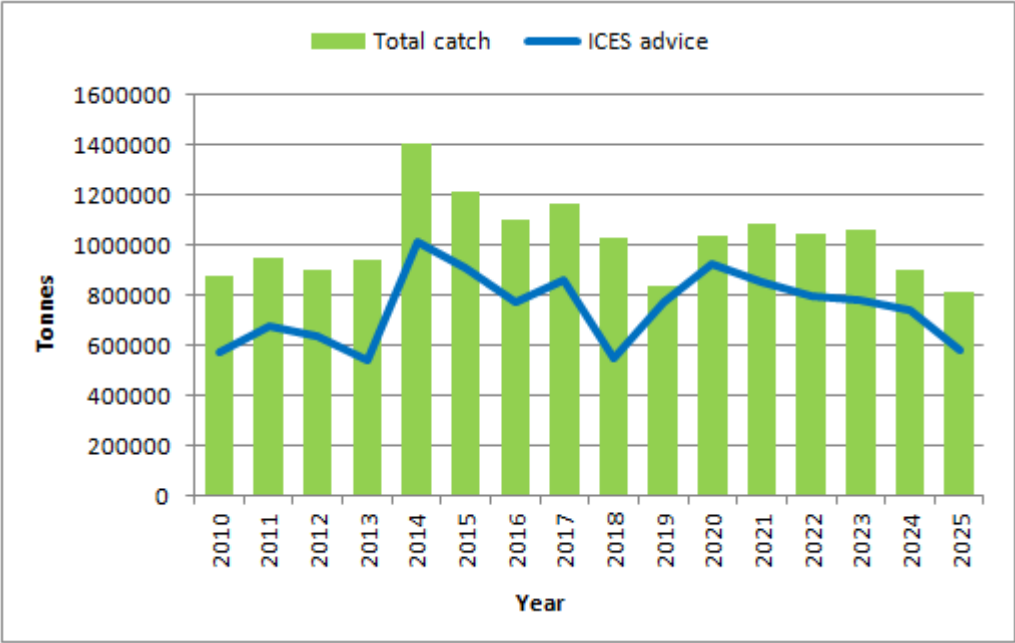


Figure 8.11.1. NE Atlantic mackerel. Comparison of the ICES advice and the total catch (ICES WG catch).

8.15 Tables

Table 8.2.2.1. NE Atlantic Mackerel. ICES estimated catch (t) in Subareas 1, 2, 5, 14 and 12a and 12b, 2000–2025 (Data submitted by Working Group members).

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Denmark	1375	7	1						
Estonia	2673	219							
Faroe Islands	5546	3272	4730		650	30		278	123
France					2	1			
Germany								7	
Iceland			53	122		363	4222	36706	112286
Ireland				495	471				
Lithuania	2085								
Netherlands			569	44	34	2393		10	72
Norway	31778	21971	22670	125481	10295	13244	8914	493	3474
Sweden		8							
United Kingdom		70	845	692	2493				4
Russia	49101	41566	45811	40026	49489	40491	33580	35408	32728
Misreported									
Unallocated			-570	-44	0	-2393		-10	-18
Discards					9				112
Total	92557	67113	74109	53883	62922	54129	46716	72891	148780

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Denmark		4845	269		391	2345	4321	1	2
Estonia					1367				
Faroe Islands	2992	66312	121499	107198	142976	103896	76889	61900.79	66194
France		7	2		197	8	36		
Germany				107	74		2963	3499	4064
Greenland			621	74021	52783	875811	30351	36142	46419
Iceland	116160	121008	159263	149282	151238	172960	169333	170374	167366
Ireland			90			1725	6	2	

Lithuania					1082		2019	
Netherlands	90	178	5	1	5887	6996	8599	7671
Norway	3038	104858	43168	110741	33817	192322	204574	153228
Poland								
Sweden			4	825	3310	740	730	1720
United Kingdom				2	5534	7851	5420	4601
Russia	41414	58613	73601	74587	80812	116433	128433	121614
Discards	5	28	1	13	911	78	54	62
Total	163604	355738	398160	449326	464497	684173	632571	563582

Year	2018	2019	2020	2021	2022	2023	2024	2025
Denmark	289			0.691	0.09			1
Estonia								
Faroe Islands	52061	37418	33291	105096	122237	175420	40380	39399
France	733		8	0.2		0.0762	0.04872	1.6442
Germany	577	190	206	9		0.126	1.071	15.644
Greenland	62973	30241	26555	33360	18039	28324	14789	35643.13
Iceland	168330	128008	151534	132109	129975	141330	89614	129621
Ireland								
Latvia								
Lithuania			2					
Netherlands	2697	13	0.73		119		0.3	7.86
Norway	46853	22605	15937	256124	198801	65807	113984	96498
Poland	2		0.044	8.2	102			26.796
Sweden	910		220	228		250	137	255
United Kingdom	2009		426		2			
Russia	118255	126543	128805	136176	102129	111326	84526	115932
Discards	51	18	0.05			0.02	2	
Total	455740	345036	356985	663111	571403	522456	343434	417401

Table 8.2.2.2. NE Atlantic Mackerel. ICES estimated catch (t) in the North Sea, Skagerrak and Kattegat (Subarea 4 and Division 3), 2000-2025 (Data submitted by Working Group members).

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Belgium	146	97	22	2	4	1	3	1	2
Denmark	27720	21680	34375	27508	25665	23212	24219	25217	26716
Faroe Islands	10614	18571	12548	11754	11705	9739	12008	11818	7627
France	1588	1981	2152	1467	1538	1004	285	7549	490
Germany Fed. Rep.	77.7	4514	3902	4859	4515	4442	2389	5383	4668
Ireland	9956	10284	20715	17145	18901	15605	4125	13337	11628
Netherlands	2262	2441.4	11044	6784	6366	3915	4093	5973	1979.8
Norway	142320	158401	161621	150858	147068	106434	113079	131191	114102
Poland						114.655			
Sweden	4994	5090	5234	4451	4440	3206	3212	3858	3662
United Kingdom	58281	67908	76317	67084	62932	37118	32371	46264	41963
Russia	1672	2				4			
Unallocated	11788	50692	63927	62198	22908	44954	8890	2421	19319
Discards	1913	51	8583	11794	11329	4782	8302	4255	8862
Total	273333	341714	400440	365904	317372	254530	212977	257268	241019

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	3	27	21	39	62	55.52	38	99	107
Denmark	23491	36552	32800	36492	31924	21340	35809	21696	27457
Faroe Islands	6648	4639	543	432	25	42919	25672	18193	12915
France	1493	686	1416	5736	1788	4912	7827	3448	5942
Germany Fed. Rep.	5158	2562	5291	4560	5755	4979	6056	10172	11185
Ireland	12901	14639	15810	20422	13523	45167	34167	24437	35957
Lithuania						8340		621	
Netherlands	2668	1300	9881	6018	4863	24536	17547	11434	17401
Norway	118070	129064	162878	64181	130056	85409	36344	55089	51960
Poland							24		0.721

Sweden	7304	3429	3248	4560	2081	1112	3190	2933	1981
United Kingdom	53651	52564	69858	75959	70840	145119	129203	99945	106016
Russia		696			4				
Unallocated	1330	660						3	
Discards	8281	949	2405	1142	355	326	44	581	405
Total	240999	247768	304151	219541	261276	384213	295921	248651	271327

Year	2018	2019	2020	2021	2022	2023	2024	2025
Belgium	110	13	75	77	185	57	42	20
Denmark	22207	25374	34375	28333	16537	20553	18710	17441
Faroe Islands	15475	17460	32860		10896	200	31783	16297
France	6712	5455	8959	5041	6342	5656	5611	2331
Germany Fed. Rep.	12091	7778	15946	9939	11903	10367	10761	9123
Iceland						25		2
Ireland	24567	1678	15395	11021	11818	10538	8271	13340
Lithuania			851	6655		237		
Netherlands	13844	8957	18425	17081	21840	17760	13577	13231
Norway	135715	135083	195515	14518	95284	147467	136202	56454
Poland	4041	1394	16	615	3	2525	29	730
Sweden	3056	2153	3451	3286	3244	1957	1545	1775
United Kingdom	104544	101891	130651	125553	172668	159169	144646	159289
Russia		0.12						
Unallocated								
Discards	619	756	732	423	2475	387	405	661
Total	342981	307992	457250	222542	353193	376899	371580	290693

Table 8.2.2.3. NE Atlantic Mackerel. ICES estimated catch (t) in the Western area (Subareas 6 and 7 and Divisions 8.a,b,d,e), 2000–2025 (Data submitted by Working Group members).

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008
Belgium		1			1				
Denmark	82	835		113				6	10
Faroe Islands	4863	2161	2490	2260	674		59	1333	3539
France	17857	18975	19726	21213	18549	15182	14625	12434	14944
Germany	22900.8	20793	22630	19200	18730	14598	14219	12831	10834
Guernsey							10		
Ireland	61277	60168	51457	49715	41730	30082	36539	35923	33132
Jersey						9	8	6	7
Lithuania							95	7	
Netherlands	30123	33654	21838	23640	21132	18819	20064	18261	17920
Norway		223						7	3948
Poland						476	1368	978	
Spain							4048	2772	7327
United Kingdom	133915	181329	167382	167242	149346	115587	70661	87425	82951
Unallocated	725	-34701	-53415	-57341	-13425	-24498	-3937	10042	-18232
Discards	1920	1164	15295	0	8034	20810	14827	10321	27432
Total	273662	284601	247403	226042	244771	191065	172586	192346	183812

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	1	2					14	44	21
Denmark		48	2889	8	903	18538	6741	19443	12569
Faroe Islands	4421	36	8			3421	5851	13173	20559
France	16464	10301	11304	14448	12438	16627	17820	16634	16925
Germany	17545	16493	18792	14277	15102	23478	19238	9740	9608
Greenland									
Guernsey			10	5	9	9	4		
Ireland	48154.671	43355	45696	42627	42988	56286	54571	52087	48957
Isle of Man		14	11	11	8	3	4	8	2
Jersey	8	6	7	8	8	7	3	3	

Lithuania			23			176	565	13	
Netherlands	20900	21699	18336	19794	16295	16242	15264	17896	18694
Norway	121	30	2019	1101	734		1313	1035	2657
Russia		1						30	
Spain	8463	6532	1257	773	635	1796	951	1253	786
United Kingdom	118333	107841	111103	93775	92956	137195	110928	112269	116329
Unallocated	-1469	4503	399	16.21	-144		34		
Discards	6872	7590	7220	10626	1976	1729	3098	2150	2153
Total	239813	218451	219074	197468	183907	275506	236399	245778	249260

Country	2018	2019	2020	2021	2022	2023	2024	2025
Belgium	58	53	49	34	58	12	17	8
Denmark	8194	5189	4110	4463	4897	7657	8	4161
Faroe Islands	13543	7787	2913		624	212		8238
France	13884	12372	12816	11308	10929	9020	9921	8030
Germany	7214	8936	8878	2049	2225	6657	6641	1535
Greenland			22					
Guernsey	12	9						
Iceland		69			1	15		4
Ireland	42180	51634	58720	49731	40455	41418	42547	26308
Isle of Man	3	3	2		1	2	7	
Jersey	3	2	5		0.1			
Netherlands	13851	13723	11893	8611	4374	3583	5097	1722
Norway	4639	1420	221	11	1			3292
Poland	14	2312	5286	1155		706	1033	730
Portugal		46	35	32				
Russia		0.59	10		0.06	187		
Spain	1269	1217	1784	704	1008	1249	1562	922
Sweden		805					310	5
United Kingdom	84342	50262	72972	84333	24361	57465	80909	22763
Unallocated	13							

Discards	1560	4810	349	2645	908	2622	2279	1466
Total	190779	160648	180065	165076	89842	130804	150331	79183

Table 8.2.2.4. NE Atlantic Mackerel. ICES estimated catch (t) in Divisions 8.c and 9.a, 2000–2025 (Data submitted by Working Group members).

Country	Div	2000	2001	2002	2003	2004	2005	2006	2007	2008
France	8.c				226	177	151	43	55	168
Portugal	8.c			61				269	481	573
Portugal	9.a	2253	3119	2934	2749	2289	1656	2620	2605	2381
Spain	8.c							43063	53401	50455
Spain	9.a							7025	6773	6855
Discards	8.c				531	928	391	3606	156	73
Discards	9.a						405	1	916	677
Unallocated	8.c	30061	38205	38703	17384	28429	42851			
Unallocated	9.a	3760	1874	7938	5464	3946	5107			
Total	9.a	6013	4993	10873	8213	6234	7021	9646	10294	9913
Total		36074	43198	49637	26354	35768	50561	56627	64387	61182

Country	Div	2009	2010	2011	2012	2013	2014	2015	2016	2017
France	8.c	383	392	44	283	220	171	21	106	83
Portugal	8.c	929	1758	2302	4868	5134	7334	6836	6069	3697
Portugal	9.a	1753	2363	962	824	254	618	1456	619	634
Spain	8.c	91043	38858	14709	17768	14617	33783	29726	26553	30893
Spain	9.a	14569	7347	2759	845	1162	2227	3853	2229	1206
Discards	8.c	725	4408	563	2187	1428	2821	4725	2469	84
Discards	9.a	241	232	1244	1244	1027	1463	2409	751	143
Unallocated	8.c			4691	4144	-573	8795	11	1357	
Unallocated	9.a		108	871	1076	4053	662	1831	2123	
Total	9.a	16562	10049	5836	3989	6497	4308	7719	5722	1983
Total		109642	55466	28145	33240	27322	57874	50869	42276	36739

Country	Div	2018	2019	2020	2021	2022	2023	2024	2025
France	8.c	50	43	96	93	103	130	73	66
Portugal	8.c	3709	3188	4189	3738	2738	1418	1084	2640
Portugal	9.a	855	706	575	953	829	686	564	393
Spain	8.c	27190	19148	31143	25272	26999	23337	20011	17912
Spain	9.a	1656	747	1379	1807	1417	681	759	777
Russia				2					
Discards	8.c	324	760	28	18	35	70	92	36
Discards	9.a	194	172	115	47	143	45	188	73
Unallocated	8.c	300							
Total	9.a	2736	1625	2070	2807	2389	1412	1511	1243
Total		34279	24764	37529	31928	32264	26366	22771	21897

Table 8.2.3.1. NE Atlantic Mackerel. Proportion of the catch by quarter 1990-2025

Year	Q1	Q2	Q3	Q4
1990	28	6	26	40
1991	38	5	25	32
1992	34	5	24	37
1993	29	7	25	39
1994	32	6	28	34
1995	37	8	27	28
1996	37	8	32	23
1997	34	11	33	22
1998	38	12	24	27
1999	36	9	28	27
2000	39	5	23	33
2001	40	6	23	30
2002	37	5	29	28
2003	36	5	22	37
2004	38	6	28	29

Year	Q1	Q2	Q3	Q4
2005	47	6	25	23
2006	42	5	18	36
2007	35	5	21	39
2008	34	4	33	28
2009	38	11	30	21
2010	26	5	54	15
2011	22	8	53	17
2012	22	6	48	24
2013	20	5	51	24
2014	20	5	46	29
2015	20	5	44	31
2016	23	4	44	29
2017	24	4	44	28
2018	19	3	40	37
2019	28	4	42	26
2020	30	4	35	31
2021	19	5	55	20
2022	18	5	58	18
2023	18	6	52	24
2024	21	3	49	27
2025	24	6	52	18

Table 8.3.1. NE Atlantic Mackerel. Sampling coverage from 1992-2025

Year	WG Total Catch (t)	% catch covered by sampling programme	No. Samples	No. Measured	No. Aged
1992	760000	85	920	77000	11800
1993	825000	83	890	80411	12922
1994	822000	80	807	72541	13360
1995	755000	85	1008	102383	14481

Year	WG Total Catch (t)	% catch covered by sampling programme	No. Samples	No. Measured	No. Aged
1996	563600	79	1492	171830	14130
1997	569600	83	1067	138845	16355
1998	666700	80	1252	130011	19371
1999	608928	86	1109	116978	17432
2000	675625	76	1182	122769	15923
2001	736627	83	1419	142517	19824
2002	771588	87	1450	184101	26146
2003	679838	80	1212	148501	19779
2004	660833	79	1380	177812	24173
2005	550285	83	1229	164593	20217
2006	488906	85	1604	183767	23467
2007	586893	87	1267	139789	21791
2008	634794	88	1234	141425	24350
2009	754057	87	1231	139867	28722
2010	877420	91	1241	124695	29462
2011	949529	88	923	97818	22817
2012	899576	89	1216	135610	38365
2013	937003	89	1092	115870	25178
2014	1401766	90	1506	117250	43475
2015	1215760	88	2132	137871	24283
2016	1100286	89	2200	149216	21456
2017	1161226	87	2183	151548	24104
2018	1023779	83	1858	139590	20703
2019	838441	88	1835	141561	17646
2020	1031828	87	1430	142991	15685
2021	1082656	79	1783	76325	18736
2022	1046702	88	1862	118573	16771
2023	1056526	89	1813	126469	17563

Year	WG Total Catch (t)	% catch covered by sampling programme	No. Samples	No. Measured	No. Aged
2024	897701	91	2233	122909	13587
2025	809175	88	1536	108599	16485

Table 8.3.2. NE Atlantic Mackerel. 2025 sampling by country.

Country	ICES catch	% WG catch covered by sampling programme	No. Samples	No. Measured	No. Aged
Belgium	28	0%	0	0	0
Denmark	21612	91%	13	306	306
Faroe Islands	63934	97%	13	491	647
France	10801	0%	0	0	0
Germany	10674	46%	128	959	6484
Greenland	35643	0%	0	0	0
Iceland	129627	100%	100	2364	6232
Ireland	39651	99%	28	1223	4194
Netherlands	14992	88%	62	2093	2747
Norway	156244	94%	99	1348	1369
Poland	1487	0%	0	0	0
Portugal	3033	13%	116	946	3947
Russia	115932	100%	140	1380	46021
Spain	20607	99%	659	2355	24297
Sweden	2035	0%	0	0	0
UK (England & Wales)	21091	88%	129	1509	7915
UK (Northern Ireland)	12426	0%	0	0	0
UK (Scotland)	149359	97%	49	1511	4440
Total	809175	88%	1536	16485	108599

Table 8.3.3. NE Atlantic Mackerel. 2025 sampling by ICES division.

Division	Official Catch (t)	WG Catch (t)	No. Samples	No. Measured	No Aged
2.a	415546	415546	282	53254	4711
3.a	486	486	0	0	0
3.b	21	21	0	0	0
3.c	1	1	0	0	0
3.d	3	3	0	0	0
4.a	286500	286500	262	14288	5117
4.b	2690	2690	30	408	190
4.c	991	991	1	39	1
5.a	1176	1176	4	217	89
5.b	680	680	1	51	47
6.a	66966	66966	46	5520	1509
6.b	0	0	0	0	0
7.a	46.9	46.9	0	0	0
7.b	930	930	1	174	48
7.c	16	16	0	0	0
7.d	4704	4704	36	563	124
7.e	890	890	14	891	340
7.f	119	119	32	3006	719
7.g	14	14	0	0	0
7.h	67	67	28	988	75
7.j	1915	1915	24	956	214
8.a	780	780	7	365	3
8.b	2568	2568	43	2085	204
8.c	20655	20655	439	14304	1606
8.d	168	168	2	2	2
9.a	1243	1243	284	11488	1486

Table 8.4.1.1. NE Atlantic Mackerel. ICES estimated catches by area (t). Discards not estimated prior to 1978 (data submitted by Working Group members).

Year	Subarea 6			Subarea 7 and divisions 8.a, 8.b, 8.d, and 8.e			Subareas 3 and 4			Subareas 1, 2, 5, 14, 12a and 12b			Divisions 8.c and 9.a			Total		
	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch
1969	4800		4800	47404		47404	739175		739175	7		7	42526		42526	833912		833912
1970	3900		3900	72822		72822	322451		322451	163		163	70172		70172	469508		469508
1971	10200		10200	89745		89745	243673		243673	358		358	32942		32942	376918		376918
1972	13000		13000	130280		130280	188599		188599	88		88	29262		29262	361229		361229
1973	52200		52200	144807		144807	326519		326519	21600		21600	25967		25967	571093		571093
1974	64100		64100	207665		207665	298391		298391	6800		6800	30630		30630	607586		607586
1975	64800		64800	395995		395995	263062		263062	34700		34700	25457		25457	784014		784014
1976	67800		67800	420920		420920	305709		305709	10500		10500	23306		23306	828235		828235
1977	74800		74800	259100		259100	259531		259531	1400		1400	25416		25416	620247		620247
1978	151700	15100	166800	355500	35500	391000	148817		148817	4200		4200	25909		25909	686126	50600	736726
1979	203300	20300	223600	398000	39800	437800	152323	500	152823	7000		7000	21932		21932	782555	60600	843155
1980	218700	6000	224700	386100	15600	401700	87931		87931	8300		8300	12280		12280	713311	21600	734911
1981	335100	2500	337600	274300	39800	314100	64172	3216	67388	18700		18700	16688		16688	708960	45516	754476
1982	340400	4100	344500	257800	20800	278600	35033	450	35483	37600		37600	21076		21076	691909	25350	717259
1983	320500	2300	322800	235000	9000	244000	40889	96	40985	49000		49000	14853		14853	660242	11396	671638

Year	Subarea 6			Subarea 7 and divisions 8.a, 8.b, 8.d, and 8.e			Subareas 3 and 4			Subareas 1, 2, 5, 14, 12a and 12b			Divisions 8.c and 9.a			Total		
	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch
1984	306100	1600	307700	161400	10500	171900	43696	202	43898	98222		98222	20208		20208	629626	12302	641928
1985	388140	2735	390875	75043	1800	76843	46790	3656	50446	78000		78000	18111		18111	606084	8191	614275
1986	104100		104100	128499		128499	23309	7431	243740	101000		101000	24789		24789	594697	7431	602128
1987	183700		183700	100300		100300	290829	10789	301618	47000		47000	22187		22187	644016	10789	654805
1988	115600	3100	118700	75600	2700	78300	308550	29766	338316	120404		120404	24772		24772	644926	35566	680492
1989	121300	2600	123900	72900	2300	75200	279410	2190	281600	90488		90488	18321		18321	582419	7090	589509
1990	114800	5800	120600	56300	5500	61800	300800	4300	305100	118700		118700	21311		21311	611911	15600	627511
1991	109500	10700	120200	50500	12800	63300	358700	7200	365900	97800		97800	20683		20683	637183	30700	667883
1992	141906	9620	151526	72153	12400	84553	364184	2980	367164	139062		139062	18046		18046	735351	25000	760351
1993	133497	2670	136167	99828	12790	112618	387838	2720	390558	165973		165973	19720		19720	806856	18180	825036
1994	134338	1390	135728	113088	2830	115918	471247	1150	472397	72309		72309	25043		25043	816025	5370	821395
1995	145626	74	145700	117883	6917	124800	321474	730	322204	135496		135496	27600		27600	748079	7721	755800
1996	129895	255	130150	73351	9773	83124	211451	1387	212838	103376		103376	34123		34123	552196	11415	563611
1997	65044	2240	67284	114719	13817	128536	226680	2807	229487	103598		103598	40708		40708	550749	18864	569613
1998	110141	71	110212	105181	3206	108387	264947	4735	269682	134219		134219	44 164		44164	658652	8012	666664
1999	116362		116362	94290		94290	313014		313014	72848		72848	43796		43796	640311		640311

Year	Subarea 6			Subarea 7 and divisions 8.a, 8.b, 8.d, and 8.e			Subareas 3 and 4			Subareas 1, 2, 5, 14, 12a and 12b			Divisions 8.c and 9.a			Total		
	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch
2000	156031	1	156032	115711	1918	117630	271420	1913	273333	92557		92557	36074		36074	671793	3832	675625
2001	133430	83	133513	150008	1081	151089	341663	51	341714	67113		67113	43198		43198	735412	1215	736627
2002	127966	12931	140897	104143	2364	106507	391857	8583	400440	74109		74109	49637		49637	747710	23878	771588
2003	135690	1399	137089	90352	6256	96608	354109	11794	365904	53883		53883	25823	531	26354	659857	19980	679838
2004	133033	1705	134738	103703	6329	110032	306043	11329	317372	62913	9	62922	34841	928	35769	640532	20300	660833
2005	79975	8201	88176	90280	12609	102889	249748	4782	254530	54129		54129	49765	796	50561	523897	26388	550285
2006	91539	6081	97621	66219	8746	74965	204674	8302	212977	46716		46716	53020	3607	56627	462169	26737	488906
2007	110788	2450	113238	71237	7871	79108	253013	4255	257268	72891		72891	63315	1072	64387	571245	15648	586893
2008	81109	21889	102997	75272	5543	80814	232157	8862	241019	148669	112	148781	60432	750	61182	597638	37156	634794
2009	141529	3927	145456	91412	2945	94357	232718	8281	240999	163604		163604	108676	966	109642	737939	16118	754057
2010	106732	2904	109636	104129	4686	108815	246819	949	247768	355731	5	355736	50826	4640	55465	864236	13183	877420
2011	160756	1836	162592	51098	5384	56482	301746	2405	304151	398132	28	398160	26339	1807	28145	938070	11459	949529
2012	121114	952	122067	65728	9673	75401	218400	1142	219541	449325	1	449326	29809	3431	33240	884376	15200	899576
2013	132062	273	132335	49869	1703	51572	260922	355	261277	464484	13	464498	24867	2455	27322	932204	4799	937003
2014	180067	340	180408	93709	1388	95098	383887	326	384213	684082	91	684173	53590	4284	57874	1395336	6430	1401766
2015	134728	29	134757	98574	3068	101642	295877	44	295921	632493	78	632571	43735	7134	50869	1205407	10353	1215760

Year	Subarea 6			Subarea 7 and divisions 8.a, 8.b, 8.d, and 8.e			Subareas 3 and 4			Subareas 1, 2, 5, 14, 12a and 12b			Divisions 8.c and 9.a			Total		
	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch
2016	206326	200	206526	37301	1950	39252	248070	581	248651	563528	54	563582	39056	3220	42276	1094281	6005	1100286
2017	225972	151	226123	21135	2002	23137	270921	405	271327	603838	62	603900	36512	227	36739	1158380	2847	1161226
2018	157249	90	157339	31970	1470	33441	342362	619	342981	455689	51	455740	33761	518	34279	1021031	2748	1023779
2019	122991	144	123135	32848	4666	37514	307236	756	307992	345019	18	345037	23832	932	24764	831925	6516	838441
2020	130577	341	130918	48807	340	49147	456517	732	457250	356985		356985	37386	143	37529	1030272	1556	1031828
2021	146519	117	146635	15912	2529	18440	222119	423	222542	663111		663111	31862	65	31928	1079523	3133	1082656
2022	63850	222	64072	25084	686	25770	350718	2475	353193	571403		571403	32086	178	32264	1043141	3562	1046702
2023	116875	147	117022	11307	2474	13782	376512	387	376899	522456	0.019	522456	26252	115	26366	1053402	3123	1056526
2024	145599	753	146353	12038	1526	13564	371175	405	371580	343432	2	343434	22490	280	22771	894735	2966	897701
2025	66765	201	66967	10952	1265	12217	290032	661	290693	417401		417401	21789	108	21897	806939	2236	809175

Table 8.5.1.1. NE Atlantic Mackerel. Mean length (cm) -at-age by area for 2025 (Q1-Q4).

Age	2.a	3.a	3.b	3.c	3d	4.a	4.b	4.c
0		21.00				20.22	20.91	21.00
1		23.66	27.29	26.96	28.20	26.19	26.34	26.32
2	33.25	32.06	32.57	31.19	31.24	32.14	30.29	30.61
3	33.54	32.15	32.74	31.75	32.40	32.53	32.59	32.67
4	34.70	34.91	35.30	35.05	34.74	34.68	34.21	34.88
5	35.97	35.82	36.17	35.82	35.71	35.72	35.78	36.31
6	36.48	36.71	36.99	37.00	36.92	36.13	35.60	35.44
7	36.93	38.07	38.27	38.25	38.29	37.37	36.20	36.11
8	37.74	37.64	37.66	37.56	37.82	37.78	37.16	37.73
9	38.36	38.91	39.06	39.18	39.38	38.29	37.08	37.78
10	38.84	38.88	39.34	38.59	39.42	38.88	38.42	38.93
11	39.25	39.33	39.51	39.33	39.33	39.10	37.62	38.85
12	39.46	39.53	39.79	39.45	39.64	39.52	38.88	38.93
13	39.71	39.75	39.68	39.40	40.23	39.59	37.15	40.38
14	39.75	40.36	40.49	40.62	40.93	39.69	39.85	39.81
15	40.31	39.70	39.66	39.56	39.77	39.92	38.89	40.06

Age	5.a	5.b	6.a	6.b	7.a	7.b	7.c	7.d
0					20.05			25.50
1		29.80	27.80		27.51	25.80	25.77	27.94
2	32.80	31.09	29.33	30.34	30.01	31.40	30.66	31.97
3	33.59	32.17	31.75	33.06	30.92	32.48	32.14	33.13
4	35.43	34.82	34.40	33.76	33.14	34.74	34.72	34.45
5	36.57	35.54	35.52	35.06	36.11	35.74	35.74	35.38
6	36.83	36.30	36.10	35.70	35.27	36.34	36.34	35.41
7	38.13	37.97	37.24	36.65	36.54	37.73	36.50	36.21
8	38.23	36.96	38.00	38.38	37.28	38.00	38.01	36.73
9	38.61	39.83	38.78	37.16	37.01	38.74	38.73	35.60

10	39.33	38.87	39.25	39.43	39.91	38.60	38.60	38.11
11	39.37	39.53	39.31	38.91	38.28	40.49	40.50	38.54
12	39.70	39.11	39.24	38.68	38.11	39.79	39.79	38.06
13	39.75	38.44	39.74	39.20	39.01	39.90	39.90	
14	39.74	40.80	40.21	40.42	40.59	39.06	39.05	
15	40.10	39.56	39.86	40.41	40.17	41.41	41.41	

Age	7.e	7.f	7.g	7.h	7.j	8.a	8.b	8.c
0	25.46	20.94	20.05	25.50	25.50	24.41	19.50	23.11
1	28.40	26.10	27.42	29.43	28.73	28.66	26.28	28.60
2	31.28	29.22	29.74	32.59	30.15	31.17	30.26	29.62
3	32.27	30.49	30.95	33.66	31.96	32.40	32.67	32.39
4	34.20	32.41	34.95	34.66	34.44	34.62	36.06	35.23
5	34.81	34.71	36.75	35.84	35.96	35.78	37.88	36.83
6	34.86	34.38	36.29	35.77	36.22	37.33	38.82	37.86
7	36.43	34.72	37.05	36.59	37.40	37.73	38.72	38.38
8	38.91	38.47	38.74	37.10	38.60	38.96	39.50	39.12
9	35.52	36.49	39.16	36.78	38.61	38.97	39.64	39.29
10	36.43		39.25	39.40	38.72	39.59	39.97	39.40
11	44.10	38.01	39.75	39.47	39.61	39.97	40.21	40.14
12	38.70	38.00	39.62	38.23	39.81	39.78	40.10	40.20
13	40.34		40.33		40.35	41.63	41.58	42.00
14	41.26		40.82		41.26	41.09	41.04	40.86
15	40.34		40.56		40.34	41.30	41.51	42.50

Age	8.d	9.a	All
0		24.61	23.37
1	28.24	26.49	26.87
2	29.52	28.82	31.97
3	31.89	31.42	32.67
4	35.12	32.83	34.67

5	36.93	33.99	35.82
6	37.92	37.08	36.38
7	38.34	37.98	37.15
8	39.10	39.20	37.84
9	39.27	39.36	38.42
10	39.42	39.69	38.94
11	40.15	40.40	39.24
12	40.20	40.83	39.51
13	41.86	42.34	39.69
14	41.04	42.15	39.77
15	42.04	42.5	40.12

Table 8.5.2. NE Atlantic Mackerel. Mean weight-at-age in the stock for 2025 per area and for the whole NEA mackerel stock

Age	North Sea area	Western area	Southern area	NEA Mackerel 2025 Weighted mean*
2	262	242	191	241
3	290	271	250	272
4	351	306	289	309
5	367	325	329	328
6	391	350	371	354
7	403	398	405	399
8	434	421	437	424
9	435	429	450	431
10	425	457	474	456
11	472	450	480	454
12+	515	466	499	472
Area Weighting	7.3%	87.4%	5.3%	
Number of fish sampled	633	1362	1812	

Table 8.6.1.1. Estimates of the Total Annual Egg Production (AEP *10¹²) by component for each year, using the Annual Egg Production Method (AEPM).

Year	Component	AEP (*10 ¹²)	sd (*10 ¹²)
1992	Southern	359	14
1992	Western	2232	138
1995	Southern	186	69
1995	Western	2047	795
1998	Southern	541	573
1998	Western	1538	231
2001	Southern	318	201
2001	Western	1347	404
2004	Southern	138	41
2004	Western	1363	264
2007	Southern	348	341
2007	Western	1415	209
2010	Southern	459	243
2010	Western	1913	200
2013	Southern	506	579
2013	Western	2192	1572
2016	Southern	225	207
2016	Western	1523	435
2019	Southern	423	214
2019	Western	1211	237
2022	Southern	293	219
2022	Western	1639	601
2025	Southern	72	46
2025	Western	1162	401

Table 8.6.1.2 Time series of adults' fecundity parameters. Prevalence of atresia (n) refers to the number of spawning fish with early alpha atresia. *: From 2013 and onwards the median value was used instead of the mean value

Year	Fecund. Samples (n)	Atresia Samples (n)	Atresia Intensity (n)	Atresia Preva- lence	Relative potential fecund. (n/g)	Geometric mean Atresia Intensity (n/g)	Potential fecundity lost per day (n/g)	Potential fecundity lost (n/g)	Relative potential fecundity lost (%)	Realised fecundity (n/g)
2001	187	290	290	0.2	1097	40	1.07	64	6	1033
2004	205	348	348	0.28	1127	33	1.25	75	7	1052
2007	176	416	416	0.38	1098	30	1.48	89	9	1009
2010	74	511	511	0.33	1140	26	1.16	70	6	1070
2013	132	165	56	0.22	*1257	27	0.8	48	4	1209
2016	97	214	66	0.3	*1159	30	1.2	72	6	1087
2019	62	252	64	0.28	*1191	19	0.71	43	4	1147
2022	409	243	74	0.28	*1313	20	0.75	45	3	1268
2025	313	199	81	0.31	*1484	16	0.72	41	3	1443

Table 8.6.1.3 NE Atlantic Mackerel SSB (kt) and variance (*1011) derived from the mackerel egg surveys.

Year	SSB	Var
1992	3874.5	43107
1995	3766.4	1810294
1998	4198.6	1555089
2001	3233.8	767320
2004	3106.8	306191
2007	3783.0	749625
2010	4810.8	443645
2013	4831.9	9014614
2016	3524.1	959137
2019	3087.5	375834
2022	3562.7	1392802
2025	2014.5	3644861

Table 8.6.1.4. Daily egg production estimate (stage 1A) for mackerel in the North Sea in 2025.

Year	DEP *10 ¹³	CV
2025	0.79	1.27
2022	0.67	0.18
2021	1.28	0.28

Table 8.7.1.1. NE Atlantic Mackerel. CATCH IN NUMBER

Units: thousands

[illegible]

Table 8.7.1.2. NE Atlantic Mackerel. WEIGHTS AT AGE IN THE CATCH

Units : Kg

year														
age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2	0.227	0.235	0.229	0.223	0.251	0.268	0.263	0.265	0.197	0.215	0.222	0.213	0.221	0.231
3	0.310	0.306	0.310	0.305	0.306	0.330	0.325	0.307	0.306	0.292	0.288	0.283	0.289	0.282
4	0.354	0.361	0.368	0.375	0.367	0.386	0.401	0.365	0.357	0.371	0.367	0.331	0.330	0.334
5	0.408	0.404	0.431	0.424	0.425	0.437	0.419	0.432	0.428	0.408	0.417	0.389	0.364	0.368
6	0.452	0.452	0.467	0.474	0.460	0.477	0.485	0.438	0.478	0.455	0.444	0.424	0.418	0.411
7	0.462	0.500	0.504	0.496	0.513	0.522	0.519	0.494	0.494	0.512	0.497	0.450	0.470	0.451
8	0.518	0.536	0.533	0.540	0.538	0.572	0.553	0.538	0.543	0.533	0.551	0.497	0.489	0.494
9	0.550	0.569	0.570	0.577	0.581	0.608	0.572	0.554	0.584	0.572	0.572	0.539	0.516	0.540
10	0.573	0.586	0.585	0.603	0.603	0.632	0.596	0.581	0.625	0.571	0.618	0.584	0.573	0.580
11	0.591	0.607	0.596	0.610	0.630	0.648	0.630	0.632	0.635	0.585	0.595	0.600	0.604	0.611
12	0.631	0.687	0.638	0.665	0.666	0.715	0.684	0.646	0.688	0.666	0.662	0.633	0.631	0.664
year														
age	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2	0.182	0.233	0.241	0.236	0.238	0.262	0.246	0.258	0.287	0.278	0.271	0.263	0.253	0.285
3	0.283	0.281	0.284	0.294	0.295	0.311	0.318	0.304	0.323	0.340	0.317	0.319	0.322	0.295
4	0.339	0.334	0.324	0.320	0.329	0.356	0.351	0.358	0.359	0.375	0.347	0.355	0.362	0.376
5	0.373	0.360	0.363	0.352	0.356	0.377	0.393	0.387	0.386	0.406	0.379	0.389	0.394	0.410
6	0.400	0.386	0.395	0.393	0.380	0.397	0.410	0.429	0.416	0.441	0.412	0.420	0.429	0.442
7	0.431	0.406	0.422	0.420	0.410	0.415	0.424	0.440	0.444	0.457	0.436	0.449	0.458	0.473
8	0.470	0.428	0.444	0.443	0.436	0.441	0.445	0.454	0.460	0.478	0.457	0.480	0.478	0.490
9	0.505	0.457	0.468	0.465	0.454	0.465	0.467	0.472	0.471	0.487	0.473	0.496	0.510	0.513
10	0.538	0.473	0.483	0.489	0.476	0.481	0.489	0.497	0.496	0.505	0.486	0.510	0.518	0.531
11	0.542	0.494	0.523	0.522	0.498	0.496	0.504	0.513	0.517	0.518	0.506	0.524	0.538	0.543
12	0.586	0.555	0.581	0.561	0.519	0.530	0.533	0.536	0.553	0.551	0.537	0.547	0.562	0.569

Table 8.7.1.3. NE Atlantic Mackerel. WEIGHTS AT AGE IN THE STOCK

Units : Kg

year														
age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2	0.178	0.212	0.196	0.189	0.205	0.182	0.160	0.146	0.165	0.148	0.153	0.163	0.166	0.178
3	0.254	0.256	0.253	0.246	0.246	0.252	0.254	0.214	0.216	0.213	0.197	0.204	0.202	0.233
4	0.288	0.314	0.300	0.305	0.290	0.280	0.317	0.323	0.261	0.283	0.271	0.264	0.245	0.281
5	0.342	0.343	0.355	0.348	0.338	0.344	0.352	0.390	0.331	0.322	0.345	0.310	0.287	0.338
6	0.374	0.373	0.392	0.403	0.370	0.400	0.403	0.403	0.396	0.361	0.351	0.351	0.334	0.371
7	0.399	0.419	0.419	0.425	0.436	0.419	0.439	0.455	0.401	0.449	0.387	0.401	0.387	0.390
8	0.439	0.451	0.439	0.456	0.453	0.491	0.479	0.497	0.435	0.452	0.460	0.453	0.408	0.435
9	0.459	0.474	0.462	0.487	0.471	0.502	0.506	0.534	0.468	0.507	0.463	0.501	0.439	0.454
10	0.519	0.484	0.491	0.527	0.516	0.490	0.519	0.533	0.470	0.522	0.472	0.514	0.492	0.498
11	0.504	0.490	0.514	0.533	0.515	0.530	0.577	0.529	0.507	0.525	0.500	0.568	0.539	0.519
12	0.535	0.544	0.551	0.582	0.583	0.532	0.583	0.601	0.543	0.588	0.506	0.581	0.583	0.537
year														
age	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2	0.155	0.145	0.171	0.209	0.185	0.209	0.192	0.203	0.209	0.186	0.193	0.187	0.169	0.241
3	0.219	0.184	0.208	0.246	0.243	0.237	0.266	0.245	0.245	0.264	0.239	0.227	0.234	0.272
4	0.259	0.250	0.243	0.253	0.280	0.276	0.282	0.290	0.282	0.284	0.299	0.271	0.280	0.308
5	0.292	0.284	0.286	0.287	0.295	0.301	0.314	0.308	0.330	0.327	0.331	0.313	0.299	0.328
6	0.319	0.321	0.313	0.334	0.328	0.310	0.324	0.347	0.348	0.358	0.351	0.332	0.344	0.354
7	0.371	0.345	0.339	0.349	0.360	0.337	0.342	0.363	0.364	0.395	0.388	0.350	0.367	0.398

8	0.406	0.373	0.367	0.377	0.378	0.377	0.355	0.367	0.386	0.410	0.397	0.398	0.384	0.423
9	0.450	0.418	0.407	0.407	0.399	0.393	0.383	0.388	0.389	0.419	0.415	0.417	0.414	0.431
10	0.495	0.435	0.459	0.442	0.419	0.422	0.414	0.420	0.406	0.449	0.424	0.424	0.437	0.456
11	0.502	0.491	0.472	0.478	0.438	0.432	0.430	0.423	0.427	0.458	0.426	0.432	0.420	0.454
12	0.566	0.531	0.530	0.561	0.470	0.503	0.493	0.469	0.469	0.496	0.464	0.487	0.424	0.465

Table 8.7.1.4. NE Atlantic Mackerel. NATURAL MORTALITY

age	2	3	4	5	6	7	8	9	10	11	12
All years	0.333	0.299	0.278	0.265	0.256	0.250	0.246	0.243	0.240	0.239	0.238

Table 8.7.1.5. NE Atlantic Mackerel. PROPORTION MATURE

age	2	3	4	5	6	7	8	9	10	11	12
All years	0.773	0.984	1	1	1	1	1	1	1	1	1

Table 8.7.1.6. NE Atlantic Mackerel. FRACTION OF HARVEST BEFORE SPAWNING

year														
age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2	0.335	0.353	0.371	0.390	0.381	0.372	0.363	0.351	0.339	0.328	0.304	0.279	0.255	0.202
3	0.335	0.353	0.371	0.390	0.381	0.372	0.363	0.351	0.339	0.328	0.304	0.279	0.255	0.202
4	0.335	0.353	0.371	0.390	0.381	0.372	0.363	0.351	0.339	0.328	0.304	0.279	0.255	0.202
5	0.335	0.353	0.371	0.390	0.381	0.372	0.363	0.351	0.339	0.328	0.304	0.279	0.255	0.202
6	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
7	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
8	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
9	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
10	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
11	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
12	0.513	0.472	0.430	0.389	0.407	0.425	0.443	0.408	0.371	0.336	0.305	0.274	0.243	0.240
year														
age	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2	0.147	0.094	0.137	0.181	0.223	0.179	0.191	0.225	0.210	0.101	0.146	0.160	0.160	0.163
3	0.147	0.094	0.137	0.181	0.223	0.179	0.191	0.225	0.210	0.101	0.146	0.160	0.160	0.163
4	0.147	0.094	0.137	0.181	0.223	0.179	0.191	0.225	0.210	0.101	0.146	0.160	0.160	0.163
5	0.147	0.094	0.137	0.181	0.223	0.179	0.191	0.225	0.210	0.101	0.146	0.160	0.160	0.163
6	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231
7	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231
8	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231
9	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231
10	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231
11	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231
12	0.237	0.234	0.216	0.199	0.182	0.311	0.202	0.307	0.333	0.254	0.215	0.212	0.213	0.231

Table 8.7.1.7. NE Atlantic Mackerel. FRACTION OF NATURAL MORTALITY BEFORE SPAWNING

Year														
age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
3	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
4	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
5	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
6	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
7	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
8	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
9	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
10	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
11	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
12	0.304	0.325	0.346	0.366	0.361	0.355	0.350	0.346	0.342	0.339	0.311	0.283	0.255	0.252
year														
age	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
3	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
4	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
5	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
6	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
7	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
8	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
9	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
10	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
11	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344
12	0.249	0.246	0.278	0.311	0.343	0.327	0.312	0.296	0.312	0.329	0.345	0.345	0.344	0.344

Table 8.7.1.8. NE Atlantic Mackerel. SURVEY INDICES

```
$`Egg-survey`
```

```
-1
```

```
1998 4198627
```

```
2001 3233833
```

```
2004 3106809
```

```
2007 3782967
```

```
2010 4810752
```

```
2013 4831948
```

```
2016 3524055
```

```
2019 3087517
```

```
2022 3562657
```

```
2025 2014000
```

```
attr("time")
```

```
[1] 0 0
```

```
attr("twofirst")
```

```
[1] 1 1
```

```
$IESSNS
```

	3	4	5	6	7	8	9	10	11
2010	1620220	4071121	3103794	1505067	661071	406681	210689	65205	26754
2012	1233005	2513269	2051619	2915770	1863062	708461	290919	107171	73035
2013	9776216	2414988	3146068	3206095	2563983	1140695	375791	155832	140110
2014	7070648	4903244	2688163	2691749	2781383	1861684	872655	388337	117581
2015	2423754	6543483	4836426	1865507	1605187	1224662	711664	268866	64112
2016	1532152	2975841	5848939	4970064	2200758	1996370	1352385	875662	484808
2017	3504375	1899756	3186630	4450054	4560003	1833488	2050942	860718	539171
2018	490164	2392607	1128801	1304020	2230344	1916823	1117937	571562	593844
2019	3849507	1163537	2949696	2898925	1885285	3966840	4077926	1413554	1288118
2020	1456364	3303845	2159141	2543278	2638345	1891131	2881829	3845763	1450000
2021	680945	1261621	1530057	339501	1343799	741455	1033074	1033128	952106
2022	2304268	984657	1351915	1034449	621928	986123	1007549	1876520	1587563
2023	3544161	1728910	529546	439772	826319	338548	481318	368664	426678
2024	536422	852591	696301	313565	299397	343319	412044	306966	292323
2025	365830	488655	789829	595124	118471	256916	167059	78969	94695
2026	616314	463977	412040	533574	408267	112477	168637	139732	60606

```
attr("time")
```

```
[1] 0.665 0.665
```

```
attr("twofirst")
```

```
[1] 1 1
```

```
$tagAsIndex
```

	2	3	4	5	6	7	8	9	10	11
2013	6069006	5682666	1910801	2086456	1872287	1326959	651516	228186	140249	42637
2014	1404966	3517431	3118179	1378461	1587427	1315461	847095	421647	187542	79917
2015	991685	1512992	2613607	2398897	1282157	1266034	1013874	806155	389730	231746
2016	2137108	661619	1096183	2135157	1821721	862498	788230	606734	373317	177980
2017	142960	2210780	1191096	1234794	2281407	2008630	812522	735265	538498	320759
2018	2049580	392508	1129257	899477	866791	1489454	1362386	636401	475164	413651
2019	905348	1178173	317502	824047	513283	608782	1062827	945126	401767	317260
2020	408664	492163	716645	287619	670345	372063	451654	737393	599270	261912
2021	1041506	444591	469698	673935	354528	633734	368809	428862	618829	465738
2022	771576	740911	393059	365193	504073	311166	437163	340732	359709	451066

```
2023 339571 749073 743572 334000 265577 338770 219730 296311 246824 226296
2024 402626 286318 552758 524089 244132 190025 195456 154211 135221 143679
attr("time")
[1] 0.5 0.5
attr("twofirst")
[1] 1 1

$`rec-IESSNS`
2
2018 3825337
2019 1686209
2020 1416546
2021 2819566
2022 4283454
2023 1402301
2024 869524
2025 1741419
2026 3172593
attr("time")
[1] 0.665 0.665
attr("twofirst")
[1] 1 1
```

Table 8.7.2.1. NE Atlantic Mackerel. SAM parameter estimates for the 2025 update.

type	data	estimate	std.dev	confidence interval lower bound	confidence interval upper bound
catchabilities					
	Egg-survey 2	0.626	0.155	0.459	0.854
	IESSNS 3	0.383	0.160	0.278	0.526
	IESSNS 4	0.531	0.111	0.425	0.663
	IESSNS 5	0.672	0.110	0.540	0.838
	IESSNS 6	0.728	0.111	0.584	0.909
	IESSNS 7	0.904	0.114	0.720	1.134
	IESSNS 8	1.006	0.119	0.793	1.276
	IESSNS 9	1.278	0.128	0.988	1.652
	IESSNS 10-11	1.290	0.163	0.931	1.789
	tagAsIndex 2	0.150	0.181	0.104	0.215
	tagAsIndex 3	0.198	0.113	0.158	0.248
	tagAsIndex 4	0.236	0.082	0.200	0.278
	tagAsIndex 5	0.288	0.081	0.245	0.339
	tagAsIndex 6	0.349	0.081	0.297	0.411
	tagAsIndex 7	0.403	0.084	0.341	0.477
	tagAsIndex 8	0.455	0.091	0.380	0.546
	tagAsIndex 9	0.546	0.102	0.445	0.670
	tagAsIndex 10-11	0.626	0.119	0.493	0.795
	rec-IESSNS 2	0.544	0.154	0.399	0.740
	Survival Type 1	0.482	0.120	0.423	0.482
process variances					
	F random walk 2-3	0.253	0.160	0.184	0.348
	F random walk 4-10	0.196	0.130	0.151	0.254
	F random walk 11-12	0.272	0.161	0.197	0.375

type	data	estimate	std.dev	confidence interval lower bound	confidence interval upper bound
	recruitment age 2	0.615	0.150	0.456	0.831
	process error age 3-11	0.099	0.103	0.080	0.121
observation variances					
	Residual catch 2-3	0.134	0.285	0.076	0.237
	Residual catch 4-10	0.069	0.228	0.044	0.110
	Residual catch 11-12	0.115	0.322	0.060	0.219
	Egg-survey	0.468	0.231	0.295	0.744
	IESSNS 3	0.562	0.178	0.394	0.803
	IESSNS 4-9	0.345	0.110	0.277	0.430
	IESSNS 10-11	0.471	0.127	0.365	0.607
	tagAsIndex 2	0.567	0.240	0.351	0.917
	tagAsIndex 3	0.308	0.237	0.192	0.495
	tagAsIndex 4-11	0.170	0.125	0.132	0.218
	rec-IESSNS 2	0.314	0.314	0.167	0.588
	RecapturePhi	1.613	0.255	2.020	1.368

Table 8.7.3.1. NE Atlantic Mackerel. STOCK SUMMARY.

Year	Recruitment (age 2)			Spawning-stock biomass (SSB) at spawning time			Total catch*	F (ages 4–8)		
	Low	Value	High	Low	Value	High		Low	Value	High
1998	3315492	4531254	6192824	2800786	3214314	3688899	646744	0.147	0.22	0.34
1999	2677409	3523605	4637240	2860047	3192211	3562951	623345	0.172	0.24	0.32
2000	2900338	3655757	4607933	2680090	2952500	3252598	663328	0.23	0.26	0.29
2001	3205045	4005613	5006150	2495140	2741529	3012249	728111	0.29	0.32	0.36
2002	1429831	1852750	2400760	2081775	2291314	2521943	734436	0.33	0.37	0.41
2003	5618481	7074268	8907259	2152053	2420499	2722430	646596	0.34	0.38	0.42

Year	Recruitment (age 2)			Spawning-stock biomass (SSB) at spawning time			Total catch*	F (ages 4–8)		
	Low	Value	High	Low	Value	High		Low	Value	High
2004	9373591	12038751	15461686	2913321	3378885	3918847	652254	0.29	0.32	0.36
2005	4335729	5631834	7315391	3089174	3590570	4173346	543402	0.21	0.24	0.27
2006	7368130	9619903	12559841	3398108	3955513	4604351	475688	0.172	0.197	0.22
2007	12940027	16806214	21827530	4373010	5119809	5994144	577647	0.192	0.22	0.25
2008	15072728	19689534	25720476	5807103	6862794	8110403	627549	0.170	0.198	0.23
2009	10892947	14303392	18781606	7106140	8384332	9892436	749162	0.154	0.181	0.21
2010	12359216	16198975	21231669	7807245	9186948	10810473	869705	0.138	0.162	0.192
2011	10816117	14150325	18512346	9320241	10958418	12884530	943111	0.126	0.150	0.179
2012	21462558	27931300	36349699	9968516	11737461	13820310	890040	0.102	0.122	0.145
2013	20269414	26293033	34106737	10961432	12876481	15126104	927124	0.092	0.110	0.131
2014	8940179	11572417	14979660	11508015	13404944	15614554	1397906	0.111	0.132	0.157
2015	7691163	9890879	12719728	10869558	12595250	14594918	1201421	0.099	0.118	0.140
2016	10473499	13445196	17260067	10231626	11808346	13628043	1094934	0.090	0.106	0.125
2017	2942924	3802002	4911856	8743605	10079263	11618954	1152946	0.094	0.111	0.130
2018	7549349	9588850	12179334	7885885	9053455	10393893	1017413	0.092	0.107	0.125
2019	4202048	5342459	6792372	6918422	7941650	9116211	833313	0.087	0.101	0.117
2020	3140134	3994399	5081063	5847401	6704705	7687699	1026050	0.118	0.136	0.157
2021	5571707	7127157	9116842	5531516	6323044	7227834	1073866	0.148	0.171	0.197
2022	5369544	7031732	9208464	4879845	5620342	6473206	1038522	0.165	0.190	0.22
2023	2158682	2910909	3925262	3787637	4426716	5173626	1052977	0.197	0.23	0.27
2024	2274043	3250530	4646325	2851192	3426676	4118316	889848	0.197	0.24	0.29
2025	1695159	2800742	4627386	2391464	3072051	3946328	802265	0.22	0.29	0.37
2026	3032417	6117286	12340380	2266982**	3204507**	4700866**				

* Not including catches of age 0 and 1 fish, as they are not used in the assessment

** Estimated value from the forecast.

Table 8.7.3.2. NE Atlantic Mackerel. ESTIMATED POPULATION ABUNDANCE

	year								
age	1998	1999	2000	2001	2002	2003	2004	2005	2006
2	4531254	3523605	3655757	4005613	1852750	7074268	12038751	5631834	9619903
3	2490247	3276712	2531455	2494597	2907050	1262479	4720629	8382568	3857162
4	2410276	1874885	2255610	1699022	1773148	1837720	972130	2693841	5340809
5	1952407	1635143	1334386	1416496	1069186	1010691	1140931	739653	1611738
6	1129149	1179964	1051098	848382	830695	607176	541279	635903	547919
7	593171	714039	721912	679991	480839	417435	303371	293888	386000
8	354338	358826	428969	433659	371721	257407	199478	159983	170892
9	243702	208031	211296	245902	231672	194237	120052	98214	87719
10	141838	145710	118595	126932	122367	109261	84522	63142	55074
11	47748	81406	81202	68830	60808	57313	43688	34617	33343
12	217915	162707	147959	135658	106117	74570	52369	45133	42451
	year								
age	2007	2008	2009	2010	2011	2012	2013	2014	2015
2	16806214	19689534	14303392	16198975	14150325	27931300	26293033	11572417	9890879
3	6252879	12423050	14789381	10559061	11906950	9996636	20044208	18457778	8566252
4	2778740	4270022	8989160	11046831	8122028	8773621	7525883	14011661	12040649
5	3228730	2133902	3016576	6054002	7361296	6128142	6566839	6032514	9167816
6	1073134	1711892	1462523	2163761	3915560	4998832	4813405	4992332	4379229
7	368132	628199	1016758	905423	1501863	2467770	3167953	3663061	3425284
8	235941	240694	366082	536127	612747	947661	1488687	2194540	2410427
9	113060	127237	145833	217483	282768	390805	615258	928358	1367473
10	50949	67970	66525	94194	122163	162914	255743	387536	620320
11	32235	25028	38656	36412	58955	73056	99108	157567	254508
12	41180	35100	30350	43762	52018	69189	93565	112178	181059
	year								
age	2016	2017	2018	2019	2020	2021	2022	2023	2024
2	13445196	3802002	9588850	5342459	3994399	7127157	7031732	2910909	3250530
3	6693316	9714086	2721248	6619645	3694303	2846637	4636782	4752567	1964677
4	6653547	5052569	6210789	2000564	4222937	2745396	1969369	3235991	3030776
5	8481054	4725319	3485562	4049829	1676871	2926595	1752744	1393546	2097424
6	6417780	5898722	3184774	2563301	2717886	1250394	1828977	1065360	865946
7	3054212	4407680	4082746	2275060	1795156	1949544	938813	1130903	646867
8	2325096	2095624	2973028	2762338	1713261	1218470	1232454	646273	639388
9	1482518	1533453	1446228	2000424	1908778	1208237	853097	738026	400116
10	817394	1037997	1002469	891026	1387809	1203836	784952	553366	392073
11	382962	550088	731136	675408	631624	882395	813794	483300	319707
12	281794	454854	616519	853655	1021409	927624	1192035	1073699	783156
	year								
age	2025	2026							
2	2800742	6117286							
3	2112850	1951611							
4	136840	1394009							
5	1915533	924385							
6	1342234	1206503							
7	516585	816616							
8	427488	256654							
9	352171	215539							
10	209156	161010							
11	200783	85769							
12	494108	255374							

Table 8.7.3.3. NE Atlantic Mackerel. ESTIMATED FISHING MORTALITY

year														
age	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
2	0.032	0.035	0.041	0.045	0.051	0.043	0.042	0.029	0.019	0.014	0.011	0.010	0.010	0.010
3	0.086	0.093	0.112	0.125	0.143	0.118	0.118	0.082	0.055	0.045	0.038	0.036	0.034	0.031
4	0.156	0.166	0.191	0.217	0.239	0.205	0.187	0.137	0.105	0.096	0.084	0.081	0.076	0.069
5	0.208	0.220	0.249	0.294	0.328	0.309	0.275	0.202	0.161	0.167	0.145	0.135	0.122	0.109
6	0.234	0.247	0.276	0.350	0.397	0.401	0.346	0.256	0.213	0.233	0.201	0.188	0.165	0.151
7	0.254	0.265	0.290	0.374	0.427	0.454	0.383	0.286	0.240	0.280	0.255	0.236	0.207	0.195
8	0.267	0.277	0.297	0.385	0.449	0.508	0.423	0.315	0.263	0.327	0.303	0.266	0.242	0.228
9	0.274	0.284	0.298	0.402	0.476	0.552	0.449	0.332	0.285	0.360	0.332	0.279	0.261	0.251
10	0.308	0.318	0.330	0.454	0.537	0.641	0.539	0.400	0.347	0.437	0.386	0.306	0.283	0.273
11	0.252	0.262	0.275	0.414	0.524	0.654	0.508	0.353	0.319	0.448	0.370	0.260	0.239	0.249
12	0.252	0.262	0.275	0.414	0.524	0.654	0.508	0.353	0.319	0.448	0.370	0.260	0.239	0.249
year														
age	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
2	0.009	0.010	0.015	0.015	0.019	0.025	0.028	0.027	0.031	0.049	0.042	0.049	0.049	0.042
3	0.027	0.027	0.039	0.036	0.043	0.055	0.057	0.053	0.059	0.089	0.077	0.091	0.089	0.083
4	0.057	0.054	0.070	0.061	0.068	0.079	0.076	0.071	0.082	0.116	0.109	0.126	0.125	0.124
5	0.089	0.081	0.104	0.087	0.086	0.096	0.093	0.091	0.116	0.157	0.162	0.191	0.182	0.190
6	0.122	0.107	0.133	0.117	0.105	0.108	0.107	0.102	0.133	0.173	0.190	0.228	0.224	0.255
7	0.156	0.137	0.164	0.148	0.128	0.126	0.125	0.117	0.164	0.195	0.227	0.280	0.298	0.390
8	0.185	0.171	0.188	0.175	0.143	0.144	0.136	0.122	0.185	0.212	0.262	0.330	0.360	0.467
9	0.217	0.216	0.202	0.186	0.146	0.153	0.153	0.130	0.203	0.222	0.290	0.372	0.419	0.555
10	0.235	0.237	0.211	0.200	0.156	0.171	0.168	0.143	0.217	0.213	0.300	0.401	0.486	0.647
11	0.206	0.217	0.164	0.146	0.109	0.131	0.132	0.113	0.210	0.182	0.295	0.413	0.526	0.763
12	0.206	0.217	0.164	0.146	0.109	0.131	0.132	0.113	0.210	0.182	0.295	0.413	0.526	0.763

Table 8.8.1.1. NE Atlantic Mackerel: summary of the analyses conducted to detect a change point in the recruitment and recruit per spawner time series

R package	Test change in :	method	What it does	Change points in Recruitment	Change points for Recruits per spawner
Change-point	mean	"PELT"	Finds multiple changepoints efficiently using a penalised likelihood	22 change points	1 : 2014
Change-point	mean	"BinSeg"	Recursive splitting; fast, but not guaranteed to find the globally optimal segmentation	1: 2017 2: 2007 3: 2014 4: 2012 5: 2009	1 : 2014
Change-point	mean	"SegNeigh"	Searches for the optimal segmentation for different numbers of changepoints; more computationally intensive	1: 2017 2: 2007 3: 2014 4: 2012	1 : 2014
Change-point	mean	"AMOC"	At Most One Change — tests for a single changepoint	2017	1 : 2014
bcp	mean		considers changes in the mean level of the series in a probabilistic framework	1: 2014 2: 2012 3: 2007 4: 2017	1: 2014 2: 2009 3: 2005 4: 2007
Rbeast	trend		decompose time series into trend and seasonal components while detecting and estimating the timing and magnitude of abrupt changes	1: 2014	1: 2014 2: 2009

Table 8.8.3.1. NE Atlantic Mackerel. Short term forecast results for the Intermediate year

Variable	Value	Notes
$F_{\text{ages 4-8}} (2026)$	0.167	From the forecast for 2026, based on assumed catch for 2026
Spawning-stock biomass (SSB; 2026) at spawning time	3 204 507	From the forecast for 2026; tonnes
$R_{\text{age 2}} (2027-2028)$	4 787 144	Resampled recruitments from the years 2017–2026 (geometric mean shown); thousands
Total catch (2026)	398 186	Sum of expected landings and discards, accounting for the interannual transfers from 2025; tonnes
$P(\text{SSB}_{2026} < \text{Blim})$	0.40	probability of $\text{SSB} < \text{Blim}$ in 2026

Table 8.8.3.2. NE Atlantic Mackerel. 2026 Catch option table from the stochastic forecast.

Basis	Total catch	F _{ages 4–8}	Spawning-stock biomass (SSB) at spawning time		% change			Probabil- ity
	2027	2027– 2028	2027	2028	SSB*	Catch**	Ad- vice***	of SSB ₂₀₂₈ < B _{lim} (%)^
ICES advice basis								
MSY approach: F ₂₀₂₇ = F _{MSY} * SSB ₂₀₂₆ /MSY B _{trig- ger}	352938	0.149	3135352	3345872	6.71	-11.36	102.42	33.2
Other scenarios								
F=F _{MSY} =F _{PA}	443198	0.191	3118364	3269935	4.86	11.3	154.19	37.6
F = 0	0	0	3196892	3652549	14.25	-100	-100	16.9
Catch ₂₀₂₇ = Catch ₂₀₂₆	398187	0.169	3127653	3307790	5.76	0	128.37	35.6
Catch ₂₀₂₇ = Catch ₂₀₂₆ +25%	497733	0.217	3108611	3223577	3.7	25	185.47	40.7
Catch ₂₀₂₇ = Catch ₂₀₂₆ -20%	318549	0.132	3142315	3374873	7.4	-20	82.7	31.6
F = F ₂₀₂₆	392517	0.167	3127869	3312345	5.9	-1.42	125.12	35.1
SSB ₂₀₂₈ = B _{lim}	675632	0.309	3069021	3068002	-0.03	69.68	287.5	50
SSB ₂₀₂₈ = B _{PA} ^^								
p(SSB ₂₀₂₈ <B _{lim}) = 5% ^^								
HCRa [#] ; all F _{min} op- tions	352938	0.149	3135352	3345872	6.71	-11.36	102.42	33.2
HCRb [#] ; F _{min} =0	63697	0.0249	3186439	3596764	12.88	-84	-63.47	19.4
HCRb [#] ; F _{min} =0.025	63811	0.025	3186421	3596663	12.87	-83.97	-63.4	19.4
HCRb [#] ; F _{min} =0.05	125744	0.05	3175869	3542169	11.53	-68.42	-27.88	22.3
HCRb [#] ; F _{min} =0.075	185862	0.075	3165413	3489351	10.23	-53.32	6.6	25
HCRb [#] ; F _{min} =0.1	244227	0.1	3155358	3438653	8.98	-38.67	40.07	27.7

* SSB_{2028} relative to SSB_{2027} .

** Catch in 2027 relative to estimated catches in 2026 (398 186 tonnes). There is no internationally agreed total allowable catch (TAC) for 2026.

*** Advice value for 2027 relative to the advice value for 2026 (174 357 tonnes).

^ The probability of SSB being below B_{lim} in 2028. This probability relates to the short-term probability of $SSB < B_{lim}$ and is not comparable to the long-term probability of $SSB < B_{lim}$ tested in simulations when estimating fishing mortality reference points.

^^ These options cannot be achieved even with zero catch in 2027.

[#] HCRa and HCRb correspond to the harvest control rules tested in the *Technical service regarding the impacts of different rebuilding Harvest Control Rules (HCRs) for Atlantic mackerel (mac.27.nea)* (ICES, 2026). Both rules apply a fishing mortality equal to F_{MSY} when the SSB in the current year is equal or above $MSY B_{trigger}$, a linear decline of F below $MSY B_{trigger}$ to $F=0$ at $SSB=0$ for HCRa and to $F=0$ for $SSB=B_{lim}$ for HCRb, and for both rules a minimum level of fishing mortality (F_{min}).

Table 8.8.5. NE Atlantic Mackerel. Comparison of the STF output for the 2026 assessment in which the 2025 stock weights-at-age calculation includes or excludes the samples collected during the egg survey.

Forecasted quantities	Including MEGS samples	Excluding MEGS samples	difference
SSB ₂₀₂₆	3 204 507	3 055 169	-5%
Fbar ₂₀₂₇	0.149	0.142	-5%
Catch ₂₀₂₇	352 938	338 698	-4%
SSB ₂₀₂₈	3 345 872	3 294 371	-2%
p(SSB ₂₀₂₈ <B _{lim})	0.33	0.38	15%

Table 8.10.1. NE Atlantic mackerel. Differences in forecast basis and output between a forecast conducted based on the benchmark assessment, starting in 2025 (STF2025) and a forecast based on the WGIWDE 2026 assessment (STF20026).

	SFT2025		STF2026		% difference
catch(2025)	755143	assumption	807195	data	-6%
catch(2026)	175298	STF	398186	assumption	-56%
Fbar(2025)	0.29	STF	0.285	SAM	2%
Fbar(2026)	0.072	STF	0.167	STF	-57%
rec(2025)	4081090	SAM	2800742	SAM	46%
rec(2026)	4094160	assumption	6087125	SAM	-33%
SSB(2025)	2735857	STF	3072051	SAM	-11%
SSB(2026)	2753580	STF	3204507	STF	-14%

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