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International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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# 8 Northeast Atlantic Mackerel

## 8.1 ICES Advice and International Management Applicable to 2016

From 2001 to 2007 the internationally agreed TACs covered most of the distribution area of the Northeast Atlantic mackerel. From 2008 to 2014, no agreement has been reached among the Coastal States on the sharing of the mackerel quotas. In 2014 three of the Coastal States agreed on a Management Strategy for 2015 and the subsequent five years. However, the total declared quotas for 2015, 2016 and 2017 all exceed the TAC advised by ICES. An overview of the declared quotas and transfers for 2017, as available to WGWIDE, is given in the text table below. Total removals of mackerel are expected to be approximately 1 178 850 t in 2017, exceeding the recommended catch limit for 2017 by about 323 000 t.

| Estimation of 2017 catch | Tonnes | Reference |
|---|---|---|
| EU quota | 505 438 | European Council Regulation 2016/127 |
| Norwegian quota | 229 493 | Directorate of Fisheries in Norway |
| Inter-annual quota transfer 2017->2016 (NO) | -20 955 | Directorate of Fisheries in Norway |
| Russian quota | 123 785 | NEAFC HOD 17/13 of April 12. 2017 |
| Discards | 5 970 | Previous years estimate |
| Icelandic quota | 168 464 | Icelandic regulation No. 295/2017 |
| Faroese quota | 128 655 | Faroese Fisheries Ministry press release 19 Oct. 2016 |
| Greenland catch | 38 000 | Logbook estimate from Greenland Institute of Natural Ressources |
| Total expected catch (incl. discard) [1,2] | 1 178 850 | |

[1] No guesstimates of banking from 2017 to 2018

[2] Quotas include amounts exchanged to other parties

The quota figures and transfers in the text table above were based on various national regulations, official press releases, and discard estimates.

Various international and national measures to protect mackerel are in operation throughout the mackerel catching countries. Refer to Table 8.2.4.1 for an overview.

Since the mid 1970s, ICES has continuously recommended conservation measures for the North Sea component of the Northeast Atlantic mackerel stock (e.g. ICES 1974, ICES 1981). The recommended closure of Division 4.a for fishing during the first half of the year is based on the perception that the western mackerel enter the North Sea in July/August, and remain there until December before migrating to their spawning areas. Updated observations from the late 1990s suggested that this return migration actually started in mid- to late February (Jansen et al. 2012b). The EU TAC regulations stated that within the limits of the quota for the western component (6, 7, 8.a,b,d,e, 5b (EU), 2a (non EU), 12, 14), a certain quantity of this stock may be caught in 4.a during the periods 1 January to 15 February and 1 September to 31 December. Up to 2010, 30% of the Western EU TAC of mackerel (MAC/2CX14-) could be taken in 4.a. From 2011 onwards, this percentage has been set at 40% and from 2015 at 60%.

## 8.2 The Fishery

### 8.2.1 Fleet Composition in 2016

A description of the fleets operated by the major mackerel catching nations is given in Table 8.2.1.

The total fleet can be considered to consist of the following components:

**Freezer trawlers.** These are commonly large vessels (up to 150 m) that usually operate a single mid-water pelagic trawl, although smaller vessels may also work as pair trawlers. These vessels are at sea for several weeks and sort and process the catch on board, storing the mackerel in frozen 20 kg blocks. The Dutch, German and the majority of the French and English fleets consist of these vessels which are owned and operated by a small number of Dutch companies. They fish in the North Sea, west of the UK and Ireland and also in the English Channel and further south along the western coast of France. The Russian summer fishery in subarea 2.a is also prosecuted by freezer trawlers and partly the Icelandic fishery in 5.a and in some years 14.b.

**Purse seiners.** The majority of the Norwegian catch is taken by these vessels, targeting mackerel overwintering close to the Norwegian coastline. The largest vessels (> 20 m) used refrigerated seawater (RSW), storing the catch in tanks containing refrigerated seawater. Smaller purse seiners use ice to chill their catch which they take on prior to departure. A purse seine fleet is also the most important component of the Spanish fleet. They are numerous and target mackerel early in the year close to the northern Spanish coast. These are dry hold vessels, chilling the catch with ice. Denmark also has a purse seine fleet operating in the northern North Sea.

**Pelagic trawlers.** These vessels vary in size from 20—100 m and operate both individually and as pairs. The largest of the pelagic trawlers use RSW tanks for storage. Iceland, Greenland, Faroes, Scotland and Ireland fish mackerel using pelagic trawlers. Scottish and Icelandic vessels mostly operate singly whereas Ireland and Faroes vessels tend to use pair trawls. Spain also has a significant trawler fleet which target mackerel with a demersal trawl in areas 8 and 9.a.N.

**Lines and jigging.** Norway and England have handline fleets operating inshore in the Skagerrak (Norway) and in area 7.e/f (England) around the coast of Cornwall, where other fishing methods are not permitted. Spain also has a large artisanal handline fleet as do France and Portugal. A small proportion of the total catch reported by Scotland (4.a and 4.b) and Iceland (5.a) is taken by a handline fleet.

**Gillnets.** Gillnet fleets are operated by Norway and Spain.

### 8.2.2 Fleet Behaviour in 2016

The most important changes in recent years are related to the geographical expansion of the northern summer fishery (areas 2, 5 and 14) and changes in southern waters due to stricter TAC compliance by Spanish authorities. Fishing in the North Sea and west of the British Isles followed a traditional pattern, targeting mackerel on their spawning migration from the Norwegian deep in the northern North Sea, westwards around the north coast of Scotland and down the west coast of Scotland and Ireland.

The Russian freezer trawler fleet operates over a wide area in northern waters. This fleet targets herring and blue whiting in addition to mackerel. In the third quarter the Russian vessels took the bulk of their catch from the international waters of area 2.a. Smaller catches were also taken further south, between the Faroes and Iceland.

Total catches from Icelandic vessels were similar to those in recent years with the majority of the catch taken in 5.a in waters south and south-east of Iceland. Catches were also taken to the west of Iceland. In 2015, Greenland was the only country targeting mackerel in area 14.b. Catches from this fleet have decreased in 2015 to 30 kt from 87 kt caught in 2014 which was the biggest catch by this fleet to date.

Concerning the Spanish fisheries no new regulations have been implemented since 2010 when a new control regime was enforced. Fishery has started as in previous years at the beginning of March, although the southern spawning component was already concentrated at their spawning grounds as earlier as February.

### 8.2.3 Recent Changes in Fishing Technology and Fishing Patterns

Northeast Atlantic mackerel, as a widely distributed species, is targeted by a number of different fishing métiers. Most of the fishing patterns of these métiers have remained unchanged during the most recent years, although the timing of the spawning migration and geographical distribution can change from year to year and this affects the fishery in various areas.

Recent changes are notable for two areas and métiers in particular:

In 2010, the Faroese fleet switched from purse-seining in Norwegian and EU waters to pair trawling in the Faroese area. The Faroese fleet used to catch their mackerel quota in Divisions 4.a and 6.a during September-October with purse-seiners. However, as no agreement has been reached between the Coastal States since 2009, the mackerel quota has been taken in Faroese waters during June-October by the same fleet using pair trawls. The mackerel distribution is more scattered during summer and pair trawls seem to be effective in such circumstances. However, since the agreement between the three of the Coastal States for the fisheries in 2015, parts of the Faroese quota will now again be taken with purse-seines in Divisions 5.a and 6.a. In recent years, up to 25% of the Faroese quota have been granted to smaller, traditionally demersal trawlers using pair trawls.

Also targeting summer feeding mackerel, Icelandic vessels have increased effort and catch dramatically in recent years from 4 kt in 2006 to an average 160 kt annually since 2011. This fishery operates over a wide area E, NE, SE, S and SW off Iceland. Since 2011 there has been less fishing activity to the north and north-east and an increase in catches taken south and west of Iceland. Greenland has reported catches from area 14.b since 2011.

In Spain part of the purse seiner fleet is using hand lines instead of nets. Although, neither the number of vessels and its evolution nor the reason for such change were deeply analysed, it seems market reasons are driving this shift.

### 8.2.4 Regulations and their Effects

An overview of the major existing technical measures, effort controls and management plans are given in Table 8.2.4.1. Note that there may be additional existing international and national regulations that are not listed here.

Between 2010 and 2016 no overarching Coastal States Agreement/NEAFC Agreement was in place and no overall international regulation on catch limitation was in force. Currently there is no agreement on a management strategy covering all parties fishing mackerel. In 2014, three of the Coastal States (The EU, Faroes and Norway) agreed on a Management Strategy for 2015 and the subsequent five years. However, the total declared quotas taken by all parties since 2015 have greatly exceeded the TAC advised by ICES (Section 8.1).

Management aimed at a fishing mortality in the range of 0.15—0.20 in the period 1998—2008. The current management plan aims at a fishing mortality in the range 0.20—0.22. The fishing mortality realised during 1998—2008 was in the range of 0.27 to 0.46. Implementation of the management plan resulted in a reduced fishing mortality and increased biomass. Since 2008 catches have greatly exceeded those given by the plan.

The measures advised by ICES to protect the North Sea spawning component aim at setting the conditions for making a recovery of this component possible. Before the late 1960s, the North Sea spawning biomass of mackerel was estimated at above 3 million tonnes. The collapse of mackerel in the North Sea in the late 1960s was most likely driven by very high catches and associated fishing mortality. However, the lack of recovery of mackerel in the North Sea was probably associated with unfavourable environmental conditions, particularly reduced temperatures (unfavourable for spawning), lower zoo-plankton availability in the North Sea and increased wind-stress induced turbulence. These unfavourable environmental conditions probably led the mackerel to spawn in western waters instead of in the North Sea.

A review of the mackerel in the North Sea, carried out during WKWIDE 2017 (ICES 2017a) concluded that Northeast Atlantic mackerel should be considered as a single population (stock) with individuals that show stronger or weaker affinity for spawning in certain parts of the spawning area. Management should ensure that fisheries do not decrease genetic and behavioural diversity, since this could reduce future production. Protection of mackerel that tend to spawn in the north-eastern parts of the spawning area is therefore still advisable to some extent.

In the southern area a Spanish national regulation affecting mackerel catches of Spanish fisheries has been implemented since 2010. In 2015, fishing opportunity was distributed by region and gear and for the bottom trawl fleet, by individual vessel. This year Spanish mackerel fishing opportunity in 8.c and 9.a was established at 39 674 t resulting from the quota established (Commission Regulation (EU) No 104/2015. This was reduced by 9 797 t due to the scheduling payback quota due to overfishing of the mackerel quota allocated to Spain in 2010 (Commission Regulation No 976/2012).

Within the area of the southwest Mackerel Box off Cornwall in southern England only handliners are permitted to target mackerel. This area was set up at a time of high fishing effort in the area in 1981 by Council Regulation to protect juvenile mackerel, as the area is a well-known nursery. The area of the box was extended to its present size in 1989**.**

Additionally, there are various other national measures in operation in some of the mackerel catching countries.

The first phase of a landing obligation came into force in 2015 for all EU vessels in pelagic and industrial fisheries. All species that are managed through TACs and quotas must be landed under the obligation unless there is a specific exemption such as *de minimis*. There are no *de minimis* exemptions for mackerel.

## 8.3 Quality and Adequacy of sampling Data from Commercial Fishery

The working group has carried out again a brief review of the sampling data from commercial fishery and the level of sampling on the commercial fisheries. The sampling programme on NEA mackerel is summarised as follows in Table 8.3.1.

Sampling activity in 2016 covered 89% of the working group catch, in line with previous years but with an increase in the number of samples. It should be noted that this sampling coverage figure is based on the total sampled catch and thus the largest catching nations that can sample 100% of their catch mask any deficiencies at national level and with more widely dispersed fisheries. This is especially true when a large proportion of the total catch is taken in large, directed fisheries which are relatively straightforward to sample.

Spain, Greenland, Iceland, Ireland, Norway, Portugal, Russia and Scotland all sampled over 90% of their catch. The freezer trawler fleet operating out of the Netherlands, Germany, England and France is covered by the Dutch and German sampling programs as the fleet is principally Dutch-owned. Individual samples within this fishery consist of only 25 aged fish which can be limiting when only a single sample is available in a particular area and quarter. As in previous years, England & Wales sampled a small fraction of their total catch, which was landed in the UK. This corresponds to the handline fishery in area 7.e and 7.f. Of the remaining countries with significant catches Northern Ireland and Sweden did not provide any sampling information. France conducted length-frequency sampling but no ageing was carried out. The sampling summary of the mackerel catching countries is shown Table 8.x.2.

Table 8.x.3 describes the mackerel sampling intensity levels in terms of catch in each ICES division. Only areas with relatively minor catches are insufficiently sampled. Discard sampling programmes are not included. Number of age samples in southern fleets not disaggregated by area (included in 8.c total)

## 8.4 Catch Data

### 8.4.1 ICES Catch Estimates

The total ICES estimated catch for 2016 was 1 094 066 t, a decrease of 114 924 t on the estimated catch in 2015. Catches increased substantially from 2006—2010 and have averaged 1 079 kt since from 2011.

The combined 2016 TAC, arising from agreements and autonomous quotas, amounts to 1 067 828 t. The ICES catch estimate (1 094 066 t) represents an slight overshoot of this. The combined fishable TAC for 2017, as best ascertained by the Working Group (see Section 8.1), amounts to 1 187 850 t.

Catches reported for 2016 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, logbooks and compliance reports. In several countries discarding is illegal. Spanish data is based on the official data supplied by the Fisheries General Secretary (SGP) but supplemented by scientific estimates which are recorded as unallocated catch in the ICES estimates (see Section 1.3.6).

The text table below gives a brief overview of the basis for the ICES catch estimates.

| COUNTRY | OFFICIAL LOG BOOK | OTHER SOURCES | DISCARD INFORMATION |
|---|---|---|---|
| Denmark | Y (landings) | Y (sale slips) | Y |
| Faroe[1] | Y (catches) | Y (coast guard) | NA |
| France | Y (landings) | | Y |
| Germany | Y (landings) | | Y |
| Greenland | Y (catches) | Y (sale slips) | Y |
| Iceland[1] | Y (landings) | | NA |
| Ireland | Y (landings) | | Y |
| Netherlands | Y (landings) | Y | Y |
| Norway[1] | Y (catches) | | NA |
| Portugal | | Y (sale slips) | Y |
| Russia[1] | Y (catches) | | NA |
| Spain | Y | Y | Y |
| Sweden | Y (landings) | | N |
| UK | Y (landings) | Y | Y |

[1]For these nations a discarding ban is in place such that official landings are considered to be equal to catches.

The Working Group considers that the estimates of catch are likely to be an underestimate for the following reasons:

- Estimates of discarding or slipping are either not available or incomplete for most countries. Anecdotal evidence suggests that discarding and slipping can occur for a number of reasons including high-grading (larger fish attract a premium price), lack of quota, storage or processing capacity and when mackerel is taken as by-catch.
- Confidential information suggests substantial under-reported landings for which numerical information is not available for most countries. Recent work has indicated considerable uncertainty in true catch figures (Simmonds *et al.*, 2010) for the period studied.
- Estimates of the magnitude and precision of unaccounted mortality suggests that, on average for the period prior up to 2007, total catch related removals were equivalent to 1.7 to 3.6 times the reported catch (Simmonds *et al.*, 2010).
- Reliance on logbook data from EU countries implies (even with 100% compliance) a precision of recorded landings of 89% from 2004 and 82% previous to this (Council Regulation (EC) Nos. 2807/83 & 2287/2003). Given that over reporting of mackerel landings is unlikely for economic reasons; the WG considers that, where based on logbook figures, the reported landings may be an underestimate of up to 18% (11% from 2004). Where inspections were not carried out there is a possibility of a 56% under reporting, without there being an obvious illegal record in the logsheets. Without information on the percentage of the landings inspected it is not possible for the Working Group to evaluate the underestimate in its figures due to this technicality. EU landings represent about 65% of the total estimated NEA mackerel catch.

- The accuracy of logbooks from countries outside the EU has not been evaluated by WGWIDE. Monitoring of logbook records is the responsibility of the national control and enforcement agencies.

The total catch as estimated by ICES is shown in Table 8.4.1.1. It is broken down by ICES area 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 areas 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 2014b). The Working Group considers the estimates for these areas are incomplete. In 2016, discard data for mackerel were provided The Netherlands, France, Germany, Ireland, Spain, Portugal, Greenland, Denmark, England, Scotland and Spain. Total discards amounted to 5 971 t from these nations (mainly Spain and France). The German, Dutch and Irish 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.

Age-disaggregated data was limited but data from indicates that, in subareas 8.a and 8.b the majority of discarded fish were aged 0 to 3. Sampling of discards in 8.c indicates more general discarding, suggesting discarded bycatch. A lack of age 0 fish (as indicated by the catch sampling) in southern waters in 2016 likely resulted in lower than average discarding in 8.c and 9.

Discarding of small mackerel has historically been a major problem in the mackerel fishery and was largely responsible for the introduction of the south-west mackerel box. In the years prior to 1994 there was evidence of large-scale discarding and slipping of small mackerel in the fisheries in Division 2.a and Sub-area 4, mainly because of the very high prices paid for larger mackerel (> 600 g) for the Japanese market. This factor was put forward as a possible reason for the very low abundance of the 1991 year class in the 1993 catches. Anecdotal evidence from the fleet suggests that since 1994, discarding/slipping has been reduced in these areas.

In some of the horse mackerel directed fisheries, e.g. those in Subareas 6 and 7, mackerel is taken as by-catch. Reports from these fisheries have suggested that discarding may be significant because of the low mackerel quota relative to the high horse mackerel quota, particularly in those fisheries carried out by freezer trawlers in the fourth quarter. The level of discards is greatly influenced by the market price and by quotas.

### 8.4.2 Distribution of Catches

A significant change in the fishery took place between 2007 and 2009 with a greatly expanded northern fishery becoming established, and maintained to the present. Of the total catch in 2016, Norway accounted for the greatest proportion (19%) followed by Scotland (18%), Iceland (16%), Russia (11%) and Faroe (9%). In the absence of an international agreement, Faroe, Greenland, Iceland and Russia declared unilateral quotas in 2016. Russia and Iceland both had catches over 100 kt with Faroes catching 93kt and Ireland 76kt. Greenlandic catches accounted for 36 kt of the total. Germany, Netherlands, Spain, Denmark, France and England had catches of the order of 20—50 kt.

In 2016, catches in the northern areas (2, 5, 14) amounted to 563 315 t (see Table 8.4.2.1), a decrease of 69 256 t on the 2015 catch. Icelandic, Norwegian and Russian catches were all over 100 kt. The decreased catches in this area are due to overall lower TACs, and a greater proportion of the Norwegian catch being taken in 4.a. (this fishery takes place on the border of areas 2.a and 4.a). Catches from area 2.a accounted for one third of the total catch in 2016. The wide geographical distribution of the fishery noted in previous years has continued with Greenlandic catches further to the west and north of Iceland than in 2015.

The time series of catches by country from the North Sea, Skagerrak and Kattegat (Subarea 4, Division 3.a) is given in Table 8.4.2.2. Catches in 2016 amounted to 248 611 t, a decrease on 2015 (47 300 t) with several countries reporting decreased catches from this area. Small catches were also reported in areas 3.a-d.

Catches in the western area (Subareas 6, 7 and Divisions 8.a,b,d and e) increased slightly to 245 754 t with most of the traditional fishing nations catching an increased proportion of their total catch in this area, likely due to the timing of the spawning migration. These catches are detailed in Table 8.4.2.3.

Table 8.4.2.4 details the catches in the southern areas (Division 8.c and Subarea 9.a) which are taken almost exclusively by Spain and Portugal. The reported catch of 36 207 t represents a decrease on 2015The catch is close to the long term average.

The distribution of catches by quarter (%) is described in the text table below:

| YEAR | Q1 | Q2 | Q3 | Q4 | YEAR | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|---|---|---|---|---|
| 1990 | 28 | 6 | 26 | 40 | 2003 | 36 | 5 | 22 | 37 |
| 1991 | 38 | 5 | 25 | 32 | 2004 | 37 | 6 | 28 | 29 |
| 1992 | 34 | 5 | 24 | 37 | 2005 | 46 | 6 | 25 | 23 |
| 1993 | 29 | 7 | 25 | 39 | 2006 | 41 | 5 | 18 | 36 |
| 1994 | 32 | 6 | 28 | 34 | 2007 | 34 | 5 | 21 | 40 |
| 1995 | 37 | 8 | 27 | 28 | 2008 | 34 | 4 | 35 | 27 |
| 1996 | 37 | 8 | 32 | 23 | 2009 | 38 | 11 | 31 | 20 |
| 1997 | 34 | 11 | 33 | 22 | 2010 | 26 | 5 | 54 | 15 |
| 1998 | 38 | 12 | 24 | 27 | 2011 | 22 | 7 | 54 | 17 |
| 1999 | 36 | 9 | 28 | 27 | 2012 | 22 | 6 | 48 | 24 |
| 2000 | 41 | 4 | 21 | 33 | 2013 | 19 | 5 | 52 | 24 |
| 2001 | 40 | 6 | 23 | 30 | 2014 | 20 | 4 | 46 | 30 |
| 2002 | 37 | 5 | 29 | 28 | 2015 | 20 | 5 | 44 | 31 |
| 2016 | 23 | 4 | 44 | 29 | | | | | |

The quarterly distribution of catch in 2016 is similar to recent years (since 2010) with the northern summer fishery in Q3 accounting for the greatest proportion of the total catch.

Catches per ICES statistical rectangle are shown in Figures 8.4.2.1 to 8.4.2.4. 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.

- First quarter 2016 (247 489 t – 23%)

The distribution of catches in the first quarter is shown in Figure 8.4.2.1. The quarter 1 fishery is similar to that in previous years with the Scottish and Irish pelagic fleets targeting mackerel in 6.a, 7.b and 7.j. Substantial catches are also taken by the Dutch owned freezer trawler fleet. The largest catches were taken in area 6.a, as in recent years. The Spanish fisheries also take significant catches along the north coast of Spain during the first quarter.

- Second quarter 2016 (45 410 t – 4%)

The distribution of catches in the second quarter is shown in Figure 8.4.2.2. The quarter 2 fishery is traditionally the smallest and this was also the case in 2016. The most significant catches where those in 8.c and at the start of the summer fishery in northern waters by Icelandic, Norwegian and Russian fleets.

- Third quarter 2016 (480 790 t – 44%)

Figure 8.4.2.3 shows the distribution of the quarter 3 catches. Large catches were taken throughout areas 2.a (Russian, Norwegian vessels), 4.a (Norwegian, Scottish vessels), 5.b (Faroese vessels). A smaller proportion of the catch was taken in 5.a (Icelandic vessels).

Fourth quarter 2016 (320 377 t – 29%)

The fourth quarter distribution of catches is shown in Figure 8.4.2.4. The summer fishery in northern waters has largely finished although there are substantial catches reported in the southern part of area 2.a. The largest catches are taken by Norway, Scotland and Ireland around the Shetland Isles and along the north coast of Scotland. The pattern of catches is very similar to that reported in recent years.

ICES cannot split the reported mackerel catches into different stock components because there is no clear distinction between components upon which a split could be determined. Mackerel with a preference for spawning in the northeast area, including the North Sea, cannot presently be identified morphometrically or genetically (Jansen and Gislason 2013). Separation based on time and area of the catch is not a precise way of splitting mackerel with different spawning preferences, because of the mixing and migration dynamics including inter-annual (and possibly seasonal) variation of the spawning location, combined with the post-spawning immigration of mackerel from the south-west where spawning ends earlier than in the North Sea.

### 8.4.3 Catch-at-Age

The 2016 catches in number-at-age by quarter and ICES area are given in Table 8.4.3.1. This catch in numbers relates to a total ICES estimated catch of 1 094 066 t. 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 Denmark, England, Germany, Greenland, Faroes, Iceland, Ireland, the Netherlands, Norway, Portugal, Russia, Scotland and Spain. There remain gaps in the age sampling of catches, notably for French (length samples were provided), Swedish and Northern Irish fleets.

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 percentage catch numbers-at-age by quarter and area are given in Table 8.4.3.2.

Over 80% of the catch in numbers consists of 3—8 year olds with all year classes between 2009 and 2012 contributing over 10% to the total catch by number.

There is a notable absence of juvenile (age 0) fish within the 2016 catch. In previous years catches from subareas 8.c and 9.a have contained a significant proportion of juveniles.

## 8.5 Biological Data

### 8.5.1 Length Composition of Catch

The mean lengths-at-age in the catch per quarter and area for 2016 are 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. Lengths recorded in 2016 for 0 group mackerel are lower than 2015 while the mean length of age 1 is higher in 2016 than 2015. The rapid growth of 0-group fish combined with variations in sampling (in recent years more juvenile fish have been sampled in northern waters whereas previously these fish were only caught in southern waters) will contribute to the observed variability in the observed size of 0-group fish. Observations of 0-group fish were very low in 2016. Growth is also affected by fish density as indicated by a recent 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 (Olafsdottir *et al.*, 2015).

Length distributions of the 2015 catches were provided by England, Faroes, France, Iceland, Ireland, Germany, Greenland, the Netherlands, Norway, Portugal, Russia, Scotland and Spain. The length distributions were available from most of the fishing fleets and account for over 90% of the catches. These distributions are only intended to give an indication of the size of mackerel caught by the various fleets and are used as an aid in allocating sample information to unsampled catches. Length distributions by country and fleet for 2016 catches are given in Table 8.5.1.2.

### 8.5.2 Weights at Age in the Catch and Stock

The mean weights-at-age in the catch per quarter and area for 2016 are given in Table 8.5.2.1. There is a trend of declining weights-at-age for the most age classes (except 0 to 2 years old) beginning around 2005 and continuing until 2013 (Figure 8.5.2.1). This declining trend in mean catch weight-at-age appears to have stopped in 2013 as mean weight for the last four years do not show any particular trend. These variations in weight-at-age are consistent with the changes noted in length in Section 8.5.1.

The Working Group calculated stock weights-at-age as the average of the weight-at-age for the three spawning components, weighted by the relative size of each component (as estimated by the 2016 egg survey for the southern and western components and the 2015 egg survey for the North Sea component, no definitive SSB estimate being available at the time of the WGWIDE for the 2017 North Sea survey). Mean weight-at-age for the western component are estimated using information from Dutch, Irish and German commercial catch data, and from biological sampling data collected in the triannual egg surveys and during the annual Norwegian tagging survey. Only samples of mature fish, coming from areas and periods corresponding to spawning, as defined at the 2014 benchmark assessment (ICES, 2014b) and detailed in the stock annex, were used to compute the mean weight-at-age for the western spawning component. For the North Sea spawning component, mean weight-at-age were normally calculated from samples commercial catches collected from areas IVa and IVb in the second quarter. In 2016, no samples were available from these areas and hence, the mean of weight-at-age for the last three years was used. Stock weights for the southern component, are based on samples from the Portuguese and Spanish catch taken in VIIIc and IXa in the 2nd quarter of the year. The mean weights in the three components and in the stock in 2016 are shown in the text table below.

In 2016, a small change was made to the method for averaging weight across stock components. There are occasional years when information on mackerel weight are missing for some ages (especially for age 1) for some spawning component. These gaps were formerly filled by taking the average across the time series for the corresponding age. Since trends are present in the mean weights at age, it was considered more appropriate to use the average among the 5 recent years, which are more likely to be representative of the weight of the specific year with missing data. This lead to minor revision in the whole time series.

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 four years do not show any specific trend (except for weights of ages 2 and 3 which have been increasing, Figure 8.5.2.2).

| | North Sea Component | Western Component | Southern Component | NEA Mackerel 2016 |
|---|---|---|---|---|
| Age | | | | Weighted mean |
| 0 | | | | 0.000 |
| 1 | | 0.051 | 0.101 | 0.058 |
| 2 | | 0.184 | 0.157 | 0.181 |
| 3 | | 0.242 | 0.206 | 0.237 |
| 4 | | 0.279 | 0.299 | 0.280 |
| 5 | | 0.295 | 0.314 | 0.297 |
| 6 | | 0.334 | 0.329 | 0.333 |
| 7 | | 0.364 | 0.358 | 0.363 |
| 8 | | 0.382 | 0.368 | 0.381 |
| 9 | | 0.406 | 0.378 | 0.403 |
| 10 | | 0.430 | 0.387 | 0.426 |
| 11 | | 0.445 | 0.401 | 0.442 |
| 12+ | | 0.462 | 0.514 | 0.471 |
| **Component Weighting** | 4.1% | 85.3% | 10.6% | |
| **Number of fish sampled** | 0 | 1265 | 2147 | |

[1]in absence of data for the North Sea component, the mean over the last 3 years for these components was used to compute the mean weight in the stock

### 8.5.3 Natural Mortality and Maturity Ogive

Natural mortality is assumed to be 0.15 for all age groups and constant over time.

The maturity ogive for 2016 was calculated as the average of the ogives of the three spawning components weighted by the relative size of each component calculated as described above for the stock weights. The ogives for the North Sea and Southern components are fixed over time. For the Western component the ogive is updated every year, using maturity data from commercial catch samples collected during the first and second quarters (ICES 2017a and stock annex). The 2016 maturity ogives for the three components and for the mackerel stock are shown in the text table below.

A trend towards later maturation (decreasing proportion mature at age 2) has been observed from the mid-2000s to 2011. A change in the opposite direction has been observed since then and the maturity ogive in 2016 is comparable with the one observed in the mid-2000s (Figure 8.5.3).

| Age | North Sea | Western Component | Southern Component | NEA Mackerel |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0.12 | 0.02 | 0.10 |
| 2 | 0.37 | 0.81 | 0.54 | 0.76 |
| 3 | 1 | 0.97 | 0.70 | 0.95 |
| 4 | 1 | 1 | 1 | 1 |
| 5 | 1 | 1 | 1 | 1 |
| 6 | 1 | 1 | 1 | 1 |
| 7 | 1 | 1 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 |
| 9 | 1 | 1 | 1 | 1 |
| 10 | 1 | 1 | 1 | 1 |
| 11 | 1 | 1 | 1 | 1 |
| 12+ | 1 | 1 | 1 | 1 |
| **Component Weighting** | 4.1% | 85.3% | 10.6% | |

## 8.6 Fishery Independent Data

### 8.6.1 International Mackerel Egg Survey

#### 8.6.1.1 Final results of the 2016 Mackerel Egg Survey

The ICES Working Group on Mackerel and Horse Mackerel Egg Surveys (WGMEGS) met in Vigo from 24–28 April 2017, chaired by Cindy van Damme (IMARES, the Netherlands) and Finlay Burns (MSS, Aberdeen, Scotland), to finalize the results of the Mackerel and Horse Mackerel Egg Survey in 2016 and to plan the North Sea Mackerel Egg Survey in 2017.

The final egg production was already provided to the WKWIDE benchmark meeting in January 2017 after a subsequent revision of the Faroese egg count due to the incorrect application of the aperture size of the used plankton gear (ICES, 2017a). However, in April 2017 WGMEGS finalised the mackerel fecundity results and calculated the SSB for 2016. These final data are reported in the 2017 WGMEGS report (ICES, 2017b).

The estimate of the total mackerel egg production was 1.77 $*10^{15}$ which is a decrease of 35% with respect to 2013 ($2.71*10^{15}$). The analyses of potential fecundity gave a value of 1159 eggs per gram female for mackerel for the western and southern components combined. The overall prevalence of atresia as a percentage of the population was 30% and the potential fecundity lost in the spawning season was 72 eggs /g. This reduced the potential fecundity by 6%. Spawning stock biomass (SSB) for the NEA mackerel stock was estimated using the realized fecundity estimate of 1087 eggs/g female, a sex ratio of 1:1 and a raising factor of 1.08 (ICES, 1987) to convert spawning fish to total fish.

This gave a final estimate of spawning-stock biomass (SSB) in 2016 of 3.077 (preliminary WKWIDE: 2.94, 2013: 3.93) million tones for the western component and 0.447 (preliminary: 0.427, 2013: 0.9) million tones for the southern component and a combined estimate of 3.52 (preliminary: 3.37, 2013: 4.83) million tones.

#### 8.6.1.2 2017 Mackerel Egg Survey in the North Sea

In 2017, the Netherlands was the sole survey participant of the North Sea mackerel egg survey. The survey was carried out during the period 22 May - 16 June 2017 in order to estimate the mackerel total annual egg production (TAEP) and spawning stock biomass (SSB) of the North Sea mackerel spawning component. During this period the survey area was covered four times. Due to the large survey area only alternate transects were sampled with the intervening transects being interpolated.

Altogether 217 plankton samples were collected and analysed according to the WGMEGS manual (ICES, 2014a). The sampling periods 1, 2 and 4 were well sampled, however weather and vessel problems curtailed sampling in period 3. As a result there are some large gaps in the survey coverage for this period. This issue will have to be further analysed during the next meeting of WGMEGS in 2018. Therefore, a reasonable provisional egg production estimate for 2017 cannot be presented in this report.

100 fecundity samples were collected during the survey. In addition, 200 pre-spawning females were also collected from commercial samples prior to the survey. The finalised fecundity data will be presented to WGMEGS in 2018.

#### 8.6.1.3 Results of the 2017 additional Mackerel Egg Survey in the northern survey area

Post the 2016 triennial egg surveys WGMEGS recommended participants should consider an exploratory egg survey within the Northern boundary region during both 2017 and 2018. As a result Ireland secured funding to conduct a fifteen day survey in the summer of 2017. This took place on board a 45m pelagic fishing vessel, Girl Stephanie, from May 28th to June 11th. The areas selected for survey were west of Hatton Bank, southeast Iceland and the Faroes/Shetland channel. Standard MEGS station spacing is every half ICES statistical rectangle (half degree of longitude), however in order to maximise the geographical area, and also since there would be no workup of the data into an abundance estimate, it was decided to increase the nominal station spacing to every degree of longitude. Weather conditions throughout the survey were generally good and excellent progress was made. As a result 60 stations were sampled with the vessel covering over 2800 miles of survey track. Stations were undertaken within Icelandic, Faroese, UK and international waters.

The resultant mackerel egg numbers from the Gulf VII samples were standardised and the data presented as Stage 1 egg numbers per m2 per day. Mackerel eggs (all stages) were present in all but 4 of the sampled stations with stage 1 mackerel eggs being identified in 80% of stations. Figure 8.6.1.3.1 shows the distribution of mackerel stage 1 eggs/$m^2$*day. No stage 1 mackerel were recorded over Rockall or Hatton Bank with only very low numbers of other, later, stages being recorded. West of Hatton Bank, numbers of mackerel stage 1 eggs increased to a survey maximum of 57 per m2 per day though elsewhere on this transect only moderate to low numbers were recorded. The survey therefore failed to deliver a zero boundary on this transect with the furthest west station at 57.45N 23.45W yielding 2 stage 1 mackerel eggs. Four stations to the east of Iceland contained no eggs of any description and this can almost certainly be attributed to the low temperatures recorded at these stations. Elsewhere, low to moderate levels of spawning were recorded on stations off the south coast of Iceland. The picture was very similar to the east, first to the Faroe Islands and then further over to the west and North of Shetland, and right up to the boundary of the UK EEZ with Norway. 67% of all the stations containing stage 1 mackerel eggs were in single figures.

This was not a comparative survey and because the dates of the 2017 MEGS survey spanned a temporal period that straddled both periods 5 and 6 from the 2016 survey any direct comparisons are difficult. However, it should be noted that where there was an overlap in survey stations between the two surveys, the 2017 estimates are generally lower. The survey was successful in answering several survey related questions. Firstly, the expected drop in temperature as the surveys proceeded northwards provided a natural barrier to mackerel spawning, with no stage 1 mackerel eggs being recorded in any of the sampled stations where the temperature at 20m was less than 8 degrees Celsius. The Northern boundary used by MEGS should be relatively secure with very little mackerel spawning taking place at that time of year at latitudes north of the Faroe Islands. Sea temperatures, at 20 m depth, south and west of Iceland are warm enough (> 8 °C) in spring (May) to enable mackerel spawning. Therefore, potential mackerel spawning to the south and to the west of Iceland requires further investigation in 2018.

### 8.6.2 Demersal trawl surveys (Recruitment Index)

The recuitment index could not be updated due to input data quality issues in national data sets and that the DATRAS system had not been updated as recommended by WKWIDE. The outdated time series from WGWIDE 2016 was therefore used in the assessment again. The assessment was therefore conducted without an estimate of the 2016 year class and with the knowledge of an upcomming revision of the time series when the data quality issues has been sorted out.

The following text descibes the methods used in 2016 and the data quality issues.

#### The data and the model

An index of survivors in the first autumn-winter (recruitment index) was derived from a geostatistical model fitted to catch data from bottom trawl surveys conducted during autumn and winter. A complete description of the data and model can be found in Jansen *et al*. (2015) and the stock annex.

The data were compiled from several bottom trawl surveys conducted between October and March from 1998—2016 by research institutes in (list countris). Surveys conducted on the European shelf in the first and fourth quarters are collectively known as the International Bottom Trawl Survey (IBTS). All surveys sample the fish community on the continental shelf and upper shelf slope. IBTS Q4 covers the shelf from Spain to Scotland, excluding the North Sea, while IBTS Q1 covers the shelf waters from north of Ireland, around Scotland, and into the North Sea.

Trawl operations during the IBTS have largely been standardized through the relevant ICES working group (ICES, 2013b). Furthermore, the effects of variation in wingspread and trawl speed were included in the model (Jansen *et al*., 2015). Trawling speed was generally 3.5—4.0 knots, and trawl gear is also standardized and collectively known as the Grande Ouverture Verticale (GOV) trawl. Some countries use modified trawl gear to suit the particular conditions in the respective survey areas, although this was not expected to change catchability significantly. However, in other cases, the trawl design deviated more significantly from the standard GOV type, namely the

Spanish BAKA trawl, the French GOV trawl, and the Irish mini-GOV trawl. The BAKA trawl had a vertical opening of only 2.1—2.2 m and was towed at only 3 knots. This was considered substantially less suitable for catching juvenile mackerel and, therefore, was excluded from the analysis. The French GOV trawl was rigged without a kite and typically had a reduced vertical opening, which may have reduced the catchability of pelagic species like mackerel. Catchability was assumed to equal the catchability of the standard GOV trawl because testing has shown that the recruitment index was not very sensitive to this assumption (Jansen *et al*., 2015). Finally, the Irish mini-GOV trawl, used during 1998—2002, was a GOV trawl in reduced dimensions.

A geostatistical log-Gaussian Cox process model (LGC) with spatiotemporal correlations was used to estimate the catch rates of mackerel recruits through space and time. The modelled average recruitment index (squared CPUE) surface was mapped in Figure 8.6.2.1. The time–series of spatially integrated recruitment index values was used in the assessment as a relative abundance index of mackerel at age 0 (recruits) – see Figure 8.6.2.2.

**Survey Coverage**

The survey has insufficient spatial coverage in some areas, namely: (i) Since 2011, the English survey (covering the Irish sea and the central-eastern part of the Celtic sea including the area around Cornwall) has been discontinued, (ii) the Scottish survey has not consistently covered the area around Donegal Bay, (iii) the southern Norwegian Sea is known to be an important nursery area during summer (see IESSNS) and the IBTS observed high catch rates at the north-eastern edge of the survey area (towards the Norwegian trench) in winter. It is therefore possible that recruits are present further North along the shelf edge of Norway. It is therefore recommended that the Norwegian shelf is surveyed using IBTS-standards in January further north of the Norwegian trench.

**Data Quality**

Three sources of errors in the current input dataset have been detected since WGWIDE 2016.

1 ) Data from 2015 and 2016 from the Scottish survey was revised, affecting the estimation of the catch rate of recruits from the 2015 year-class.

2 ) During WKWIDE in January 2017, the ICES DATRAS mackerel data product "CPUE by age and haul" was found to be missing up to 63% of the annual NS-IBTS Q1 hauls uploaded to DATRAS, affecting primarily 2010, 2011, 2012 and 2015. This error was corrected by database administrators during the benchmark meeting. WKWIDE recommended that the DATRAS system should automatically check if the number of stations and fish that are uploaded to the system corresponds to the number of stations and fish that can be downloaded in the data product "CPUE by age and haul". This was not done before WGWIDE 2017. It is therefore uncertain if the current data set has lost fish/stations in the data processing.

3 ) The new Irish data was uploaded to DATRAS as recommended by WKWIDE. Furthermore, some of the existing Irish data in DATRAS were revised. However, the new data and the revision were incorrect. This was related to the data type and the raising from subsamples to total catch. This was discovered during the preparations for WGWIDE 2017 and will not be corrected and quality assured in time for the assessment.

Furthermore, the following potential sources of uncertainty were identified:

1 ) It has been found that national institutes providing mackerel data from first- and fourth-quarter demersal surveys do not measure the lengths of mackerel consistently. This leads to significant errors when combining age–length and catch–at–length data from multiple institutes. A conversion key has been provided (Hansen *et al.*, 2017 WGWIDE WD). WKWIDE recommended that length-conversions should be implemented in DATRAS to provide a homogeneous data set for the recruitment model. This was not done before WGWIDE 2017.
2 ) Mackerel samples collected on the EVHOE fourth quarter survey are not aged. The current practice of applying age-length keys from Ireland and Scotland to catches in the more southern EVHOE survey is not ideal, because the mackerel growth during the first year is related to latitude (Jansen *et al.*, 2013). WGWIDE therefore recommends that the Spanish age–length keys from the Bay of Biscay are uploaded to DATRAS and considered for historic data and that Ifremer (France) initiate aging of mackerel starting from Q4 2017.

Given the abovementioned issues, WGWIDE reiterates the recommendations from WKWIDE to the ICES data centre and the Irish, French and Norwegian institutes. Furthermore, WGWIDE recommends that IBTSWG 1) update the IBTS manual to reflect the present use of mackerel data, and 2) quality assure mackerel data from Q1 and Q4 surveys since 1997, and 3) describe new data quality and survey coverage issues in each years' IBTSWG report.

This should facilitate a revision of the recruitment index in time for the 2018 assessment.

For the update assessment WGWIDE 2017 used the time series from WGWIDE 2016 (Figure 8.6.2.2).

### 8.6.3 Ecosystem surveys in the Nordic Seas in July–August (IESSNS)

The IESSNS was successfully conducted in the summer of 2017. Five vessels sampled 279 predetermined surface trawl stations in the period from July 3 to August 4 which covered an area of 2.8 mill. $km^2$ (Figure 8.6.3.1). At each surface trawl station, a standardized trawl (Multpelt832) is employed for 30-min according to a standardize operation protocol which is designed to catch mackerel. Additionally, abundance of herring and blue whiting is measured using acoustic methods and backscatter is verified by trawling on registrations as needed. The aim is to establish an index for blue whiting and herring abundance to be used in stock assessment in a few years. The cruise report is available as a working document to the current report and a detailed survey description is in the stock annex.

IESSNS provides an age-segregated index for mackerel abundance, on annual bases, that is used to tune the mackerel stock assessment. At the mackerel benchmark in February 2017 (ICES 2017a) several changes were made to how the index is calculated and the current index: (1) include ages 3 to 11 in the index; (2) is mackerel abundance instead of mackerel density; (3) is calculated using the StoX software; (4) includes areas north of latitude 60 °N in the North Sea; (5) excludes years 2007 and 2011 (Olafsdottir *et al.*, 2017). The index was re-calculated for all years according to the conclusions of the 2017 mackerel benchmark (ICES, 2017a; Table 8.6.1.9).

The total swept area abundance index of mackerel in 2017 was estimated 24.2 billion individuals which is a decrease of 2% compared to 2016. However, the stock biomass was 13 % higher in 2017 than in 2016 (Figure 8.6.3.2). The most abundant year classes were 2010, 2011, 2012 and 2014 (Figure 8.6.3.3). The incoming 2016-year class appear promising and is estimated larger than the 2015-year class. Mackerel cohort internal consistency has improved by adding the 2017 survey data to the time series. Internal consistency is strong for ages 1 to 5 years (r > 0.8) and a fair/good internal consistency for ages 5 to 11 years (r > 0.5), except for 6-7 years old mackerel (Figure 8.6.3.4).

### 8.6.4 Tag Recapture data

The Institute of Marine Research in Bergen has annually conducted tagging experiments on mackerel since 1968, both in the North Sea and to the west of Ireland during the spawning season May–June. However, only the information from mackerel tagged west of Ireland is used in the mackerel assessment, and only information on recaptures of mackerel tagged with steel-tags until 2006. A new RFID tagging method from 2011 onwards was accepted and used in the assessment based on the conclusions from the 2017 WKWIDE benchmark workshop (ICES 2017a).

#### Steel-tags

These tags have been recovered at metal detector/deflector gate systems installed at plants processing mackerel for human consumption. This system demanded a lot of manual work, paying for external personnel to stay at the plants during processing. Among the typical 50 fish deflected, the hired personal must find the tagged fish with a hand-hold detector and send the fish to IMR for analysis. This has been time consuming and expensive. Besides being used in present mackerel assessment model, the tagging data have also been used in estimates of mortality, and recently in estimation of spawning stock biomass, and further has the tagging data been valuable for understanding the migration of the mackerel (Tenningen *et al.*, 2011).

#### RFID tags

New and promising radio-frequency identification (RFID) tagging project on NEA mackerel was initiated in 2011 at the Institute of Marine Research, Bergen (IMR) in Norway. RFID is a technology that uses radio waves to transfer data from an electronic tag, called an RFID tag, through a reader for the purpose of identifying and tracking the object. The new RFID tagging project has moved away from manual and expensive to an automatic and cost-effective scanning system.

During the period 2011—2016 as many as 313 558 mackerel has been tagged with the new tags and 2430 of these tags have recaptured (Table 8.6.4.1). This includes an experiment off the Norwegian Coast on young mackerel in September 2011 as well as three experiments carried out in August in Iceland 2015-2017, none of which is included as input data in the assessment. In the assessment only data from the releases at the spawning grounds in May-June of Ireland and the Hebrides are included.

The RFID-tagged mackerel are currently recaptured at 17 European factories processing mackerel for human consumption (Table 8.6.4.2). The project started with RFID antenna reader systems connected to conveyor belt systems at 8 Norwegian factories in 2012. Now there are 5 operational systems in at 4 factories in UK (Denholm has 2 RFID systems), 3 in Iceland, 1 at the Faroes and 1 in Denmark. More systems are also bought by Ireland (3), which up to now has been non-operational. In the current assessment data from the factories Sæby, Lunar Freezing Frazerburgh, Höfn, Austevoll and Egersund (after 2013) are excluded due to problems with efficiencies and low recapture rates. The factories having operational systems are online on internet or via GPRS and RFID tagged mackerel recaptured by the systems are automatically updated in the central database in Bergen with date, time, and factory of location.

There is a web-based software solution that is used to track the different systems, import data on catch information, and biological sampling data of released fish and screened catches. Based on this information the system can estimate numbers released and screened by year class in a known biomass landed, which is used to estimate abundance by year class and totally.

Hence, the usefulness of the data is dependent on the work from each country's research institutes, fisheries authorities or the industry it selves to provide additional data about catches screened through the RFID systems, such as total catch weight, position of catch (ICES rectangle), mean weight in catch, etc. Regular biological sampling of the catches landed at these factories is also needed. Altogether, these data are essential for the estimation of numbers screened per year class, which is needed as input to the tag data-table currently used in the SAM-assessment for steel tags.

In the WKWIDE benchmark 2017 the RFID time series in terms of numbers per year class released, screened and recaptured per release year and recapture year was accepted for use in the assessment from 2017 onwards. There was a discussion about merging the data from all factories, or running with time series per factory. This discussion was related to observed differences in recapture rates between factories and countries, and a potential bias in the data introduced by a shift going from pure Norwegian factories 2012-2013 (with lower recapture rates) and over to additional factories outside Norway (with higher recapture rates) from2014 onwards. Despite the potential bias, it was decided to go forward with data from factories merged, and with a recommendation that the differences in recapture rates should be followed up onwards, and evaluated again in the next benchmark

### 8.6.5 Other surveys

#### 8.6.5.1 International Ecosystem survey in the Norwegian Sea (IESNS)

After the mid-2000s an increasing amount of mackerel has been observed in catches in the Norwegian Sea during the combined survey in May (IESNS) targeting herring and blue whiting (ICES 2016a). This pattern continued in 2017 where mackerel was caught over a wide area including many trawl stations in the central and eastern part of the Norwegian Sea (ICES 2017d). Mackerel at age 1 (mean length 18.1 cm) was most numerous in the combined samples and amounted to 32%, followed by age 3 (21%) and age 5 (14%) (ICES 2017d). Simultaneously, the edge of the distribution was found progressively further north and west. In 2017 the northernmost mackerel catch was at 71°N and the westernmost catch was at 10°W. It should be noted that the sampling probably provides useful qualitative results on mackerel distribution in May, but do not provide a complete quantitative picture of mackerel distribution and abundance because of its vertical distribution, relatively low trawling speed, trawling hauls mainly targeting herring and blue whiting acoustical registrations.

#### 8.6.5.2 Acoustic estimates of mackerel in the Iberian Peninsula and Bay of Biscay (PELACUS and PELGAS)

PELACUS 0317, was conducted at the same period of previous years (13 March to 16th April, Carrera WD 2017). Besides the area was extending towards south 8b (up to 45º N, figure 8.6.5.2.1). Stock structure is fairly stable, with a mean length for the period 2013-17 being around 35 cm corresponding to 300 gr per fish (figure 8.5.5.2.2). No trend in mean length at age nor in weight was observed in the most recent years. 2017 abundance estimates are shown in tables 8.6.5.2.1-2. Most of the fish had 4+ year old, although the strength of the 2016 seems to be higher than those of the previous years, accounting up to 80% of the abundance in 9a but only 2% in 8c. In total, 549 thousand tonnes, corresponding to 1778 million fish were estimated in Spanish waters, a 10% more than those estimated last year (498 thousand tonnes corresponding to 1566 million fish). Stock structure in 8b seems to be similar to that found in 8c; with a scarce signal of the 2016 year class. 161 thousand tonnes, corresponding to 517 million fish, were assessed in this area.

Sea surface temperature and flourometry were significantly higher in 2017 than in 2016. This may explain the low egg production in relation to the available mackerel biomass observed in 2016 (figure 8.6.5.2.3). According to Hughes et al (2014) and Bruge et al (2016) the potential habitats for spawning are related with temperature, and the low temperatures achieved at the beginning of the 2016 spring would have been not suitable for spawning, shifting the peak towards end April, thus outside the survey period. This may result on an underestimation of the size of the spawning stock biomass in this area by the Egg Production Method.

## 8.7 Stock Assessment

### 8.7.1 Update assessment in 2017

During the 2017 WKWIDE benchmark a number of changes have been accepted for the NEA mackerel assessment. The final accepted assessment now uses the IESSNS index expressed in abundance (instead of density as previously done), for the ages 3 to 11 (instead of 6-11), with an age varying estimated catchability (instead of a single parameter across ages), and a separate observation variance for age 3 and for ages 4 and older. In order to express this index in abundances, the years with incomplete coverage (2007 and 2011) were removed from the time series. The new assessment uses the new RFID tag/recapture data, starting in 2011, parameterized with a survival rate and overdispersion parameters estimated separately from the historical steal tag data. Finally, the model uses an AR error structure for the observations from the IESSNS to account for the fact that this data show obvious year-effect (i.e. is internally autocorrelated). No other change to the data used or the model configuration was made compared to the previous assessment.

The WGWIDE 2017 NEA Mackerel assessment was the first update assessment applying the methodology defined during the 2017 benchmark. The update assessment was carried out by fitting the state-space assessment model SAM (Nielsen and Berg, 2014) using the web interface on www.stockassessment.org (assessment name: WGWIDE2017.V2). The R script based on the *stock assessment* R-package[1] which was

[1] Available at : devtools::install_github("fishfollower/SAM/stockassessment")

developed for the benchmark was also run to check that the output were identical. Model configuration and input data were conform to the description in the stock annex.

The assessment model is fitted to catch-at-age data for ages 0 to 12 (plus group) for the period 1980 to 2016 (with a strong down-weighting of the catches for the period 1980-1999) and three surveys: 1) the SSB estimates from the triennial Mackerel Egg survey (every three years in the period 1992-2016), 2) the recruitment index from the western Europe bottom trawl IBTS Q1 and Q4 surveys (1998-2015) and 3) the abundance estimates for ages 3 to 11 from the IESSNS survey (2010, 2012-2017). The model also incorporates tagging-recapture data from the Norwegian tagging program (for fish recaptured between 1980 and 2005 for the steal tags time series, and fish recaptured between 2012 and 2016 for the radio frequency tags time series).

Fishing mortality-at-age and recruitment are modelled as random walks, and there is a process error term on ages 1-11.

The differences in the new data used in this assessment compared to the benchmark (ICES 2017a) were:

- Small revision in the SSB index after recalculation during WGMEGS 2017. The changes were an index 5% lower for 2007 due to an error found in the raw egg production data, and a revision 5% higher of the index for 2016, due to the final estimate for fecundity lower than the preliminary one.
- No update of the IBTS recruitment index was available and the time series did not include any 2016 estimate (see Section 8.6.2).
- Addition of the 2017 survey data in the IESSNS indices.
- Addition of the 2016 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.
- A revised tagging recapture data set for the RFID tagging program, after removal of the data from 3 factories (with suspected efficiency problems) and improved estimates of the number fish scanned for some factories.

Input parameters and configurations are summarized in Table 8.7.1.1. The input data are given in Tables 8.7.1.2 to 8.7.1.9. Given the size of the data base (1518 lines) the tagging data are not presented in this report, but are available on www.stockassessment.org in the data section (files named tag.dat and tag3.dat).

### 8.7.2 Model diagnostics

**Parameter estimates**

The estimated parameters and their uncertainty are shown in Table 8.7.2.1 and Figure (8.7.2.1). The model gives a good fit to the catch data (lowest observation standard deviation). The observation standard deviations for the egg survey is also low, indicating a good fit to this survey. The observations standard deviations for the recruitment index and the IESSNS surveys ages 4 to 11 are higher (between 0.34 and 0.36) indicating that the assessment gives a low weight to the information coming from the surveys. The IESSNS age 3 has a very low weight in the assessment (high observation standard deviation). Overdispersion of the tag recaptures is not directly comparable with observation standard deviation, but has the same meaning. The model considers the data from the RFID tags to be more precise than the steal tags (lower overdispersion).

The catchability of the egg survey is 1.37, significantly larger than 1, which implies that the assessment considers the egg survey index to be an overestimate. The catchabilities at age for the IESSNS increase from close to 1 for age 3 to 2.68 for age 7 and decreases slightly for older ages. Since the IESSNS index now is expressed as fish abundance, this also means that the assessment considers the IESSNS to provide over-estimated abundance values for the oldest ages. The post tagging survival estimate is higher for the steal tags (around 40%) than for the RFID tags (around 10%).

The process error standard deviation (ages 1-11) is moderate (lower than in previous assessments) and as well as the standard deviation of the F random walk.

The catchability parameters appear to be estimated more precisely than the observation standard deviations, except for the catchability of the IESSNS at age which has a higher standard deviation. Uncertainty on the tags post release survival is low. Uncertainty on the observation standard deviations of the surveys are similar (expect for age 3 IESSNS index which is higher).

The estimated AR1 error correlation structure for the observations from the IESSNS survey age 3 to 11 a high correlation between the errors of adjacent ages (r=0.86), then decreasing exponentially with age difference (figure 8.7.2.2.). This high error correlation implies that the weight of this survey in the assessment in lower than for a model without correlation structure, which also reflects in the high observation standard deviation for this survey.

**Residuals**

The "one step ahead" (uncorrelated) residuals for the catches did not show any temporal pattern (Figure 8.7.2.3) except for 2014 for which they were mainly positive for 2014 (modelled catches lower than the observed ones). This may result from the rather strong random walk constraint (low variance) imposed to the variation on fishing mortality, which prevents the model from increasing the fishing mortality suddenly (which probably happened given the sharp increase in the catches in 2014). Residuals for ages 0 and 1 are larger than for subsequent ages 2 to 10. Residuals for ages 11 to 12 are also larger than for ages 2 to 10. This suggest that decoupling the observation variance of the catches (for example by grouping age 0 and 1, ages 2 to 10 and ages 11 and older) could been more appropriate. This has been investigated during the benchmark assessment, but the model with decoupled observation variances gave a very tight fit to the recruitment index and a very large observation standard deviation for the catches of ages 0 and 1. WKWIDE regarded the tight fit to the recruitment index as unrealistic (as the fit implied that the IBTS index was a nearly perfect estimate of recruitment) and chose to retain the current model structure because there was insufficient time to continue with this analysis. WKWIDE recommends that this work is prioritized during the next benchmark, because the problem with juvenile catches remained unsolved.

The residuals for the egg survey show a slight temporal pattern with negative residuals in the period 2001-2004 and followed by positive residuals for the period 2007-2013. They are however in general small.. Residuals for the IESSNS indices do not show any marked pattern, except the predominance of positive residuals for the last two year (2016 and 2017) which indicate that the model does not agree with the high value of the survey observed for the last 2 years. Residuals to the recruitment index show no particular pattern.

Finally, inspection of the residuals for the tag recaptures (Figure 8.7.2.4) did not show any sign of model misspecification. The only minor concern was for fish released at age 2 for which the predominance of positive residuals suggested that the post-release mortality for those fish may have been lower than for other ages (more tags return than expected). This minor problem can be addressed by estimating a separate set of parameters for fish released at age 2, but this option was not tested during the benchmark meeting due to lack of time.

**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 8.7.2.5). All leave one out runs showed parallel trajectories in SSB and Fbar, except the run removing the tagging data which shows a different dynamics in the early period of the assessment (before 2000) and in the recent years (since the start of the RFID time series).

Removing the IESSNS resulted in a low SSB estimates and higher Fbar estimates for the period covered by this survey. On the opposite, removing the egg survey resulted in a larger estimated stock, exploited with a lower fishing mortality. The run without tagging data also resulted in higher SSB and lower Fbar. These three sources of data seem to have a notable contribution to the assessment (even if all leave one out runs fall within the confidence intervals of the assessment using all data), and in a way, the final assessment seems to make a trade-off between the information coming from the IESSNS which lead to a more optimistic perception of the stock, and the information from the egg survey and the tagging data which suggest a more pessimistic perception of the stock. Removing the recruitment index had only on minor effect on the estimated stock trajectory.

### 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 below 2 million tonnes in the late 1990s and early 2000s to 4.37 million tonnes in 2011 and to have fluctuated around 4 million tonnes since then. The estimate for 2016 (supported only by the 2017 IESSNS index) suggests a decrease in the SSB to close to 3.5 million tonnes. The fishing mortality has declined from levels close to Flim (0.43) in the mid-2000s to just under Fpa (0.31) at the end of the 2000s and has increased above Fpa again since 2014.. The recruitment time series from the assessment shows a clear increasing trend since the late 1990s with a succession of large year classes (2002, 2006, 2011 and 2014). All year classes since 2007 (except the 2013 and 2015 year class) are estimated to be above average. There is insufficient information to estimate accurately the size of the 2016 year class. The estimate is very low, but relies only on the age 0 catch data (in absence of a 2016 IBTS index).

There is some indication of changes in the selectivity of the fishery over the last 20 years (Figure 8.7.3.2.). In the year 1990, the fishery seems to have exerted a high fishing mortality on the fish 7 years and older. This changed gradually until 2000, when the fishing mortality on younger ages (3- to 6-years) increased compared to the older fish. In the following years, the selectivity pattern changed again towards a lower fishing mortality on the age-classes younger than 6 years until 2008. The selection pattern has been stable since then.

### 8.7.4 Exploratory run to assess the effect of the revision of the RFID tagging recapture data

The RFID tagging recapture data has been revised since the 2017 benchmark. In order to measure the impact of this revision on the assessment output, the model was run again using the previous RFID tagging recapture data base.

The revision of the RFID tagging data had a marked impact on the assessment. The assessment with the revised data gives a slightly lower weight (higher observation standard deviation) to the catch data and the IESSNS index, and a slightly higher weight to the egg survey and the IBTS recruitment indices (figure 8.7.4.1). The overdispersion for the RFID tags recapture is much lower for the assessment using the revised data than for the assessment using the old data, indicating that the model considers the revised data as more reliable than the previous data set. The joint uncertainty of the recent SSB and Fbar estimates (figure 8.7.4.2), indicates a slight improvement in the precision for the assessment based on the revised data.

The model using the revised data gives a different perception of the recent stock development (figure 8.7.4.3). The SSB estimates since 2013 are revised downwards 450 thousand tonnes on average over the 4 last years of the assessment period. Conversely, Fbar for the same period is revised upward by on average 0.03. The recruitment estimates are not revised substantially.

Because of the lower overdispersion for the RFID tagging data and the slight reduction in model uncertainty, it was considered that the revised tagging recapture data set was an improvement on the data set used at the benchmark, and it was decided to use it in the final 2017 WGWIDE assessment.

### 8.7.5 Quality of the assessment

**Parametric uncertainty**

Large confidence intervals are associated with the SSB in the years before 1992 (figure 8.7.3.1 and figure 8.7.5.1). This results from the absence of information from the egg survey index, the down weighting of the catches and the assessment being only driven by the tagging data and natural mortality in the early period. The confidence intervals become narrower from the early 1990s to the mid-2000s, corresponding to the period where information is available from the egg survey index, the tagging data and (partially) catches. The uncertainty increases again in the recent years, for the period when the IESSNS indices are introduced and where catches are not providing sufficient information of the most recent year classes. The SSB estimate for 2016 is estimated with a precision of +/- 28% (Figure 8.7.3.1 and table 8.7.3.1). There is generally also a corresponding large uncertainty on the fishing mortality, especially before 1995. The estimate of $F_{bar4\text{-}8}$ in 2016 has a precision of +/- 36%. The uncertainty on the recruitment is high for the years before 1998 (precision of on average +/- 55%). The precision improves slightly for the years for which the recruitment index is available (+/- 38%) except for the last estimated recruitment (+/- 83%).

**Model instability**

The retrospective analysis was carried out for 3 retro years (it was not possible to run the model further back in time due to the short length of the time series for some data sources), by fitting the assessment using the 2017 data, removing successively 1 year of data (Figure 8.7.5.2). Since some of the time series are still short (7 years for the IESSNS index, 5 years for the RFID tags), the parameters corresponding to these sources of data are expected to change from year to year, until the time series are long enough to have stable estimates.

There is no strong retrospective pattern observed in the SSB. The first and third retrospective runs provide estimates which are lower than the current run for the current year, while the second retrospective run is close to the current run. All runs provide estimates which are within the confidence intervals of the current assessment. Differences in the estimated Fbar values are larger than for SSB, but they do not show any systematic pattern, and also remain within the confidence intervals of the current assessment. Recruitment appears to be quite consistently estimated.

**Model behaviour**

The realisation of the process error in the model was also inspected. The process error expressed as annual deviations in mortality-at-age (figure 8.7.5.3) shows some pattern across time and ages. There is a predominance of negative deviations in the mid-1990s/early-2000s, of positive deviations in the middle of the 2000s followed by a predominance of negative in the last four years. The magnitude of theses deviations is frequently as large as the assumed value for natural mortality of 0.15 (on average +- 0.14). While process error is assumed to be independent and identically distributed, there is clear evidence of correlations in the realisation of the process error in the mackerel assessment, which appears to be correlated both across age-classes and along the time series.

The temporal autocorrelation can also be visualised if the process error is expressed in term of biomass (process error expressed as deviations in abundances-at-age multiplied by weight at age and summed over all age classes, figure 8.7.5.4). Periods with positive values (when the model globally estimates larger abundances-at-age than corresponding to the survival equation) have been alternating with periods with negative values (between 2002and 2007). For the years since 2007, the cumulated process error remains positive, with a magnitude reaching a third of the volume of the catches for 2009. The reason for this misbehaviour of the model could not be identified. It should be noted, however, that the magnitude of the biomass cumulated process error in the 2017 assessment is lower than in the previous year's assessment.

**Relevance of the recruitment estimates**

Of note is that in the mackerel assessment recruitment is defined at age 0. Given the occasionally large process error occurring on ages 1 and 2 (figure 8.7.5.3), the strength of a cohort can be modified due to the loses or gains additional recruitment. Hence, some discrepancies can be observed in the recruitment pattern through time between age group 0 and age group 3 (when it really enters the fishery, figure 8.7.5.4). The difference in the pattern is only to some degree associated with the temporal pattern in catches taken in age groups 0 to 2, and results more of the realisation of the process error. Therefore, using the recruitment estimates at age 0 to make some inference on future catches may be misleading for some year classes. This can have implications, for instance, for the forecast and TAC advice. Forecast using recruitment estimates from SAM as number-at-age 0 in contrast to number-at-age 3 can give different results that are mainly caused by the magnitude and direction of the process error.

One should note however that the largest discrepancy is observed for the 2014 year class, which corresponds for age 3 fish in the abundance in 2017, not yet accurately estimate by the assessment model.

## 8.8 Short term forecast

The short-term forecast provides estimates of SSB and catch in 2018 and 2019, given assumption of the current year's (also called intermediate year) catch and a range of management options for the catch in 2018.

All procedures used this year follows the description provided in the Stock Annex, except for the recruitment estimates (see below).

### 8.8.1 Intermediate year catch estimation

Estimation of catch in the intermediate year (2017) is based on declared quotas and interannual transfers as shown in the text table in Section 8.1.

### 8.8.2 Initial abundances at age

The recruitment estimate at age 0 from the assessment in the terminal assessment year (2016) was considered too uncertain to be used, because this year class has not yet fully recruited into the fishery. The last recruitment estimate is normally replaced by predictions from the RCT3 software (Shepherd, 1997). The RCT3 software evaluates the historical performance of the IBTS recruitment index, by performing a linear regression between the index and the SAM estimates over the period 1998 to the year before the terminal year. The recruitment is then calculated as a weighted mean of the prediction from this linear regression based on the IBTS index value, and a time tapered geometric mean of the SAM estimates from 1990 to the year before the terminal year. The time tapered geometric mean gives the latest years more weight than a geometric mean. This is done because the recent productivity of the stock appear different than in the 1990's.

The recruitment index for 2016 could not be calculated (see section 8.6.2). The time tapered geometric mean (5 724 540) from 1990—2015 was therefore used as the recruitment in 2016 in the forecast.

### 8.8.3 Short term forecast

A deterministic short-term forecast was calculated using FLR. Table 8.8.3.1 lists the input data and Tables 8.8.3.2 and 8.8.3.3 provide projections for various fishing mortality multipliers and catch constraints in 2018.

Assuming catches for 2017 of 1 179 kt, F was estimated at 0.41 and SSB at 3.44 Mt in spring 2017. If catches in 2018 equal the catch in 2017, F is expected to increase to 0.51 in 2018 with a corresponding reduction in SSB to 3.00 Mt in spring 2018. Assuming an F of 0.51 again in 2019, the SSB will decrease further to 2.58 Mt in spring 2019.

Exploitation in 2018 at $F_{MSY}$ (0.21) will yield catches of 551 kt and a reduction in SSB to 3.12 Mt in spring 2018 (-9 % change), which is above MSY $B_{trigger}$ (2.57 Mt) and therefore it is not necessary to reduce fishing mortality. Continuing with catches corresponding to $F_{MSY}$ (0.21) for 2019 would result in an SSB of 4.54 Mt in spring 3 162 (8% reduction when compared to SSB in 2017).

## 8.9 Biological Reference Points

A long term management plan evaluation was conducted in 2017 (ICES, 2017c) which resulted in the adoption of new reference points for NEA mackerel stock by ICES.

### 8.9.1 Precautionary reference points

$\boldsymbol{B_{lim}}$ - There is no evidence of significant reduction in recruitment at low SSB within the time series hence the previous basis for $B_{lim}$ was retained. $B_{lim}$ is taken as $B_{loss}$, the lowest estimate of spawning stock biomass from the revised assessment. This was estimated to have occurred in 2002; $B_{loss}$ = 1 940 000 t.

$\boldsymbol{F_{lim}}$ - $F_{lim}$ is derived from $B_{lim}$ and is determined from the long term equilibrium simulations as the F that on average would bring the stock to $B_{lim}$; $F_{lim}$ = 0.48.

$\boldsymbol{B_{pa}}$ - The ICES basis for advice requires that a precautionary safety margin incorporating the uncertainty in actual stock estimates leads to a precautionary reference point $B_{pa}$, which is a biomass reference point with a high probability of being above $B_{lim}$. $B_{pa}$ was calculated as $B_{lim} \cdot exp(1.645 \cdot \sigma)$ where $\sigma = 0.17$ (the estimate of uncertainty associated with spawning biomass in the terminal year in the assessment (2016) as estimated in the 2017 management plan evaluation); $B_{pa}$ = 2 570 000 t.

$\boldsymbol{F_{pa}}$ -The ICES basis for advice requires that a precautionary safety margin incorporating the uncertainty in actual stock estimates leads to a precautionary reference point $F_{pa}$, which is a fishing mortality reference point designed to avoid reaching $F_{lim}$. Consequently, $F_{pa}$ was calculated as $F_{lim}$ * exp(1.645 σ) where σ = 0.20 default value was taken following the guidelines, as the estimated standard deviation of ln(F) in the final assessment year (2016) provided by the SAM assessment (i.e. σ = 0.14 corresponding to the uncertainty of ln(F2015)) was smaller than 0.20 but considered unrealistically low.; $F_{pa}$ = 0.35.

### 8.9.2 MSY reference points

The ICES MSY framework specifies a target fishing mortality, $F_{MSY}$, which, over the long term, maximises yield, and also a spawning biomass, MSY $B_{trigger}$, below which target fishing mortality is reduced linearly relative to the SSB $B_{trigger}$ ratio.

Following the ICES guidelines (ICES CM 2013/ACOM:37), long term equilibrium simulations indicated that F=0.21 would be an appropriate $F_{MSY}$ target as on average it resulted in the highest mean yields in the long term, with a low probability (less than 5%) of reducing the spawning biomass below $B_{lim}$.

The ICES basis for advice notes that, in general, $F_{MSY}$ should be lower than $F_{pa}$, and MSY $B_{trigger}$ should be equal to or higher than $B_{pa}$. Simulations indicated that potential values for MSY Btrigger were below Bpa. Following the ICES procedure MSY $B_{trigger}$ was set equal to $B_{pa}$, 2 570 000 t.

**Updated ICES reference points for NEA mackerel**

| Type | | Value | Technical basis |
|---|---|---|---|
| MSY approach | MSY $B_{trigger}$ | 2.57 million tonnes | $B_{pa}$ [1] |
| | $F_{MSY}$ | 0.21 | Stochastic simulations [1] |
| Precautionary approach | $B_{lim}$ | 1.94 million tonnes | $B_{loss}$ in 2002 [2] |
| | $B_{pa}$ | 2.57 million tonnes | $B_{lim} \times \exp(1.654 \times \sigma)$, $\sigma = 0.17$ [1] |
| | $F_{lim}$ | 0.48 | F that on average leads to $B_{lim}$ [1] |
| | $F_{pa}$ | 0.35 | $F_{lim} \times \exp(1.654 \times \sigma)$, $\sigma = 0.20$[1] |

**[1] 2017 management plan evaluation (ICES, 2017c)**

**[2] 2017 benchmark assessment (ICES, 2017a)**

## 8.10 Comparison with previous assessment and forecast

**Assessment**

The last available assessment used for providing advice was carried out in 2016 at WGWIDE. The new 2017 WGWIDE assessment gives a quite different perception of the stock (Figure 8.10.1).

The differences in the 2015 TSB and SSB estimates between the previous and the present assessments are moderate, of -10% and -14%, respectively. The upward revision of the 2015 fishing mortality estimate is also moderate, of 19%.

| | TSB 2015 | SSB 2015 | $F_{4-8}$ 2015 |
|---|---|---|---|
| Values | | | |
| 2016 WGWIDE | 6398043 | 4886564 | 0.289 |
| 2017 WGWIDE | 5733556 | 4216606 | 0.344 |
| % difference | -10% | -14% | 19% |

The differences observed can be better understood when looking at the different changes in the assessment that were made since last WGWIDE. First, the benchmark assessment gave a lower perception of the recent SSB than the previous WGWIDE 2016 assessment, and a perception of a much higher Fbar (Figure 8.10.1.). Updating the benchmark assessment using the unrevised RFID tagging data gives an assessment very consistent with the benchmark assessment. Using the revised tagging data causes again a downward revision of SSB and an upwards revision of Fbar. Differences in the estimated recruitment between these 4 assessments are small.

Inspecting the changes in the estimated model parameters can help understand the reason for these revisions (figure 8.10.2). The changes in the assessment methodology and input data done during the benchmark have resulted in a higher weight (lower observation standard deviations) for the surveys compared to the catch data. The decrease in survey observation standard deviation was, in proportion, larger for the egg survey than for the IESSNS, meaning that the weight of the egg survey has increased compared to the IESSNS. This was mostly the consequence of introducing a correlation structure for the errors of the IESSNS, which was judged to be appropriate as it allowed to account for year effects in this survey. Parameters for the update assessment with the old RFID data are comparable to the benchmark assessment (comparison not shown). The update assessment using the revised RFID tagging data shows a decrease in the weight of the catch data (higher observation standard deviation), a further decrease in the weight of the IESSNS and an increase of the weight for the egg survey and the RFID tagging data. Leave one out runs (Figure 8.7.3.5) show that the IESSNS tend to pull recent SSB estimates up, while the egg survey and the tagging data pull the SSB estimates down. The progressive reduction of the weight of the IESSNS survey therefore explains the downwards revision of the estimated SSB.

The uncertainty on the SSB and $F_{bar4\text{-}8}$ of the benchmark assessment is in general slightly lower than for last year's assessment (Figure 8.10.3). The 2017 update assessment has also a slightly lower uncertainty than both last year's assessment and the benchmark assessment, especially for the period around 2010, but uncertainty is similar for the most recent estimates.

While some correlations across ages and years are still observed in the process error (figure 8.7.5.3), the process error expressed as biomass is smaller than in the previous assessment (figure 8.7.5.4 to compare to figure 8.7.3 from the 2016 WGWIDE report) which can be seen as an improvement in model behaviour..

**Forecast**

The prediction of the mackerel catch for 2016 used for the short-term forecast in the advice given last year was very close to the actual 2016 catch reported in 2017 and used in the present assessment (text table below). The new assessment produced an estimate of the SSB in 2016 15.5% lower than the 2016 forecast prediction. The fishing mortality $F_{bar4\text{-}8}$ for 2016 estimated this year is 15.6% higher than the value estimated by the short term forecast in the previous assessment. Most of these discrepancies can be explained by the revision of the perception of the stock described above.

| | Catch (2016) | SSB (2016) | $F_{4\text{-}8}$(2016) |
|---|---|---|---|
| 2016 WGWIDE forecast | 1067828 t | 4587535 t | 0.27 |
| 2017 WGWIDE assessment | 1094066 t | 3970981 t | 0.32 |
| % difference | 2.4% | -15.5% | 15.6% |

## 8.11 Management Considerations

As there is no agreement on an overarching management plan on mackerel, ICES base their advice on the MSY approach. However, three of the Coastal States (EU, Norway, and Faroes) sent a request to ICES to evaluate a new long term management strategy (see Section 1.1.1) which was addressed by WKMACMSE (ICES 2017c).

Details and discussion on quality issues in this year's assessment is given in Section 8.7.5 above.

The Atlantic mackerel in the Northeast Atlantic is traditionally characterised as three distinct 'spawning components': the southern component, the western component and the North Sea component. The basis for the components is derived from tagging experiments (ICES, 1974), however, the methods normally used to identify stocks or components (e.g. ectoparasite infections, blood phenotypes, otolith shapes and genetics) have not been able to demonstrate significant differences between animals from different components. The mackerel in the Northeast Atlantic appears on one hand to mix extensively whilst, on the other hand, exhibit some tendency for homing (Jansen et al. 2013, Jansen and Gislason, 2013). Consequently, it cannot be considered either a panmictic population, nor a population that is composed of isolated components (Jansen and Gislason 2013).

Nevertheless, stock components are still being used to identify the different spawning areas where mackerel are known to spawn. The trends in the different components is derived from the triennial egg survey in the western and southern area and a dedicated egg survey in the North Sea the year following the western survey (figure xx).

Since the mid 1970s, ICES has continuously recommended conservation measures for the North Sea component of the Northeast Atlantic mackerel stock (e.g. ICES 1974, ICES 1981). The measures advised by ICES to protect the North Sea spawning component (i.e. closed areas and minimum landing size) aimed to promote the conditions that make a recovery of this component possible.

The recommended closure of Division 4.a for fishing during the first half of the year is based on the perception that the western mackerel enter the North Sea in July/August, and remain there until December before migrating to their spawning areas. Updated observations from the late 1990s suggested that this return migration actually started in mid- to late February (Jansen et al. 2012b). The EU TAC regulations stated that within the limits of the quota for the western component (6, 7, 8.a,b,d,e, 5b (EU), 2a (non EU), 12, 14), a certain quantity of this stock may be caught in 4.a during the periods 1 January to 15 February and 1 September to 31 December. Up to 2010, 30% of the Western EU TAC of mackerel (MAC/2CX14-) could be taken in 4.a. From 2011 onwards, this percentage has been set at 40% and from 2015 at 60%.

The minimum landing size for mackerel is currently set at 30 cm for the North Sea and 20 cm in the western area. The historical basis for the setting of minimum landing sizes is described in a working document to WGWIDE in 2015 (Pastoors 2015). The MLS of 30 cm in the North Sea was originally introduced by Norway in 1971 and was intended to protect the very strong 1969 year class from exploitation in the industrial fishery. The 30 cm later became the norm for the North Sea MLS while the MLS for mackerel in western waters was set at 20 cm. In the early 1990s, ICES recommended that, because of mixing of juvenile and adult mackerel on western waters fishing grounds, the adoption of a 30 cm minimum landing size for mackerel was not desirable as it could lead to increased discarding (ICES 1990a) (ICES 1991). A substantial part of the catch of (western) NEA mackerel is taken in ICES division 4.a during the period October until mid-February to which the 30 cm MLS applies even though there is limited understanding on the effectiveness of minimum landing sizes in achieving certain conservation benefits (STECF 2015).

## 8.13 Ecosystem considerations

An overview of the main ecosystem drivers possibly affecting the different life-stages of Northeast 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 recruitment (age 1) has been higher since 2001 compared to previous decades with several very large cohorts (Jansen, 2016). Increasing stock size was suggested to have an effect through density driven expansion of the spawning area into new areas with *Calanus* in oceanic areas west of the North European continental shelf (Jansen, 2016).

During the recent decade, mackerel length- and weight-at-age declined substantially for all ages (Jansen and Burns, 2015; Olafsdottir *et al*., 2015). Growth of 0–3 years old mackerel decreased from 1998 to 2012. Mean length at age 0 decreased by 3.6 cm, however the growth differed substantially among cohorts (Jansen and Burns, 2015). For the 3-8 years old mackerel, the average size was reduced by 3.7 cm and 175 g from 2002 to 2013 (Olafsdottir *et al*., 2015). The variations in growth of mackerel in all ages are correlated with mackerel density. Furthermore, the ontogenetic progression in density dependent regulation of growth appears to reflect the spatial dynamics (migration patterns) in the feeding season. (Jansen and Burns, 2015; Olafsdottir *et al*., 2015). Growth rates of the juveniles were tightly correlated with the density of juveniles in the nursery areas (Jansen and Burns, 2015). For adult mackerel (age 3-8) growth rates were correlated with the combined effects of mackerel and herring stock sizes (Olafsdottir *et al*., 2015). Conspecific density-dependence was most likely mediated via intensified competition associated with greater mackerel density.

**Spatial distribution and timing**

The mackerel stock expanded its geographic range during the feeding season (summer) from 1.3 million km$^2$ in 2007 to at least 2.9 million km$^2$ in 2014, mainly towards western and northern regions of the Nordic seas (Nøttestad *et al*., 2016c). The geographic range remains large (2.6 million km$^2$) in 2017 (Nøttestad et al. 2017). Several factors could cause the observed range expansion of mackerel, such as, decreasing prey availability in the traditional feeding area in the Norwegian Sea, an increasing stock size of mackerel and Norwegian spring-spawning herring, and perhaps interannual variation in plankton production (Olafsdottir *et al*., 2017). This extended distribution range enters new fringe areas where mackerel presence is restricted by the minimum temperature tolerance of mackerel. Recent warming of these fringe areas facilitated mackerel ability to occupy the areas (Jansen *et al*., 2016). It appears mackerel utilize the warm northward flowing Atlantic current to migrate towards fringe areas until they encounter temperatures that are intolerably cold. Based on an expectation of increasing foraging rate while utilizing available prey as they migrate northward, could be a simple and robust feeding strategy for mackerel in the Norwegian Sea (Nøttestad *et al*., 2016b).

Geographical distribution of the 2016 cohort at age 0 and 1 was different from the traditional juvenile distribution patterns. The 2016 cohort was observed from latitude 60-71°N along the coast and offshore areas of Norway based on various survey data and fishing data. Traditional, 0- and 1-group of mackerel reside further south in waters of the southernmost part of Norway.

**Trophic interactions**

There are strong indications for interspecific competition for food between NSS-herring, blue whiting and mackerel (Huse *et al*., 2012). According to Langøy *et al.* (2012), Debes *et al.* (2012), Oskarsson *et al.* (2015) and Bachiller et al. (2016), the herring may suffer from this competition, as mackerel had higher stomach fullness index than herring and the herring stomach composition is different from previous periods when mackerel stock size was smaller. Langøy *et al* (2012) and Debes *et al*. (2012) also found that mackerel consumed wider range of prey species than herring. Mackerel may thus be thriving better in periods with low zooplankton abundances. Feeding incidence increased with decreasing temperature and also stomach filling degree, indicating that feeding activity is highest in areas associated with colder water masses (Bachiller et al., 2016). A bioenergetics model being developed by Bachiller *et al*. (2016) estimates that the NEA mackerel, NSS herring and blue whiting can consume between 122 and 135 million tonnes of zooplankton per year (2005-2010) This is higher than that estimated in previous studies (e.g. Utne *et al*., 2012; Skjoldal *et al*., 2004). NEA mackerel feeding rate can consequently be as high as that of the NSS herring in some years. Geographical distribution overlap between mackerel and NSS herring during the summer feeding season is highest in the south-western part of the Norwegian Sea (Faroe and east Icelandic area) (Nøttestad et al. 2016b; 2017).

There is a growing concern that recruitment success of NSS herring is affected by predation from mackerel on herring larvae. Skaret *et al*. (2015) evaluated mackerel predation in an area of overlap between adult mackerel and herring larvae in the Norwegian coastal shelf, with particular focus on predation on herring larvae. 45% of the mackerel guts contained herring larvae, with a maximum of 225 larvae counted in a single gut. Both the frequency of guts containing herring larvae and the average amount of herring larvae increased in line with increasing abundance of larvae. On the other hand, no spatial correlation between mackerel abundance and herring larvae abundance was found at the station level. The results suggest that mackerel fed opportunistically on herring larvae, and that predation pressure therefore largely depends on the degree of overlap in time and space (Skaret *et al*., 2015).

The increase of 0- and 1-groups of NEA mackerel found along major coastlines of Norway both in 2016 and 2017, has created some interesting new trophic interactions. Increasingly numbers of adult Atlantic bluefin tuna (*Thynnus thunnus*), with an average size of approximately 200 kg, have been documented to feed on 0-group mackerel from the 2016 and 2017-year classes during the commercial bluefin tuna fishery in Norway. Additionally, the new situation of numerous 0- and 1-group mackerel in Norwegian coastal waters have created favourable feeding possibilities for larger cod, saithe, marine mammals and seabirds in these waters. Repeated stomach samples from several species document that smaller sized mackerel is eaten by different predators.

In the southern distribution area, mackerel coexists with chub mackerel (Scomber colias, Gmelin), a similar species widely distributed between the Bay of Biscay and northern waters of Atlantic African coast. According to Villamor et al. (2017-WD), Martins et al., (2013) and Correia (2016), catches of this species have notably increased in the most recent years in the Iberian Peninsula, probably as a consequence of the strength of the most recent year classes together with the decline of sardine landings. While no interaction would be expected for adult fish due to the northward feeding migration of adult mackerel, juveniles occur in the same habitats. The interaction between younger fish of both species is at present unknown, but should be studied in order to estimate the impact in terms of inter-specific competition and on the dynamics of the southern recruitment and nursery areas.

## 8.14 References

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**Table 8.2.1. 2016 Mackerel fleet composition of major mackerel catching nations.**

| Country | Len (m) | Engine power (hp) | Gear | Storage1 | No vessels |
|---|---|---|---|---|---|
| Denmark | 57-86 | 4077-8158 | Trawl | Tank | 7 |
| | 70-76 | 4077-6118 | Purse Seine | Tank | 3 |
| Faroe Islands | 49-69 | 2400-4000 kw | Purse Seine/Trawl | RSW | 6 |
| | 70-79 | 3900-8000 kw | Purse Seine/Trawl | RSW | 4 |
| | 68-90 | 3200-6000 kw | Trawl | Freezer | 2 |
| | <50 | | Trawl | | 30 |
| France | <24 | | Trawl | | 1230 |
| | >24 | | Trawl | | 36 |
| Germany | 90-140 | 3800-12000 | Single Midwater Trawl | Freezer | 4 |
| Greenland | 67-80 | 1773-3764 | Trawl | RSW | 9 |
| | 55-88 | 1835-5192 | Trawl | Freezer/RSW | 4 |
| | 51-120 | 1199-7765 | Trawl | Freezer | 9 |
| Iceland | 51-60 | 2502-4079 | Single Midwater Trawl | RSW, Freezer | 6 |
| | 61-70 | 2000-7507 | Single Midwater Trawl | RSW, Freezer | 17 |
| | 71-80 | 3200-11257 | Single Midwater Trawl | RSW, Freezer | 12 |
| | >80 | 8051 | Single Midwater Trawl | Freezer | 1 |
| Ireland | 27m-65m | 522-2720 | Pair Midwater Trawl | RSW | 13 |
| | 12m-41m | 160-1119 | Pair Midwater Trawl | Dryhold | 25 |
| | 51m-71m | 1007-3840 | Midwater Trawl | RSW | 8 |
| | 12m-17m | 90-171 | Midwater Trawl | Dryhold | 4 |
| Netherlands | 55 | 2125 | Pair Midwater Trawl | Freezer | 1 |
| | 88-145 | 4400-10455 | Single Midwater Trawl | Freezer | 9 |
| Norway | 60-85 m | | Purse seiner | RSW | 78 |
| | 30-40 m | | Purse seiner | Dryhold, RSW | 17 |
| | 10-17 m | | Purse seiner | Dryhold | 178 |
| | 10-17 m | | Hook and line/nets | Dryhold | 169 |
| | 10-17 m | | PS/hooks/nets | Dryhold | 200 |
| | 30-40 m | | Trawl | Dryhold.Tankhold | 17 |
| Portugal | 0-10 | | Other | | 94 |
| | 10-20 | | OTB | | 3 |
| | 10-20 | | Other | | 86 |
| | 20-30 | | OTB | | 27 |
| | 20-30 | | Other | | 16 |
| | 30-40 | | Trawl | | 7 |

| | | | | | |
|---|---|---|---|---|---|
| Spain | 12-18 | 82-294 | Trawl | Dryhold | 8 |
| | 18-24 | 96-317 | Trawl | Dryhold | 26 |
| | 24-40 | 162-876 | Trawl | Dryhold | 75 |
| | 40- | 353 | Trawl | Dryhold | 2 |
| | 0-10 | 34-44 | Purse Seine | Dryhold | 2 |
| | 10-12 | 34-107 | Purse Seine | Dryhold | 10 |
| | 12-18 | 21-245 | Purse Seine | Dryhold | 108 |
| | 18-24 | 70-397 | Purse Seine | Dryhold | 99 |
| | 24-40 | 140-809 | Purse Seine | Dryhold | 100 |
| | 0-10 | 3-74 | Artisanal | Dryhold | 250 |
| | 10-12 | 12-118 | Artisanal | Dryhold | 182 |
| | 12-18 | 18-177 | Artisanal | Dryhold | 196 |
| | 18-24 | 59-368 | Artisanal | Dryhold | 35 |
| | 24-40 | 129-368 | Artisanal | Dryhold | 11 |

1 RSW = refrigerated seawater.

**Table 8.2.4.1. Overview of major existing regulations on mackerel catches.**

| Technical measure | National/International level | Specification | Note |
|---|---|---|---|
| Catch limitation | Coastal States/NEAFC | 2010-2017 | Not agreed |
| Management strategy | European (EU, NO, FO) | If SSB >= 3.000.000t, F = 0.24<br>If SSB is less than 3.000.000t, F = 0.24 * SSB/3.000.000<br>TAC should not be changed more than 20%<br>A party may transfer up to 10% of unutilised quota to the next year | Not agreed by all parties |
| Minimum size (North Sea) | European (EU, NO, FO) | 30 cm in the North Sea | |
| Minimum size (all areas except North Sea) | European (EU, NO) | 20 cm in all areas except North Sea | 10% undersized allowed |
| Minimum size | National (NO) | 30 cm in all areas | |
| Catch limitation | European (EU, NO, FO) | Within the limits of the quota for the western component (VI,VII, VIIIabde, Vb(EC), IIa(nonEC), XII, XIV), a certain quantity may be taken from IVa but only during the periods 1 January to 15 February and 1 October to 31 December. | |
| Area closure | National (UK) | South-West Mackerel Box off Cornwall | Except where the weight of the mackerel does not exceed 15 % by liveweight of the total quantities of mackerel and other marine organisms onboard which have been caught in this area |
| Area limitations | National (IS) | Pelagic trawl fishery only allowed outside of 200m depth contours around Iceland and/or 12 nm from the coast. | |

| Technical measure | National/International level | Specification | Note |
|---|---|---|---|
| National catch limitations by gear, semester and area | National (ES) | 28.74% of the Spanish national quota is assigned for the trawl fishery, 34.29% for purse seiners and 36.97% for the artisanal fishery | Since 2015, the trawl fishery has the individual quotas assigned by vessel. |
| Discard prohibition | National (NO, IS, FO) | All discarding is prohibited for Norwegian, Icelandic and Faroese vessels | |
| Landing Obligation | European | From 2015 onwards a landing obligation for European Union fisheries is in place for small pelagics including mackerel, horse mackerel, blue whiting and herring.<br>Since 2016 is also partly in place for demersal fisheries. | |

**Table 8.3.1.1. 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.ABDE | | | SUBAREAS 3 AND 4 | | | SUBAREAS 1 2 5 AND 14 | | | DIVISIONS 8.C AND 9.A | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch |
| 1969 | 4800 | | 4800 | 47404 | | 47404 | 739175 | | 739175 | 7 | | 7 | 42526 | | 42526 | 833912 | | 833912 |
| 1970 | 3900 | | 3900 | 72822 | | 72822 | 322451 | | 322451 | 163 | | 163 | 70172 | | 70172 | 469508 | | 469508 |
| 1971 | 10200 | | 10200 | 89745 | | 89745 | 243673 | | 243673 | 358 | | 358 | 32942 | | 32942 | 376918 | | 376918 |
| 1972 | 13000 | | 13000 | 130280 | | 130280 | 188599 | | 188599 | 88 | | 88 | 29262 | | 29262 | 361229 | | 361229 |
| 1973 | 52200 | | 52200 | 144807 | | 144807 | 326519 | | 326519 | 21600 | | 21600 | 25967 | | 25967 | 571093 | | 571093 |
| 1974 | 64100 | | 64100 | 207665 | | 207665 | 298391 | | 298391 | 6800 | | 6800 | 30630 | | 30630 | 607586 | | 607586 |
| 1975 | 64800 | | 64800 | 395995 | | 395995 | 263062 | | 263062 | 34700 | | 34700 | 25457 | | 25457 | 784014 | | 784014 |
| 1976 | 67800 | | 67800 | 420920 | | 420920 | 305709 | | 305709 | 10500 | | 10500 | 23306 | | 23306 | 828235 | | 828235 |
| 1977 | 74800 | | 74800 | 259100 | | 259100 | 259531 | | 259531 | 1400 | | 1400 | 25416 | | 25416 | 620247 | | 620247 |
| 1978 | 151700 | 15100 | 166800 | 355500 | 35500 | 391000 | 148817 | | 148817 | 4200 | | 4200 | 25909 | | 25909 | 686126 | 50600 | 736726 |
| 1979 | 203300 | 20300 | 223600 | 398000 | 39800 | 437800 | 152323 | 500 | 152823 | 7000 | | 7000 | 21932 | | 21932 | 782555 | 60600 | 843155 |
| 1980 | 218700 | 6000 | 224700 | 386100 | 15600 | 401700 | 87931 | | 87931 | 8300 | | 8300 | 12280 | | 12280 | 713311 | 21600 | 734911 |
| 1981 | 335100 | 2500 | 337600 | 274300 | 39800 | 314100 | 64172 | 3216 | 67388 | 18700 | | 18700 | 16688 | | 16688 | 708960 | 45516 | 754476 |
| 1982 | 340400 | 4100 | 344500 | 257800 | 20800 | 278600 | 35033 | 450 | 35483 | 37600 | | 37600 | 21076 | | 21076 | 691909 | 25350 | 717259 |
| 1983 | 320500 | 2300 | 322800 | 235000 | 9000 | 244000 | 40889 | 96 | 40985 | 49000 | | 49000 | 14853 | | 14853 | 660242 | 11396 | 671638 |
| 1984 | 306100 | 1600 | 307700 | 161400 | 10500 | 171900 | 43696 | 202 | 43898 | 98222 | | 98222 | 20208 | | 20208 | 629626 | 12302 | 641928 |
| 1985 | 388140 | 2735 | 390875 | 75043 | 1800 | 76843 | 46790 | 3656 | 50446 | 78000 | | 78000 | 18111 | | 18111 | 606084 | 8191 | 614275 |
| 1986 | 104100 | | 104100 | 128499 | | 128499 | 236309 | 7431 | 243740 | 101000 | | 101000 | 24789 | | 24789 | 594697 | 7431 | 602128 |

**Table 8.3.1.1. NE Atlantic Mackerel. ICES estimated catches by area (t). Discards not estimated prior to 1978 (data submitted by Working Group members). Continued.**

| YEAR | SUBAREA 6 | | | SUBAREA 7 AND DIVISIONS 8.ABDE | | | SUBAREAS 3 AND 4 | | | SUBAREAS 1 2 5 AND 14 | | | DIVISIONS 8.C AND 9.A | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch |
| 1987 | 183700 | | 183700 | 100300 | | 100300 | 290829 | 10789 | 301618 | 47000 | | 47000 | 22187 | | 22187 | 644016 | 10789 | 654805 |
| 1988 | 115600 | 3100 | 118700 | 75600 | 2700 | 78300 | 308550 | 29766 | 338316 | 120404 | | 120404 | 24772 | | 24772 | 644926 | 35566 | 680492 |
| 1989 | 121300 | 2600 | 123900 | 72900 | 2300 | 75200 | 279410 | 2190 | 281600 | 90488 | | 90488 | 18321 | | 18321 | 582419 | 7090 | 589509 |
| 1990 | 114800 | 5800 | 120600 | 56300 | 5500 | 61800 | 300800 | 4300 | 305100 | 118700 | | 118700 | 21311 | | 21311 | 611911 | 15600 | 627511 |
| 1991 | 109500 | 10700 | 120200 | 50500 | 12800 | 63300 | 358700 | 7200 | 365900 | 97800 | | 97800 | 20683 | | 20683 | 637183 | 30700 | 667883 |
| 1992 | 141906 | 9620 | 151526 | 72153 | 12400 | 84553 | 364184 | 2980 | 367164 | 139062 | | 139062 | 18046 | | 18046 | 735351 | 25000 | 760351 |
| 1993 | 133497 | 2670 | 136167 | 99828 | 12790 | 112618 | 387838 | 2720 | 390558 | 165973 | | 165973 | 19720 | | 19720 | 806856 | 18180 | 825036 |
| 1994 | 134338 | 1390 | 135728 | 113088 | 2830 | 115918 | 471247 | 1150 | 472397 | 72309 | | 72309 | 25043 | | 25043 | 816025 | 5370 | 821395 |
| 1995 | 145626 | 74 | 145700 | 117883 | 6917 | 124800 | 321474 | 730 | 322204 | 135496 | | 135496 | 27600 | | 27600 | 748079 | 7721 | 755800 |
| 1996 | 129895 | 255 | 130150 | 73351 | 9773 | 83124 | 211451 | 1387 | 212838 | 103376 | | 103376 | 34123 | | 34123 | 552196 | 11415 | 563611 |
| 1997 | 65044 | 2240 | 67284 | 114719 | 13817 | 128536 | 226680 | 2807 | 229487 | 103598 | | 103598 | 40708 | | 40708 | 550749 | 18864 | 569613 |
| 1998 | 110141 | 71 | 110212 | 105181 | 3206 | 108387 | 264947 | 4735 | 269682 | 134219 | | 134219 | 44164 | | 44164 | 658652 | 8012 | 666664 |
| 1999 | 116362 | | 116362 | 94290 | | 94290 | 313014 | | 313014 | 72848 | | 72848 | 43796 | | 43796 | 640311 | | 640311 |
| 2000 | 187595 | 1 | 187595 | 115566 | 1918 | 117484 | 285567 | 165 | 304898 | 92557 | | 92557 | 36074 | | 36074 | 736524 | 2084 | 738608 |
| 2001 | 143142 | 83 | 143142 | 142890 | 1081 | 143971 | 327200 | 24 | 339971 | 67097 | | 67097 | 43198 | | 43198 | 736274 | 1188 | 737462 |
| 2002 | 136847 | 12931 | 149778 | 102484 | 2260 | 104744 | 375708 | 8583 | 394878 | 73929 | | 73929 | 49576 | | 49576 | 749131 | 23774 | 772905 |
| 2003 | 135690 | 1399 | 137089 | 90356 | 5712 | 96068 | 354109 | 11785 | 365894 | 53883 | | 53883 | 25823 | 531 | 26354 | 659831 | 19427 | 679288 |
| 2004 | 134033 | 1705 | 134738 | 103703 | 5991 | 109694 | 306040 | 11329 | 317369 | 62913 | 9 | 62922 | 34840 | 928 | 35769 | 640529 | 19962 | 660491 |
| 2005 | 79960 | 8201 | 88162 | 90278 | 12158 | 102436 | 249741 | 4633 | 254374 | 54129 | | 54129 | 49618 | 796 | 50414 | 523726 | 25788 | 549514 |

**Table 8.3.1.1. NE Atlantic Mackerel. ICES estimated catches by area (t). Discards not estimated prior to 1978 (data submitted by Working Group members). Continued.**

| Year | Subarea 6 | | | Subarea 7 and Divisions 8.abde | | | Subareas 3 and 4 | | | Subareas 1 2 5 and 14 | | | Divisions 8.c and 9.a | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch | Ldg | Disc | Catch |
| 2006 | 88077 | 6081 | 94158 | 66209 | 8642 | 74851 | 200929 | 8263 | 209192 | 46716 | | 46716 | 52751 | 3607 | 56358 | 454587 | 26594 | 481181 |
| 2007 | 110788 | 2450 | 113238 | 71235 | 7727 | 78962 | 253013 | 4195 | 257208 | 72891 | | 72891 | 62834 | 1072 | 63906 | 570762 | 15444 | 586206 |
| 2008 | 76358 | 21889 | 98247 | 73954 | 5462 | 79416 | 227252 | 8862 | 236113 | 148669 | 112 | 148781 | 59859 | 750 | 60609 | 586090 | 37075 | 623165 |
| 2009 | 135468 | 3927 | 139395 | 88287 | 2921 | 91208 | 226928 | 8120 | 235049 | 163604 | | 163604 | 107747 | 966 | 108713 | 722035 | 15934 | 737969 |
| 2010 | 106732 | 2904 | 109636 | 104128 | 4614 | 108741 | 246818 | 883 | 247700 | 355725 | 5 | 355729 | 49068 | 4640 | 53708 | 862470 | 13045 | 875515 |
| 2011 | 160756 | 1836 | 162592 | 51098 | 5317 | 56415 | 301746 | 1906 | 303652 | 398132 | 28 | 398160 | 24036 | 1807 | 25843 | 935767 | 10894 | 946661 |
| 2012 | 121115 | 952 | 122067 | 65728 | 9701 | 75429 | 218400 | 1089 | 219489 | 449325 | 1 | 449326 | 24941 | 3431 | 28372 | 879510 | 15174 | 894684 |
| 2013 | 132062 | 273 | 132335 | 49871 | 1652 | 51523 | 260921 | 337 | 261258 | 465714 | 15 | 465729 | 19733 | 2455 | 22188 | 928433 | 4732 | 933165 |
| 2014 | 180068 | 340 | 180408 | 93709 | 1402 | 95111 | 383887 | 334 | 384221 | 684082 | 91 | 684173 | 46257 | 4284 | 50541 | 1388003 | 6451 | 1394454 |
| 2015 | 134728 | 30 | 134757 | 98563 | 3155 | 101718 | 295877 | 34 | 295911 | 632493 | 78 | 632571 | 36899 | 7133 | 44033 | 1198560 | 10431 | 1208990 |
| 2016 | 206326 | 200 | 206526 | 37300 | 1927 | 39227 | 248041 | 570 | 248611 | 563440 | 54 | 563494 | 32987 | 3220 | 36207 | 1088094 | 5971 | 1094066 |

**Table 8.3.2.1. NE Atlantic Mackerel. ICES estimated catch (t) in Areas 1, 2, 5 and 14, 1984–2016 (Data submitted by Working Group members).**

| Country | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|---|
| Denmark | 11787 | 7610 | 1653 | 3133 | 4265 | 6433 | 6800 | 1098 | 251 |
| Estonia | | | | | | | | | 216 |
| Faroe Islands | 137 | | | | 22 | 1247 | 3100 | 5793 | 3347 |
| France | | 16 | | | | 11 | | 23 | 6 |
| Germany Fed. Rep. | | | 99 | | 380 | | | | |
| Germany Dem. Rep. | | | 16 | 292 | | 2409 | | | |
| Iceland | | | | | | | | | |
| Ireland | | | | | | | | | |
| Latvia | | | | | | | | | 100 |
| Lithuania | | | | | | | | | |
| Netherlands | | | | | | | | | |
| Norway | 82005 | 61065 | 85400 | 25000 | 86400 | 68300 | 77200 | 76760 | 91900 |
| Poland | | | | | | | | | |
| Sweden | | | | | | | | | |
| United Kingdom | | | 2131 | 157 | 1413 | | 400 | 514 | 802 |
| USSR/Russia | 4293 | 9405 | 11813 | 18604 | 27924 | 12088 | 28900 | 13361 | 42440 |
| Misreported (Area 4.a) | | | | | | | | | |
| Misreported (Area 6.a) | | | | | | | | | |
| Misreported (Unknown) | | | | | | | | | |
| Unallocated | | | | | | | | | |
| Discards | | | | | | | | | |
| Total | 98222 | 78096 | 101112 | 47186 | 120404 | 90488 | 118700 | 97819 | 139062 |

**Table 8.3.2.1. NE Atlantic Mackerel. ICES estimated catch (t) in Areas 1, 2, 5 and 14, 1984–2016. Continued.**

| COUNTRY | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|
| Denmark | | | 4746 | 3198 | 37 | 2090 | 106 | 1375 |
| Estonia | | 3302 | 1925 | 3741 | 4422 | 7356 | 3595 | 2673 |
| Faroe Islands | 1167 | 6258 | 9032 | 2965 | 5777 | 2716 | 3011 | 5546 |
| France | 6 | 5 | 5 | | 270 | | | |
| Germany | | | | | | | | |
| Greenland | | | | 1 | | | | |
| Iceland | | | | 92 | 925 | 357 | | |
| Ireland | | | | | | | 100 | |
| Latvia | 4700 | 1508 | 389 | 233 | | | | |
| Lithuania | | | | | | | | 2085 |
| Netherlands | | | | 561 | | | 661 | |
| Norway | 100500 | 141114 | 93315 | 47992 | 41000 | 54477 | 53821 | 31778 |
| Poland | | | | | 22 | | | |
| Sweden | | | | | | | | |
| United Kingdom | | 1706 | 194 | 48 | 938 | 199 | 662 | |
| Russia | 49600 | 28041 | 44537 | 44545 | 50207 | 67201 | 51003 | 491001 |
| Misreported (Area 4.a) | | -109625 | -18647 | | | -177 | -40011 | |
| Misreported (Area 6.a) | | | | | | | -100 | |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | | | | | | | | |
| Discards | | | | | | | | |
| Total | 165973 | 72309 | 135496 | 103376 | 103598 | 134219 | 72848 | 92557 |

**Table 8.3.2.1. NE Atlantic Mackerel. ICES estimated catch (t) in Areas 1, 2, 5, and 14, 1984–2016. Continued.**

| Country | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|
| Denmark | 7 | 1 | | | | | | |
| Estonia | 219 | | | | | | | |
| Faroe Islands | 3272 | 4730 | | 650 | 30 | | 278 | 123 |
| France | | | | 2 | 1 | | | |
| Germany | | | | | | | 7 | |
| Greenland | | | | | | | | |
| Iceland | | 53 | 122 | | 363 | 4222 | 36706 | 112286 |
| Ireland | | | 495 | 471 | | | | |
| Latvia | | | | | | | | |
| Lithuania | | | | | | | | |
| Netherlands | | 569 | 44 | 34 | 2393 | | 10 | 72 |
| Norway | 21971 | 22670 | 125481 | 10295 | 13244 | 8914 | 493 | 3474 |
| Poland | | | | | | | | |
| Sweden | 8 | | | | | | | |
| United Kingdom | 54 | 665 | 692 | 2493 | | | | 4 |
| Russia | 41566 | 45811 | 40026 | 49489 | 40491 | 33580 | 35408 | 32728 |
| Misreported (Area 4.a) | | | | | | | | |
| Misreported (Area 6.a) | | | | | | | | |
| Misreported (Unknown) | | -570 | | -553 | | | | |
| Unallocated | | | -44 | 32 | -2393 | | -10 | -18 |
| Discards | | | | 9 | | | | 112 |
| Total | 67097 | 73929 | 53883 | 62922 | 54129 | 46716 | 72891 | 148781 |

**Table 8.3.2.1. NE Atlantic Mackerel. ICES estimated catch (t) in Areas 1, 2, 5, and 14, 1984–2016. Continued.**

| Country | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|
| Denmark | | 4845 | 269 | | 391 | 2345 | 4321 | 1 |
| Estonia | | | | | 13671 | | 0 | |
| Faroe Islands | 2992 | 66312 | 121499 | 107198 | 142976 | 103896 | 76889 | 61901 |
| France | | | 2 | | 197 | 8 | 36 | |
| Germany | | | | 107 | 74 | | 2963 | 3499 |
| Greenland | | | 621 | 74021 | 541481 | 875811 | 30351 | 36142 |
| Iceland | 116160 | 121008 | 159263 | 149282 | 151103 | 172960 | 169333 | 170374 |
| Ireland | | | 90 | | | 1725 | 6 | 2 |
| Latvia | | | | | | | | |
| Lithuania | | | | | | 1082 | | 1931 |
| Netherlands | | 90 | 178 | 5 | 1 | 5887 | 6996 | 8599 |
| Norway | 3038 | 104858 | 43168 | 110741 | 33817 | 192322 | 204574 | 153228 |
| Poland | | | | | | | | |
| Sweden | | | | 4 | 825 | 3310 | 740 | 730 |
| United Kingdom | | | | | 2 | 5534 | 7851 | 5240 |
| Russia | 414141 | 58613 | 73601 | 74587 | 80812 | 116433 | 128433 | 121614 |
| Misreported (Area 4.a) | | | | | | | | |
| Misreported (Area 6.a) | | | | | | | | |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | | | | | | | | |
| Discards | | 5 | 28 | 1 | 151 | 911 | 78 | 54 |
| Total | 163604 | 355729 | 398160 | 449326 | 465729 | 684173 | 632571 | 563315 |

**Table 8.3.2.2. NE Atlantic Mackerel. ICES estimated catch (t) in the North Sea, Skagerrak and Kattegat (Sub-area 4 and 3.a), 1988-2016 (Data submitted by Working Group members).**

| Country | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|---|
| Belgium | 20 | 37 | | 125 | 102 | 191 | 351 | 106 |
| Denmark | 32588 | 26831 | 29000 | 38834 | 41719 | 42502 | 47852 | 30891 |
| Estonia | | | | | 400 | | | |
| Faroe Islands | | 2685 | 5900 | 5338 | | 11408 | 11027 | 17883 |
| France | 1806 | 2200 | 1600 | 2362 | 956 | 1480 | 1570 | 1599 |
| Germany Fed. Rep. | 177 | 6312 | 3500 | 4173 | 4610 | 4940 | 1497 | 712 |
| Iceland | | | | | | | | |
| Ireland | | 8880 | 12800 | 13000 | 13136 | 13206 | 9032 | 5607 |
| Latvia | | | | | 211 | | | |
| Lithuania | | | | | | | | |
| Netherlands | 2564 | 7343 | 13700 | 4591 | 6547 | 7770 | 3637 | 1275 |
| Norway | 59750 | 81400 | 74500 | 102350 | 115700 | 112700 | 114428 | 108890 |
| Poland | | | | | | | | |
| Romania | | | | | | | 2903 | |
| Sweden | 1003 | 6601 | 6400 | 4227 | 5100 | 5934 | 7099 | 6285 |
| United Kingdom | 1002 | 38660 | 30800 | 36917 | 35137 | 41010 | 27479 | 21609 |
| USSR (Russia from 1990) | | | | | | | | |
| Misreported (Area 2.a) | | | | | | | 109625 | 18647 |
| Misreported (Area 6.a) | 180000 | 92000 | 126000 | 130000 | 127000 | 146697 | 134765 | 106987 |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | 29630 | 6461 | -3400 | 16758 | 13566 | | | 983 |
| Discards | 29776 | 2190 | 4300 | 7200 | 2980 | 2720 | 1150 | 730 |
| Total | 338316 | 281600 | 305100 | 365875 | 367164 | 390558 | 472397 | 322204 |

**Table 8.3.2.2. NE Atlantic Mackerel. ICES estimated catch (t) in the North Sea, Skagerrak and Kattegat (Sub-area 4 and 3.a), 1988-2016. Continued.**

| Country | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|
| Belgium | 62 | 114 | 125 | 177 | 146 | 97 | 22 |
| Denmark | 24057 | 21934 | 25326 | 29353 | 27720 | 21680 | 343751 |
| Estonia | | | | | | | |
| Faroe Islands | 13886 | 32882 | 4832 | 4370 | 10614 | 18751 | 12548 |
| France | 1316 | 1532 | 1908 | 2056 | 1588 | 1981 | 2152 |
| Germany | 542 | 213 | 423 | 473 | 78 | 4514 | 3902 |
| Iceland | | | | 357 | | | |
| Ireland | 5280 | 280 | 145 | 11293 | 9956 | 10284 | 20715 |
| Latvia | | | | | | | |
| Lithuania | | | | | | | |
| Netherlands | 1996 | 951 | 1373 | 2819 | 2262 | 2441 | 11044 |
| Norway | 88444 | 96300 | 103700 | 106917 | 142320 | 158401 | 161621 |
| Poland | | | | | | | |
| Romania | | | | | | | |
| Sweden | 5307 | 4714 | 5146 | 5233 | 49941 | 5090 | 52321 |
| United Kingdom | 18545 | 19204 | 19755 | 32396 | 58282 | 52988 | 61781 |
| Russia | | 3525 | 635 | 345 | 1672 | 1 | |
| Misreported (Area 2.a) | | | | 40000 | | | |
| Misreported (Area 6.a) | 51781 | 73523 | 98432 | 59882 | 8591 | 39024 | 49918 |
| Misreported (Unknown) | | | | | | | |
| Unallocated | 236 | 1102 | 3147 | 17344 | 34761 | 24873 | 22985 |
| Discards | 1387 | 2807 | 4753 | | 1912 | 24 | 8583 |
| Total | 212839 | 229487 | 269700 | 313015 | 304896 | 339970 | 394878 |

**Table 8.3.2.2. NE Atlantic Mackerel. ICES estimated catch (t) in the North Sea, Skagerrak and Kattegat (Subarea 4 and 3.a), 1988-2016. Continued.**

| COUNTRY | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|
| Belgium | 2 | 4 | 1 | 3 | 1 | 2 | 3 |
| Denmark | 275081 | 25665 | 232121 | 242191 | 252171 | 26716 | 23491 |
| Estonia | | | | | | | |
| Faroe Islands | 11754 | 11705 | 9739 | 12008 | 11818 | 7627 | 6648 |
| France | 1467 | 1538 | 1004 | 285 | 7549 | 490 | 1493 |
| Germany | 4859 | 4515 | 4442 | 2389 | 5383 | 4668 | 5158 |
| Iceland | | | | | | | |
| Ireland | 17145 | 18901 | 15605 | 4125 | 13337 | 11628 | 12901 |
| Latvia | | | | | | | |
| Lithuania | | | | | | | |
| Netherlands | 6784 | 6366 | 3915 | 4093 | 5973 | 1980 | 2039 |
| Norway | 150858 | 147068 | 106434 | 113079 | 131191 | 114102 | 118070 |
| Poland | | | 109 | | | | |
| Romania | | | | | | | |
| Sweden | 4450 | 4437 | 3204 | 3209 | 38581 | 36641 | 73031 |
| United Kingdom | 67083 | 62932 | 37118 | 28628 | 46264 | 37055 | 47863 |
| Russia | | | 4 | | | | |
| Misreported (Area 2.a) | | | | | | | |
| Misreported (Area 6.a) | 62928 | 23692 | 37911 | 8719 | | 17280 | 1959 |
| Misreported (Unknown) | | | | | | | |
| Unallocated | -730 | -783 | 7043 | 171 | 2421 | 2039 | -629 |
| Discards | 11785 | 11329 | 4633 | 8263 | 4195 | 8862 | 8120 |
| Total | 365894 | 317369 | 254374 | 209192 | 257208 | 236111 | 235049 |

**Table 8.3.2.2. NE Atlantic Mackerel. ICES estimated catch (t) in the North Sea, Skagerrak and Kattegat (Subarea 4 and 3.a), 1988-2016. Continued.**

| Country | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Belgium | 27 | 21 | 39 | 62 | 56 | 38 | 99 |
| Denmark | 36552 | 32800 | 36492 | 31924 | 21340 | 35809 | 21696 |
| Estonia | | | | | | | |
| Faroe Islands | 4639 | 543 | 432 | 25 | 42919 | 25672 | 18193 |
| France | 686 | 1416 | 5736 | 1788 | 4912 | 7827 | 3448 |
| Germany | 25621 | 52911 | 4560 | 5755 | 4979 | 6056 | 10172 |
| Iceland | | | | | | | |
| Ireland | 14639 | 15810 | 20422 | 13523 | 45167 | 34167 | 24437 |
| Latvia | | | | | | | |
| Lithuania | | | | | 8340 | | 596 |
| Netherlands | 1300 | 9881 | 6018 | 4863 | 24536 | 17547 | 11434 |
| Norway | 129064 | 162878 | 64181 | 130056 | 85409 | 36344 | 55089 |
| Poland | | | | | | 24 | |
| Romania | | | | | | | |
| Sweden | 34291 | 32481 | 4560 | 2081 | 1112 | 3190 | 2933 |
| United Kingdom | 52563 | 69858 | 75959 | 70840 | 145119 | 129203 | 99945 |
| Russia | 696 | | | 4 | | | |
| Misreported (Area 2.a) | | | | | | | |
| Misreported (Area 6.a) | | | | | | | |
| Misreported (Unknown) | | | | | | | |
| Unallocated | 660 | | | | | | |
| Discards | 883 | 1906 | 1089 | 337 | 334 | 34 | 559 |
| Total | 247700 | 303652 | 219489 | 261258 | 384221 | 295911 | 248611 |

**Table 8.3.2.3. NE Atlantic Mackerel. ICES estimated catch (t) in the Western area (Sub-areas 6 and 7 and Divisions 8.a,b,d,e), 1985–2016 (Data submitted by Working Group members).**

| Country | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|---|---|---|---|---|---|---|---|
| Belgium | | | | | | | | |
| Denmark | 400 | 300 | 100 | | 1000 | | 1573 | 194 |
| Estonia | | | | | | | | |
| Faroe Islands | 9900 | 1400 | 7100 | 2600 | 1100 | 1000 | | |
| France | 7400 | 11200 | 11100 | 8900 | 12700 | 17400 | 4095 | |
| Germany | 11800 | 7700 | 13300 | 15900 | 16200 | 18100 | 10364 | 9109 |
| Guernsey | | | | | | | | |
| Ireland | 91400 | 74500 | 89500 | 85800 | 61100 | 61500 | 17138 | 21952 |
| Isle of Man | | | | | | | | |
| Jersey | | | | | | | | |
| Lithuania | | | | | | | | |
| Netherlands | 37000 | 58900 | 31700 | 26100 | 24000 | 24500 | 64827 | 76313 |
| Norway | 24300 | 21000 | 21600 | 17300 | 700 | | 29156 | 32365 |
| Poland | | | | | | | | |
| Spain | | | | 1500 | 1400 | 400 | 4020 | 2764 |
| United Kingdom | 205900 | 156300 | 200700 | 208400 | 149100 | 162700 | 162588 | 196890 |
| Misreported (Area 4.a) | | -148000 | -117000 | -180000 | -92000 | -126000 | -130000 | -127000 |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | 75100 | 49299 | 26000 | 4700 | 18900 | 11500 | -3802 | 1472 |
| Discards | 4500 | | | 5800 | 4900 | 11300 | 23550 | 22020 |
| Total | 467700 | 232599 | 284100 | 197000 | 199100 | 182400 | 183509 | 236079 |

**Table 8.3.2.3. NE Atlantic Mackerel. ICES estimated catch (t) in the Western area (Sub-areas 6 and 7 and Divisions 8.a,b,d,e), 1985–2016 (Data submitted by Working Group members).**

| Country | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|
| Belgium | | | | | | | | |
| Denmark | | 2239 | 1143 | 1271 | | | 552 | 82 |
| Estonia | | | 361 | | | | | |
| Faroe Islands | | 4283 | 4284 | | 24481 | 3681 | 4239 | 4863 |
| France | 2350 | 9998 | 10178 | 14347 | 19114 | 15927 | 14311 | 17857 |
| Germany | 8296 | 25011 | 23703 | 15685 | 15161 | 20989 | 19476 | 22901 |
| Guernsey | | | | | | | | |
| Ireland | 23776 | 79996 | 72927 | 49033 | 52849 | 66505 | 48282 | 61277 |
| Isle of Man | | | | | | | | |
| Jersey | | | | | | | | |
| Lithuania | | | | | | | | |
| Netherlands | 81773 | 40698 | 34514 | 34203 | 22749 | 28790 | 25141 | 30123 |
| Norway | 44600 | 2552 | | | 223 | | | |
| Poland | 600 | | | | | | | |
| Spain | 3162 | 4126 | 4509 | 2271 | 7842 | 3340 | 4120 | 4500 |
| United Kingdom | 215265 | 208656 | 190344 | 127612 | 128836 | 165994 | 127094 | 126620 |
| Misreported (Area 4.a) | -146697 | -134765 | -106987 | -51781 | -73523 | -98255 | -59982 | -3775 |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | | 4632 | 28245 | 10603 | 4577 | 8351 | 21652 | 31564 |
| Discards | 15660 | 4220 | 6991 | 10028 | 16057 | 3277 | | 1920 |
| Total | 248785 | 251646 | 270212 | 213272 | 196110 | 218599 | 204885 | 297932 |

**Table 8.3.2.3. NE Atlantic Mackerel. ICES estimated catch (t) in the Western area (Sub-areas 6 and 7 and Divisions 8.a,b,d,e), 1985–2016. Continued.**

| Country | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|
| Belgium | | | | 1 | | | | |
| Denmark | 835 | | 113 | | | | 6 | 10 |
| Estonia | | | | | | | | |
| Faroe Islands | 2161 | 2490 | 2260 | 674 | | 59 | 1333 | 3539 |
| France | 18975 | 19726 | 21213 | 18549 | 15182 | 14625 | 12434 | 14944 |
| Germany | 20793 | 22630 | 19200 | 18730 | 14598 | 14219 | 12831 | 10834 |
| Guernsey | | | | | | 10 | | |
| Ireland | 60168 | 51457 | 49715 | 41730 | 30082 | 36539 | 35923 | 33132 |
| Isle of Man | | | | | | | | |
| Jersey | | | | | 9 | 8 | 6 | 7 |
| Lithuania | | | | | | 95 | 7 | |
| Netherlands | 33654 | 21831 | 23640 | 21132 | 18819 | 20064 | 18261 | 17920 |
| Norway | | | | | | | 7 | 3948 |
| Poland | | | | | 461 | 1368 | 978 | |
| Russia | | | | | | | | |
| Spain | 4063 | 3483 | | | 4795 | 4048 | 2772 | 7327 |
| United Kingdom | 139589 | 131599 | 167246 | 149346 | 115586 | 67187 | 87424 | 768821 |
| Misreported (Area 4.a) | -39024 | -43339 | -62928 | -23139 | -37911 | -8719 | | -17280 |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | 37952 | 27558 | 5587 | 9714 | 13412 | 4783 | 10042 | -952 |
| Discards | 1164 | 15191 | 7111 | 7696 | 20359 | 14723 | 10177 | 27351 |
| Total | 280553 | 252620 | 233157 | 244432 | 190597 | 169009 | 192201 | 177662 |

**Table 8.3.2.3. NE Atlantic Mackerel. ICES estimated catch (t) in the Western area (Sub-areas 6 and 7 and Divisions 8.a,b,d,e), 1985–2016. Continued.**

| Country | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|
| Belgium | 1 | 2 | | | | | 14 | 44 |
| Denmark | | 48 | 2889 | 8 | 903 | 18538 | 6741 | 19443 |
| Estonia | | | | | | | | |
| Faroe Islands | 4421 | 36 | 8 | | | 3421 | 5851 | 13173 |
| France | 16464 | 10301 | 11304 | 14448 | 12438 | 16627 | 17820 | 16634 |
| Germany | 17545 | 16493 | 18792 | 14277 | 15102 | 23478 | 19238 | 9740 |
| Guernsey | | | 10 | 5 | 9 | 9 | 4 | |
| Ireland | 48155 | 43355 | 45696 | 42627 | 42988 | 56286 | 54571 | 52087 |
| Isle of Man | | 14 | 11 | 11 | 8 | 3 | | 8 |
| Jersey | 8 | 6 | 7 | 8 | 8 | 7 | 3 | 3 |
| Lithuania | | | 23 | | | 176 | 554 | 13 |
| Netherlands | 20900 | 21699 | 18336 | 19794 | 16295 | 16242 | 15264 | 17896 |
| Norway | 121 | 30 | 2019 | 1101 | 734 | | 1313 | 1035 |
| Poland | | | | | | | | |
| Russia | | 1 | | | | | | 30 |
| Spain | 8462 | 6532 | 1257 | 773 | 635 | 1796 | 951 | 1253 |
| United Kingdom | 109147 | 107840 | 111103 | 93775 | 92957 | 137195 | 110932 | 112268 |
| Misreported (Area 4.a) | -1959 | | | | | | | |
| Misreported (Unknown) | | | | | | | | |
| Unallocated | 490 | 4503 | 399 | 16 | -144 | | 34 | |
| Discards | 6848 | 7518 | 7153 | 10654 | 2105 | 1742 | 3185 | 2126 |
| Total | 230603 | 218377 | 219007 | 197496 | 183857 | 275519 | 236475 | 245754 |

**Table 8.3.2.4. NE Atlantic Mackerel. ICES estimated catch (t) in Divisions 8.c and 9.a, 1977–2016 (Data submitted by Working Group members).**

| COUNTRY | DIV | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|
| France | 8. | | | | | | | | | |
| Poland | 9.a | 8 | | | | | | | | |
| Portugal | 9.a | 1743 | 1555 | 1071 | 1929 | 3108 | 3018 | 2239 | 2250 | 4178 |
| Spain | 8.c | 19852 | 18543 | 15013 | 11316 | 12834 | 15621 | 10390 | 13852 | 11810 |
| Spain | 9.a | 2935 | 6221 | 6280 | 2719 | 2111 | 2437 | 2224 | 4206 | 2123 |
| USSR | 9.a | 2879 | 189 | 111 | | | | | | |
| Total | 9.a | 7565 | 7965 | 7462 | 4648 | 5219 | 5455 | 4463 | 6456 | 6301 |
| Total | | 27417 | 26508 | 22475 | 15964 | 18053 | 21076 | 14853 | 20308 | 18111 |

| Country | Div | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|
| France | 8.c | | | | | | | | | |
| Poland | 9.a | | | | | | | | | |
| Portugal | 9.a | 6419 | 5714 | 4388 | 3112 | 3819 | 2789 | 3576 | 2015 | 2158 |
| Spain | 8.c | 16533 | 15982 | 16844 | 13446 | 16086 | 16940 | 12043 | 16675 | 21246 |
| Spain | 9.a | 1837 | 491 | 3540 | 1763 | 1406 | 1051 | 2427 | 1027 | 1741 |
| USSR | 9.a | | | | | | | | | |
| Total | 9.a | 8256 | 6205 | 7928 | 4875 | 5225 | 3840 | 6003 | 3042 | 3899 |
| Total | | 24789 | 22187 | 24772 | 18321 | 21311 | 20780 | 18046 | 19719 | 25045 |

| Country | Div | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|
| France | 8.c | | | | | | | | | 226 |
| Poland | 9.a | | | | | | | | | |
| Portugal | 9.a | 2893 | 3023 | 2080 | 2897 | 2002 | 2253 | 3119 | 2934 | 2749 |
| Spain | 8.c | 23631 | 28386 | 35015 | 36174 | 37631 | 30061 | 38205 | 38703 | 17384 |
| Spain | 9.a | 1025 | 2714 | 3613 | 5093 | 4164 | 3760 | 1874 | 7938 | 5464 |
| Discards | 8.c | | | | | | | | | 531 |
| Discards | 9.a | 3918 | 5737 | 5693 | 7990 | 6165 | 6013 | | | |
| Total | 9.a | 27549 | 34123 | 40708 | 44164 | 43796 | 36074 | 4993 | 10873 | 8213 |
| Total | | | | | | | | 43198 | 49575 | 26354 |

**Table 8.3.2.4. NE Atlantic Mackerel. ICES estimated catch (t) in Divisions 8.c and 9.a, 1977–2016 (Data submitted by Working Group members). Continued.**

| COUNTRY | DIV | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| France | 8.c | 177 | 151 | 43 | 55 | 168 | 383 | 392 | 44 | 283 |
| Poland | 9.a | | | | | | | | | |
| Portugal | 9.a | 2289 | 1509 | 2620 | 2605 | 2381 | 1753 | 2363 | 962 | 824 |
| Spain | 8.c | | | 43063 | 53401 | 50455 | 91043 | 38858 | 14709 | 17768 |
| Spain | 9.a | | | 7025 | 6773 | 6855 | 14569 | 7347 | 2759 | 845 |
| Discards | 8.c | 928 | 391 | 3606 | 156 | 73 | 725 | 4408 | 563 | 2187 |
| Discards | 9.a | | 405 | 1 | 916 | 677 | 241 | 232 | 1245 | 1244 |
| Unallocated | 8.c | 28429 | 42851 | | | | | | 4691 | 4144 |
| Unallocated | 9.a | 3946 | 5107 | | | | | 108 | 871 | 1076 |
| Total | 9.a | 6234 | 7021 | 9646 | 10293 | 9913 | 16562 | 10049 | 5836 | 3989 |
| Total | | 35768 | 50414 | 56358 | 63906 | 60609 | 108713 | 53708 | 25843 | 28372 |

| **Country** | **Div** | **2013** | **2014** | **2015** | **2016** |
|---|---|---|---|---|---|
| France | 8.c | 220 | 171 | 21 | 106 |
| Portugal | 9.a | 254 | 618 | 1456 | 619 |
| Spain | 8.c | 14617 | 33783 | 29726 | 26553 |
| Spain | 9.a | 1162 | 2227 | 3853 | 2229 |
| Discards | 8.c | 1428 | 2821 | 4724 | 2469 |
| Discards | 9.a | 1027 | 1463 | 2409 | 751 |
| Unallocated | 8.c | -573 | 8795 | 11 | 1357 |
| Unallocated | 9.a | 4053 | 662 | 1831 | 2123 |
| Total | 9.a | 6497 | 4308 | 9550 | 5722 |
| Total | | 22188 | 45570 | 44033 | 36207 |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016.**

**Quarters 1-4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 0.2 | 0.3 | | | 7204.2 | 0.7 | 24.3 | 0.2 |
| 2 | 113.9 | 2.4 | 4.4 | 2.4 | 66745.3 | 7005.6 | 1143.3 | 113.9 |
| 3 | 249.2 | 5.1 | 1.5 | 1.0 | 81431.5 | 359.5 | 292.6 | 249.2 |
| 4 | 391.3 | 6.9 | 1.5 | 1.2 | 107012.4 | 284.0 | 167.0 | 391.3 |
| 5 | 443.5 | 5.1 | 1.2 | 1.2 | 126798.8 | 321.3 | 41.8 | 443.5 |
| 6 | 461.7 | 3.0 | 0.7 | 0.9 | 94024.1 | 301.8 | 56.7 | 461.7 |
| 7 | 233.5 | 1.1 | 0.4 | 0.5 | 56498.7 | 361.5 | 33.0 | 233.5 |
| 8 | 46.3 | 0.1 | 0.3 | 0.3 | 47247.0 | 161.6 | 53.7 | 46.3 |
| 9 | 79.3 | 0.1 | 0.1 | 0.2 | 31140.9 | 28.0 | 0.7 | 79.3 |
| 10 | 73.9 | 0.1 | | 0.1 | 17704.5 | 26.9 | 1.1 | 73.9 |
| 11 | 17.2 | | | | 6862.0 | 4.6 | 0.4 | 17.2 |
| 12 | 21.2 | | | | 3367.4 | 4.6 | | 21.2 |
| 13 | 5.0 | | | | 1031.9 | 1.3 | 0.1 | 5.0 |
| 14 | 4.2 | | | | 374.0 | 0.8 | | 4.2 |
| 15+ | 0.3 | | | | 177.1 | 0.1 | | 0.3 |
| SOP | 818.3 | 9.4 | 3.0 | 2.5 | 245405.0 | 2629.4 | 564.3 | 818.3 |
| Catch | 761.2 | 9.2 | 3.0 | 2.5 | 244678.0 | 2610.3 | 547.1 | 761.2 |
| SOP% | 108% | 102% | 101% | 102% | 100% | 101% | 103% | 108% |

| AGE | 2.a | 5.a | 14.b | 5.b | 5.b1 | 6.b | 7.b | 7.c |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 103.0 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.7 | 1.4 |
| 2 | 58387.5 | 3882.4 | 304.0 | 367.1 | 0.2 | 1.4 | 711.8 | 16.5 |
| 3 | 96987.2 | 19511.2 | 6772.4 | 1621.9 | | 5.3 | 5125.5 | 60.9 |
| 4 | 97730.5 | 68589.8 | 17748.0 | 5653.7 | | 8.8 | 4513.1 | 96.5 |
| 5 | 185596.5 | 86497.7 | 28020.7 | 7940.2 | 0.1 | 9.5 | 4921.4 | 100.3 |
| 6 | 203335.3 | 69411.4 | 29529.5 | 7175.3 | 0.1 | 10.3 | 3652.5 | 108.4 |
| 7 | 117411.0 | 41963.7 | 14668.2 | 4317.8 | 0.1 | 6.3 | 3777.2 | 68.4 |
| 8 | 80150.7 | 35021.9 | 6888.2 | 4265.5 | 0.1 | 3.8 | 2869.3 | 43.5 |
| 9 | 48385.9 | 21039.7 | 5377.8 | 3559.4 | | 1.8 | 1525.4 | 22.5 |
| 10 | 41129.9 | 8363.0 | 1396.8 | 1459.9 | | 0.7 | 1066.9 | 8.2 |
| 11 | 17846.0 | 1959.8 | 107.9 | 536.6 | | 0.3 | 47.3 | 3.7 |
| 12 | 8436.3 | 272.9 | 19.1 | 1060.8 | | 0.1 | 0.1 | 1.3 |
| 13 | 3723.1 | 86.7 | 3.2 | 358.3 | | | | 0.1 |
| 14 | 1508.9 | | 2.7 | 39.2 | | | | 0.2 |
| 15+ | 388.4 | | | 311.9 | | | | |
| SOP | 357701.9 | 142238.0 | 46600.2 | 15170.6 | 0.2 | 14.4 | 8823.0 | 157.2 |
| Catch | 357678.0 | 142230.0 | 44916.9 | 15170.4 | 0.2 | 14.2 | 8820.2 | 155.9 |
| SOP% | 100% | 100% | 104% | 100% | 98% | 101% | 100% | 101% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarters 1-4**

| AGE | 7.A | 7.D | 7.E | 7.F | 7.G | 7.H | 7.J | 7.K |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 4.3 | | | 0.2 | | |
| 1 | 15.1 | 595.7 | 768.6 | 281.4 | 0.4 | 16.6 | 8.6 | |
| 2 | 69.1 | 10657.7 | 2872.6 | 1431.0 | 1.4 | 50.8 | 66.1 | |
| 3 | 19.3 | 6558.9 | 1539.0 | 781.7 | 1.0 | 22.2 | 775.9 | |
| 4 | 4.8 | 3874.3 | 724.1 | 206.9 | 2.7 | 32.2 | 6401.6 | 0.1 |
| 5 | 1.2 | 394.6 | 137.4 | 83.8 | 3.5 | 34.0 | 3056.4 | 0.1 |
| 6 | 1.1 | 977.6 | 232.5 | 44.8 | 3.7 | 36.5 | 5391.6 | 0.1 |
| 7 | 0.7 | 25.4 | 49.8 | 22.6 | 2.8 | 24.1 | 3174.3 | 0.1 |
| 8 | 0.7 | 1195.8 | 194.5 | 27.2 | 2.5 | 16.2 | 2938.6 | 0.1 |
| 9 | 0.2 | 14.5 | 16.6 | 10.1 | 1.6 | 8.4 | 5325.9 | 0.1 |
| 10 | 0.3 | 21.7 | 15.6 | 4.7 | 0.8 | 4.1 | 603.3 | |
| 11 | 0.2 | 13.7 | 9.1 | 1.8 | 0.2 | 2.1 | 921.8 | |
| 12 | | 0.5 | 0.7 | | | 0.5 | 2.7 | |
| 13 | | 2.2 | 1.3 | | | 0.2 | 0.2 | |
| 14 | | | | 0.8 | | 0.1 | 454.6 | |
| 15+ | | | | | | | | |
| SOP | 23.3 | 8134.6 | 1795.4 | 536.0 | 6.7 | 64.2 | 9936.5 | 0.2 |
| Catch | 23.4 | 7999.0 | 1762.3 | 536.0 | 6.7 | 63.9 | 9933.7 | 0.2 |
| SOP% | 100% | 102% | 102% | 100% | 100% | 100% | 100% | 99% |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 125.2 | 370.3 | 19.9 | | | 195.4 | 0.9 | 716.1 |
| 1 | 1005.1 | 1878.8 | 25875.4 | | 10.9 | 6462.6 | 398.0 | 45101.0 |
| 2 | 2959.3 | 5530.7 | 11019.1 | 0.1 | 3.9 | 8171.1 | 665.5 | 203282.3 |
| 3 | 1875.0 | 3653.8 | 5014.3 | 4.7 | 36.9 | 4712.8 | 566.4 | 257135.7 |
| 4 | 906.5 | 2113.4 | 12901.1 | 4.1 | 353.2 | 1109.6 | 64.2 | 423839.2 |
| 5 | 826.8 | 2773.4 | 19308.3 | 5.3 | 138.0 | 940.0 | 113.1 | 587708.5 |
| 6 | 828.8 | 3262.1 | 14107.4 | 10.3 | 285.9 | 1377.4 | 93.8 | 530868.1 |
| 7 | 613.5 | 2661.5 | 10297.9 | 10.3 | 157.2 | 950.2 | 136.4 | 339469.7 |
| 8 | 396.3 | 1829.5 | 6348.4 | 5.0 | 150.4 | 484.9 | 71.0 | 268441.9 |
| 9 | 165.0 | 781.9 | 2552.4 | 1.0 | 304.1 | 69.0 | 40.1 | 169849.9 |
| 10 | 59.8 | 274.0 | 925.6 | 1.5 | 27.4 | 148.3 | 23.6 | 94388.6 |
| 11 | 20.0 | 96.3 | 288.0 | 0.1 | 54.2 | 13.1 | 5.5 | 33887.5 |
| 12 | 4.0 | 16.0 | 74.1 | 0.5 | 0.1 | 2.1 | | 15638.5 |
| 13 | 1.5 | 2.7 | 3.2 | | | | | 5400.9 |
| 14 | | | | | 27.1 | | | 2413.3 |
| 15+ | | 0.1 | 20.3 | | | | | 951.7 |
| SOP | 2522.9 | 6894.5 | 30656.6 | 16.3 | 528.4 | 5027.9 | 619.3 | 1092976.9 |
| Catch | 2519.4 | 6878.4 | 30469.0 | 16.4 | 528.2 | 5102.5 | 619.3 | 1094066.2 |
| SOP% | 100% | 100% | 101% | 100% | 100% | 99% | 100% | 100% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 1**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 0.1 | 0.0 | 0.0 | 0.0 | 56.4 | 6.2 | 36.9 | 17707.6 |
| 3 | 0.2 | 0.0 | 0.0 | 0.0 | 112.1 | 2.2 | 26.8 | 18472.9 |
| 4 | 0.9 | 0.0 | 0.0 | 0.1 | 633.2 | 1.1 | 13.4 | 92514.1 |
| 5 | 1.2 | 0.0 | 0.0 | 0.1 | 680.2 | 0.3 | 3.4 | 118987.0 |
| 6 | 1.0 | 0.0 | 0.0 | 0.1 | 453.0 | 0.3 | 3.4 | 95959.3 |
| 7 | 0.9 | 0.0 | 0.0 | 0.1 | 529.9 | 0.1 | 0.0 | 81761.3 |
| 8 | 0.9 | 0.0 | 0.0 | 0.1 | 500.6 | 0.1 | 0.0 | 77780.3 |
| 9 | 0.5 | 0.0 | 0.0 | 0.1 | 358.7 | 0.0 | 0.0 | 49167.5 |
| 10 | 0.2 | 0.0 | 0.0 | 0.0 | 148.2 | 0.0 | 0.0 | 20952.1 |
| 11 | 0.1 | 0.0 | 0.0 | 0.0 | 57.5 | 0.0 | 0.0 | 5046.7 |
| 12 | 0.0 | 0.0 | 0.0 | 0.0 | 32.4 | 0.0 | 0.0 | 2350.2 |
| 13 | 0.0 | 0.0 | 0.0 | 0.0 | 7.3 | 0.0 | 0.0 | 176.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 53.1 |
| SOP | 2.1 | 0.0 | 0.0 | 0.2 | 1305.7 | 2.5 | 17.9 | 204601.3 |
| Catch | 2.2 | 0.0 | 0.0 | 0.2 | 1312.7 | 2.5 | 17.9 | 204995.8 |
| SOP% | 100% | | | 102% | 99% | 100% | 100% | 100% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.5 | 0.4 |
| 2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 659.6 | 2.0 |
| 3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4771.4 | 7.4 |
| 4 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4327.4 | 6.4 |
| 5 | 0.3 | 0.0 | 0.0 | 311.3 | 0.0 | 0.0 | 4833.2 | 2.7 |
| 6 | 0.2 | 0.0 | 0.0 | 622.7 | 0.0 | 0.0 | 3578.6 | 3.6 |
| 7 | 0.2 | 0.0 | 0.0 | 311.3 | 0.0 | 0.0 | 3706.3 | 2.6 |
| 8 | 0.2 | 0.0 | 0.0 | 934.0 | 0.0 | 0.0 | 2832.2 | 1.9 |
| 9 | 0.1 | 0.0 | 0.0 | 1245.4 | 0.0 | 0.0 | 1505.8 | 2.8 |
| 10 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1053.9 | 0.5 |
| 11 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 46.3 | 0.4 |
| 12 | 0.0 | 0.0 | 0.0 | 934.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 0.0 | 0.0 | 0.0 | 311.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| 15+ | 0.0 | 0.0 | 0.0 | 311.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 0.5 | 0.0 | 0.0 | 1914.5 | 0.0 | 0.0 | 8581.5 | 9.0 |
| Catch | 0.5 | 0.0 | 0.0 | 1914.5 | 0.0 | 0.0 | 8578.1 | 9.0 |
| SOP% | 101% | | | 100% | 98% | | 100% | 100% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 1**

| AGE | 7.A | 7.D | 7.E | 7.F | 7.G | 7.H | 7.J | 7.K |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.6 | 9.9 | 73.7 | 90.3 | 0.4 | 16.0 | 5.2 | 0.0 |
| 2 | 1.7 | 2960.1 | 652.4 | 552.7 | 1.0 | 43.5 | 24.0 | 0.0 |
| 3 | 0.7 | 2135.3 | 395.6 | 191.3 | 0.1 | 3.3 | 518.1 | 0.0 |
| 4 | 0.1 | 1066.7 | 187.8 | 46.9 | 0.2 | 0.4 | 4778.9 | 0.1 |
| 5 | 0.0 | 266.7 | 46.5 | 16.2 | 0.1 | 0.1 | 2285.3 | 0.1 |
| 6 | 0.0 | 266.7 | 46.7 | 11.4 | 0.2 | 0.3 | 4009.0 | 0.1 |
| 7 | 0.0 | 0.0 | 1.5 | 5.1 | 0.1 | 0.2 | 2395.8 | 0.1 |
| 8 | 0.0 | 0.0 | 0.0 | 5.5 | 0.1 | 0.2 | 2240.4 | 0.1 |
| 9 | 0.0 | 0.0 | 0.0 | 7.6 | 0.2 | 0.3 | 4050.3 | 0.1 |
| 10 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 475.0 | 0.0 |
| 11 | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.1 | 695.3 | 0.0 |
| 12 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 344.8 | 0.0 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 0.5 | 1425.3 | 283.4 | 135.0 | 0.6 | 9.3 | 7483.5 | 0.2 |
| Catch | 0.5 | 1425.4 | 283.7 | 135.0 | 0.6 | 9.4 | 7483.1 | 0.2 |
| SOP% | 104% | 100% | 100% | 100% | 101% | 99% | 100% | 99% |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 249.0 | 802.2 | 24781.8 | 0.0 | 4.8 | 269.3 | 10.0 | 26313.8 |
| 2 | 1238.6 | 3494.9 | 6552.9 | 0.0 | 0.2 | 1560.2 | 156.3 | 35707.5 |
| 3 | 978.3 | 2631.1 | 2743.4 | 1.4 | 34.1 | 870.3 | 452.7 | 34348.7 |
| 4 | 461.9 | 1081.1 | 6784.8 | 0.8 | 350.7 | 329.4 | 18.7 | 112605.4 |
| 5 | 377.1 | 804.0 | 9862.1 | 1.0 | 136.4 | 370.7 | 21.9 | 139008.1 |
| 6 | 320.5 | 743.3 | 7300.5 | 1.9 | 284.0 | 574.3 | 2.6 | 114183.6 |
| 7 | 187.3 | 434.6 | 5239.1 | 1.5 | 155.9 | 416.4 | 5.5 | 95155.6 |
| 8 | 88.5 | 203.7 | 3164.5 | 0.7 | 149.1 | 223.6 | 4.8 | 88131.2 |
| 9 | 36.7 | 86.1 | 1250.6 | 0.1 | 303.5 | 32.9 | 0.0 | 58049.2 |
| 10 | 13.1 | 31.0 | 425.1 | 0.2 | 27.2 | 106.6 | 0.0 | 23233.8 |
| 11 | 5.1 | 12.6 | 126.7 | 0.0 | 54.2 | 11.9 | 0.0 | 6058.4 |
| 12 | 1.5 | 2.9 | 24.5 | 0.0 | 0.1 | 0.2 | 0.0 | 3345.8 |
| 13 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 494.9 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 27.1 | 0.0 | 0.0 | 372.8 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 367.8 |
| SOP | 945.2 | 2329.3 | 16522.4 | 2.7 | 522.8 | 891.9 | 188.8 | 247169.0 |
| Catch | 927.4 | 2307.0 | 16474.0 | 2.7 | 522.8 | 890.5 | 188.8 | 247488.9 |
| SOP% | 102% | 101% | 100% | 100% | 100% | 100% | 100% | 100% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 2**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 0.0 | 7.7 | 0.0 |
| 2 | 32.8 | 0.2 | 4.3 | 0.0 | 170.9 | 4702.9 | 271.8 | 7.7 |
| 3 | 88.6 | 0.5 | 1.3 | 0.1 | 227.5 | 188.5 | 164.9 | 9.9 |
| 4 | 141.1 | 0.8 | 1.1 | 0.1 | 394.4 | 105.1 | 90.4 | 224.2 |
| 5 | 162.9 | 0.8 | 0.8 | 0.1 | 711.4 | 109.3 | 15.4 | 168.6 |
| 6 | 163.5 | 0.9 | 0.3 | 0.1 | 526.8 | 108.2 | 23.0 | 156.3 |
| 7 | 86.1 | 0.5 | 0.2 | 0.1 | 321.7 | 189.0 | 1.0 | 191.8 |
| 8 | 18.3 | 0.0 | 0.3 | 0.0 | 323.3 | 92.9 | 15.9 | 200.0 |
| 9 | 41.9 | 0.1 | 0.1 | 0.0 | 484.7 | 7.1 | 0.0 | 199.4 |
| 10 | 39.8 | 0.1 | 0.0 | 0.0 | 435.9 | 6.7 | 0.0 | 57.8 |
| 11 | 11.3 | 0.0 | 0.0 | 0.0 | 166.1 | 2.2 | 0.0 | 7.3 |
| 12 | 17.6 | 0.0 | 0.0 | 0.0 | 255.8 | 3.4 | 0.0 | 2.4 |
| 13 | 4.2 | 0.0 | 0.0 | 0.0 | 61.0 | 0.8 | 0.0 | 0.6 |
| 14 | 3.5 | 0.0 | 0.0 | 0.0 | 51.7 | 0.7 | 0.0 | 0.6 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 |
| SOP | 312.1 | 1.5 | 2.4 | 0.2 | 1545.2 | 1596.6 | 182.7 | 454.4 |
| Catch | 290.1 | 1.3 | 2.4 | 0.2 | 1521.9 | 1594.2 | 165.0 | 455.0 |
| SOP% | 108% | 110% | 99% | 110% | 102% | 100% | 111% | 100% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 1.0 |
| 2 | 1173.6 | 144.9 | 3.8 | 2.1 | 0.0 | 1.3 | 43.7 | 13.6 |
| 3 | 4001.0 | 875.2 | 37.1 | 7.0 | 0.0 | 5.1 | 302.9 | 53.0 |
| 4 | 1940.1 | 2724.9 | 65.0 | 16.9 | 0.0 | 8.5 | 152.6 | 89.4 |
| 5 | 8128.2 | 2713.1 | 147.6 | 439.5 | 0.0 | 9.2 | 62.6 | 96.9 |
| 6 | 8864.8 | 1707.8 | 179.5 | 706.6 | 0.0 | 9.9 | 54.4 | 104.2 |
| 7 | 5055.6 | 891.0 | 95.1 | 455.5 | 0.0 | 6.2 | 51.5 | 64.6 |
| 8 | 1605.9 | 598.4 | 44.4 | 344.7 | 0.0 | 3.8 | 24.1 | 40.3 |
| 9 | 1603.3 | 324.8 | 47.5 | 492.7 | 0.0 | 1.8 | 12.7 | 19.1 |
| 10 | 1354.2 | 129.1 | 44.5 | 740.0 | 0.0 | 0.6 | 8.2 | 6.7 |
| 11 | 440.0 | 0.0 | 17.7 | 334.1 | 0.0 | 0.3 | 0.6 | 2.6 |
| 12 | 856.8 | 0.0 | 5.2 | 87.8 | 0.0 | 0.1 | 0.1 | 1.2 |
| 13 | 184.6 | 0.0 | 1.8 | 31.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 140.0 | 0.0 | 2.1 | 38.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15+ | 10.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 12045.4 | 3566.9 | 268.9 | 1272.7 | 0.0 | 13.8 | 188.1 | 145.4 |
| Catch | 12062.3 | 3567.0 | 262.8 | 1272.7 | 0.0 | 13.7 | 188.0 | 144.0 |
| SOP% | 100% | 100% | 102% | 100% | 98% | 101% | 100% | 101% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 2**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 1.0 | 59.8 | 31.3 | 2.6 | 0.0 | 0.3 | 2.1 | 0.0 |
| 2 | 3.7 | 1902.3 | 513.2 | 37.1 | 0.2 | 4.5 | 29.9 | 0.0 |
| 3 | 2.9 | 1264.2 | 355.4 | 39.3 | 0.7 | 17.7 | 228.0 | 0.0 |
| 4 | 0.9 | 691.7 | 205.4 | 20.7 | 2.0 | 30.4 | 1352.3 | 0.0 |
| 5 | 0.7 | 113.3 | 65.3 | 13.7 | 2.8 | 32.6 | 665.9 | 0.0 |
| 6 | 0.5 | 173.0 | 82.2 | 10.6 | 3.1 | 35.1 | 1164.9 | 0.0 |
| 7 | 0.3 | 0.0 | 24.8 | 7.4 | 2.1 | 21.9 | 657.6 | 0.0 |
| 8 | 0.3 | 119.4 | 45.1 | 8.6 | 1.9 | 13.8 | 581.7 | 0.0 |
| 9 | 0.0 | 0.0 | 7.9 | 2.3 | 1.1 | 6.9 | 1042.8 | 0.0 |
| 10 | 0.1 | 0.0 | 2.7 | 1.8 | 0.5 | 2.3 | 105.7 | 0.0 |
| 11 | 0.0 | 0.0 | 1.0 | 0.2 | 0.0 | 0.9 | 184.0 | 0.0 |
| 12 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.4 | 2.7 | 0.0 |
| 13 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 89.1 | 0.0 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 2.4 | 1343.1 | 405.8 | 32.9 | 4.9 | 49.5 | 2044.9 | 0.0 |
| Catch | 2.4 | 1206.3 | 371.7 | 32.9 | 4.9 | 49.0 | 2041.9 | 0.0 |
| SOP% | 98% | 111% | 109% | 100% | 100% | 101% | 100% | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 146.1 | 491.3 | 503.4 | 0.0 | 6.0 | 1222.0 | 388.1 | 2864.0 |
| 2 | 164.6 | 548.7 | 3966.7 | 0.1 | 2.6 | 2419.8 | 509.1 | 16675.9 |
| 3 | 73.9 | 299.1 | 2137.4 | 3.3 | 2.2 | 1921.5 | 113.7 | 12421.6 |
| 4 | 137.6 | 801.3 | 5916.0 | 3.2 | 2.1 | 468.2 | 45.5 | 15631.8 |
| 5 | 314.5 | 1877.6 | 9309.3 | 4.3 | 1.6 | 507.6 | 91.3 | 25767.0 |
| 6 | 406.3 | 2444.3 | 6707.8 | 8.4 | 1.9 | 755.0 | 91.1 | 24490.6 |
| 7 | 361.0 | 2177.1 | 4968.8 | 8.8 | 1.3 | 514.1 | 130.9 | 16285.7 |
| 8 | 263.3 | 1591.5 | 3114.8 | 4.4 | 1.1 | 228.0 | 66.2 | 9352.5 |
| 9 | 113.4 | 685.6 | 1273.1 | 0.8 | 0.5 | 36.2 | 40.1 | 6445.9 |
| 10 | 39.4 | 238.0 | 481.5 | 1.3 | 0.2 | 41.8 | 23.6 | 3761.9 |
| 11 | 13.6 | 82.4 | 156.6 | 0.1 | 0.1 | 1.2 | 5.5 | 1427.5 |
| 12 | 1.9 | 11.8 | 49.0 | 0.5 | 0.1 | 1.9 | 0.0 | 1299.1 |
| 13 | 0.0 | 0.1 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 286.9 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 326.4 |
| 15+ | 0.0 | 0.1 | 20.3 | 0.0 | 0.0 | 0.0 | 0.0 | 31.7 |
| SOP | 650.5 | 3780.2 | 13649.0 | 13.6 | 4.6 | 1759.0 | 430.4 | 45766.1 |
| Catch | 650.3 | 3779.6 | 13495.6 | 13.6 | 4.4 | 1782.1 | 430.4 | 45410.1 |
| SOP% | 100% | 100% | 101% | 100% | 104% | 99% | 100% | 101% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 3**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 9.5 | 7.9 |
| 2 | 67.6 | 2.2 | 0.1 | 2.2 | 2768.2 | 2213.7 | 802.7 | 98.3 |
| 3 | 144.4 | 4.5 | 0.2 | 0.8 | 2048.6 | 153.2 | 83.6 | 24.4 |
| 4 | 227.0 | 6.1 | 0.3 | 0.8 | 2647.5 | 150.2 | 51.3 | 27.8 |
| 5 | 253.8 | 4.3 | 0.3 | 0.7 | 5406.2 | 161.0 | 13.3 | 22.2 |
| 6 | 278.1 | 2.1 | 0.4 | 0.5 | 4172.8 | 168.2 | 22.8 | 16.4 |
| 7 | 135.2 | 0.6 | 0.2 | 0.2 | 1527.7 | 145.7 | 26.6 | 27.0 |
| 8 | 17.5 | 0.1 | 0.0 | 0.1 | 1691.8 | 47.9 | 32.3 | 27.6 |
| 9 | 30.5 | 0.1 | 0.0 | 0.1 | 1002.6 | 12.4 | 0.0 | 18.3 |
| 10 | 30.2 | 0.0 | 0.0 | 0.0 | 1034.2 | 12.3 | 0.0 | 18.6 |
| 11 | 4.6 | 0.0 | 0.0 | 0.0 | 277.8 | 1.3 | 0.0 | 10.8 |
| 12 | 3.0 | 0.0 | 0.0 | 0.0 | 144.1 | 0.7 | 0.0 | 0.4 |
| 13 | 0.6 | 0.0 | 0.0 | 0.0 | 95.4 | 0.4 | 0.0 | 1.7 |
| 14 | 0.7 | 0.0 | 0.0 | 0.0 | 22.4 | 0.0 | 0.0 | 0.2 |
| 15+ | 0.3 | 0.0 | 0.0 | 0.0 | 23.0 | 0.0 | 0.0 | 0.2 |
| SOP | 454.4 | 7.9 | 0.6 | 1.7 | 8392.8 | 933.1 | 326.5 | 87.8 |
| Catch | 419.6 | 7.9 | 0.6 | 1.7 | 8336.3 | 916.3 | 327.3 | 89.0 |
| SOP% | 108% | 100% | 111% | 102% | 101% | 102% | 100% | 99% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 41.7 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 40165.1 | 3737.6 | 300.2 | 319.4 | 0.0 | 0.1 | 7.4 | 0.9 |
| 3 | 83456.8 | 18636.0 | 6734.5 | 1572.8 | 0.0 | 0.2 | 50.2 | 0.4 |
| 4 | 71044.1 | 65864.9 | 17680.8 | 5547.9 | 0.0 | 0.3 | 31.3 | 0.8 |
| 5 | 137092.7 | 83784.6 | 27869.4 | 7061.1 | 0.0 | 0.3 | 22.7 | 0.7 |
| 6 | 151666.6 | 67703.6 | 29345.8 | 5708.0 | 0.0 | 0.3 | 17.4 | 0.6 |
| 7 | 93699.2 | 41072.7 | 14571.1 | 3462.9 | 0.0 | 0.2 | 18.1 | 1.2 |
| 8 | 59721.9 | 34423.5 | 6843.0 | 2902.8 | 0.0 | 0.0 | 12.3 | 1.3 |
| 9 | 36774.3 | 20714.8 | 5329.6 | 1749.2 | 0.0 | 0.0 | 6.5 | 0.7 |
| 10 | 30385.4 | 8233.9 | 1352.2 | 700.8 | 0.0 | 0.0 | 4.7 | 1.1 |
| 11 | 13412.6 | 1959.8 | 90.1 | 168.4 | 0.0 | 0.0 | 0.4 | 0.7 |
| 12 | 5834.1 | 272.9 | 13.9 | 23.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 3215.5 | 86.7 | 1.4 | 7.6 | 0.0 | 0.0 | 0.0 | 0.1 |
| 14 | 1028.3 | 0.0 | 0.6 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15+ | 208.4 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 269230.7 | 138668.3 | 46324.3 | 11692.6 | 0.0 | 0.6 | 49.8 | 2.8 |
| Catch | 269326.2 | 138663.0 | 44648.1 | 11692.4 | 0.0 | 4.9 | 49.8 | 2.9 |
| SOP% | 100% | 100% | 104% | 100% | 99% | 11% | 100% | 98% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 3**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 5.6 | 340.9 | 253.1 | 47.4 | 0.0 | 0.1 | 0.3 | 0.0 |
| 2 | 9.5 | 3747.4 | 661.1 | 368.6 | 0.2 | 1.6 | 3.7 | 0.0 |
| 3 | 4.8 | 2044.0 | 310.7 | 366.3 | 0.2 | 0.8 | 27.6 | 0.0 |
| 4 | 1.2 | 1362.6 | 161.1 | 98.9 | 0.4 | 1.3 | 269.5 | 0.0 |
| 5 | 0.5 | 0.1 | 8.5 | 40.0 | 0.6 | 1.2 | 105.2 | 0.0 |
| 6 | 0.4 | 340.7 | 48.0 | 18.3 | 0.5 | 1.0 | 217.6 | 0.0 |
| 7 | 0.4 | 0.1 | 12.6 | 8.7 | 0.6 | 2.0 | 120.9 | 0.0 |
| 8 | 0.4 | 681.4 | 80.7 | 9.6 | 0.5 | 2.1 | 116.2 | 0.0 |
| 9 | 0.2 | 0.1 | 5.8 | 0.3 | 0.3 | 1.2 | 232.9 | 0.0 |
| 10 | 0.2 | 0.1 | 8.6 | 2.1 | 0.3 | 1.7 | 22.6 | 0.0 |
| 11 | 0.1 | 0.1 | 5.4 | 0.2 | 0.1 | 1.1 | 42.5 | 0.0 |
| 12 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 0.2 | 0.2 | 0.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.7 | 0.0 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 5.3 | 3443.3 | 508.7 | 216.1 | 1.3 | 4.8 | 405.3 | 0.0 |
| Catch | 5.3 | 3443.2 | 509.2 | 216.1 | 1.3 | 4.9 | 405.4 | 0.0 |
| SOP% | 99% | 100% | 100% | 100% | 99% | 98% | 100% | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 15.6 | 148.5 | 1.8 | 0.0 | 0.0 | 192.7 | 0.6 | 359.2 |
| 1 | 277.1 | 120.9 | 7.0 | 0.0 | 0.1 | 1789.8 | 0.0 | 2901.6 |
| 2 | 541.2 | 269.4 | 77.9 | 0.0 | 1.1 | 1842.1 | 0.0 | 58009.3 |
| 3 | 327.1 | 142.9 | 26.1 | 0.0 | 0.6 | 722.6 | 0.0 | 116884.3 |
| 4 | 161.8 | 49.8 | 47.8 | 0.0 | 0.4 | 106.6 | 0.0 | 165542.7 |
| 5 | 93.7 | 32.8 | 43.2 | 0.0 | 0.0 | 21.9 | 0.0 | 262040.9 |
| 6 | 73.2 | 31.3 | 39.2 | 0.0 | 0.1 | 16.8 | 0.0 | 259890.7 |
| 7 | 39.9 | 15.0 | 34.0 | 0.0 | 0.0 | 9.0 | 0.0 | 154931.8 |
| 8 | 30.0 | 13.4 | 24.2 | 0.0 | 0.2 | 23.7 | 0.0 | 106704.6 |
| 9 | 9.9 | 3.1 | 9.4 | 0.0 | 0.0 | 0.0 | 0.0 | 65902.1 |
| 10 | 4.8 | 1.5 | 8.0 | 0.0 | 0.0 | 0.0 | 0.0 | 41823.3 |
| 11 | 0.5 | 0.2 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 15978.5 |
| 12 | 0.1 | 0.5 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 6293.9 |
| 13 | 0.4 | 1.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 3412.6 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1073.3 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 232.1 |
| SOP | 435.1 | 173.6 | 114.8 | 0.0 | 1.0 | 980.6 | 0.0 | 482448.9 |
| Catch | 446.3 | 175.5 | 117.3 | 0.0 | 1.0 | 978.4 | 0.0 | 480790.1 |
| SOP% | 97% | 99% | 98% | | 100% | 100% | 92% | 100% |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.2 | 0.0 | 0.0 | 0.0 | 7203.0 | 0.7 | 7.0 | 440.9 |
| 2 | 13.4 | 0.0 | 0.0 | 0.1 | 63749.8 | 82.9 | 32.0 | 3282.3 |
| 3 | 16.0 | 0.0 | 0.0 | 0.1 | 79043.2 | 15.6 | 17.3 | 641.9 |
| 4 | 22.4 | 0.0 | 0.0 | 0.2 | 103337.3 | 27.6 | 12.0 | 169.6 |
| 5 | 25.7 | 0.0 | 0.0 | 0.3 | 120000.9 | 50.8 | 9.8 | 15.5 |
| 6 | 19.0 | 0.0 | 0.0 | 0.2 | 88871.6 | 25.0 | 7.6 | 10.9 |
| 7 | 11.2 | 0.0 | 0.0 | 0.1 | 54119.4 | 26.7 | 5.5 | 21.7 |
| 8 | 9.7 | 0.0 | 0.0 | 0.1 | 44731.3 | 20.7 | 5.5 | 20.9 |
| 9 | 6.4 | 0.0 | 0.0 | 0.1 | 29295.0 | 8.5 | 0.7 | 11.9 |
| 10 | 3.7 | 0.0 | 0.0 | 0.0 | 16086.2 | 8.0 | 1.1 | 17.6 |
| 11 | 1.3 | 0.0 | 0.0 | 0.0 | 6360.7 | 1.1 | 0.4 | 10.8 |
| 12 | 0.6 | 0.0 | 0.0 | 0.0 | 2935.1 | 0.6 | 0.0 | 0.4 |
| 13 | 0.2 | 0.0 | 0.0 | 0.0 | 868.2 | 0.1 | 0.1 | 1.7 |
| 14 | 0.1 | 0.0 | 0.0 | 0.0 | 300.0 | 0.1 | 0.0 | 0.0 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 150.0 | 0.1 | 0.0 | 0.0 |
| SOP | 49.7 | 0.0 | 0.0 | 0.5 | 234159.7 | 97.4 | 37.2 | 952.0 |
| Catch | 49.3 | 0.0 | 0.0 | 0.5 | 233507.1 | 97.4 | 36.9 | 954.4 |
| SOP% | 101% | 112% | 0% | 99% | 100% | 100% | 101% | 100% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 61.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 17048.8 | 0.0 | 0.0 | 45.6 | 0.0 | 0.0 | 1.2 | 0.0 |
| 3 | 9529.4 | 0.0 | 0.9 | 42.1 | 0.0 | 0.0 | 1.0 | 0.0 |
| 4 | 24746.1 | 0.0 | 2.1 | 88.9 | 0.0 | 0.0 | 1.9 | 0.0 |
| 5 | 40375.3 | 0.0 | 3.7 | 128.3 | 0.0 | 0.0 | 2.9 | 0.0 |
| 6 | 42803.7 | 0.0 | 4.2 | 138.0 | 0.0 | 0.0 | 2.2 | 0.0 |
| 7 | 18656.0 | 0.0 | 2.0 | 88.1 | 0.0 | 0.0 | 1.4 | 0.0 |
| 8 | 18822.7 | 0.0 | 0.9 | 83.9 | 0.0 | 0.0 | 0.7 | 0.0 |
| 9 | 10008.2 | 0.0 | 0.7 | 72.1 | 0.0 | 0.0 | 0.5 | 0.0 |
| 10 | 9390.3 | 0.0 | 0.2 | 19.2 | 0.0 | 0.0 | 0.2 | 0.0 |
| 11 | 3993.5 | 0.0 | 0.0 | 34.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 1745.4 | 0.0 | 0.0 | 15.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 323.0 | 0.0 | 0.0 | 7.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 340.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15+ | 170.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 76426.6 | 0.0 | 6.3 | 290.8 | 0.0 | 0.0 | 4.3 | 0.0 |
| Catch | 76404.0 | 0.0 | 6.0 | 290.8 | 0.0 | 4.4 | 4.3 | 0.0 |
| SOP% | 100% | | 105% | 100% | 99% | 0% | 100% | |

**Table 8.3.3.1. NE Atlantic Mackerel. Catch numbers ('000s) -at-age by area for 2016 (cont.).**

**Quarter 4**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| 1 | 7.8 | 185.2 | 410.5 | 141.1 | 0.0 | 0.2 | 1.1 | 0.0 |
| 2 | 54.2 | 2048.0 | 1045.9 | 472.7 | 0.0 | 1.1 | 8.5 | 0.0 |
| 3 | 10.9 | 1115.5 | 477.3 | 184.8 | 0.0 | 0.5 | 2.2 | 0.0 |
| 4 | 2.7 | 753.3 | 169.8 | 40.4 | 0.0 | 0.2 | 0.9 | 0.0 |
| 5 | 0.0 | 14.6 | 17.0 | 13.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 0.1 | 197.3 | 55.6 | 4.5 | 0.0 | 0.1 | 0.1 | 0.0 |
| 7 | 0.0 | 25.2 | 10.9 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8 | 0.0 | 395.0 | 68.8 | 3.4 | 0.0 | 0.1 | 0.3 | 0.0 |
| 9 | 0.0 | 14.4 | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 21.6 | 4.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 0.0 | 13.6 | 2.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 0.0 | 0.5 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 0.0 | 2.2 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SOP | 15.2 | 1922.9 | 597.4 | 152.0 | 0.0 | 0.6 | 3.3 | 0.0 |
| Catch | 15.2 | 1924.1 | 597.7 | 152.0 | 0.0 | 0.6 | 3.3 | 0.0 |
| SOP% | 100% | 100% | 100% | 100% | 72% | 99% | 100% | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 109.7 | 221.8 | 18.1 | 0.0 | 0.0 | 2.6 | 0.2 | 356.9 |
| 1 | 333.0 | 464.5 | 583.3 | 0.0 | 0.0 | 3181.5 | 0.0 | 13021.6 |
| 2 | 1015.0 | 1217.6 | 421.5 | 0.0 | 0.0 | 2349.0 | 0.0 | 92889.6 |
| 3 | 495.8 | 580.7 | 107.4 | 0.0 | 0.0 | 1198.4 | 0.0 | 93481.0 |
| 4 | 145.2 | 181.3 | 152.4 | 0.0 | 0.0 | 205.3 | 0.0 | 130059.3 |
| 5 | 41.6 | 59.0 | 93.6 | 0.0 | 0.0 | 39.8 | 0.0 | 160892.5 |
| 6 | 28.8 | 43.2 | 59.9 | 0.0 | 0.0 | 31.3 | 0.0 | 132303.2 |
| 7 | 25.5 | 34.8 | 56.1 | 0.0 | 0.0 | 10.6 | 0.0 | 73096.7 |
| 8 | 14.4 | 21.0 | 44.9 | 0.0 | 0.0 | 9.6 | 0.0 | 64253.6 |
| 9 | 5.1 | 7.1 | 19.3 | 0.0 | 0.0 | 0.0 | 0.0 | 39452.7 |
| 10 | 2.6 | 3.5 | 11.1 | 0.0 | 0.0 | 0.0 | 0.0 | 25569.6 |
| 11 | 0.8 | 1.1 | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 10423.1 |
| 12 | 0.5 | 0.7 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 4699.7 |
| 13 | 1.1 | 1.6 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 1206.5 |
| 14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 640.8 |
| 15+ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 320.1 |
| SOP | 492.0 | 611.9 | 368.8 | 0.0 | 0.0 | 1396.3 | 0.0 | 317577.4 |
| Catch | 495.4 | 616.2 | 382.0 | 0.0 | 0.0 | 1451.5 | 0.0 | 320377.3 |
| SOP% | 99% | 99% | 97% | | 75% | 96% | 98% | 99% |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5%.**

**Quarters 1-4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 0% | 1% | | | 1% | 0% | 1% | 0% |
| 2 | 5% | 10% | 43% | 31% | 10% | 79% | 63% | 4% |
| 3 | 12% | 21% | 15% | 13% | 13% | 4% | 16% | 3% |
| 4 | 18% | 29% | 14% | 15% | 17% | 3% | 9% | 16% |
| 5 | 21% | 21% | 12% | 15% | 20% | 4% | 2% | 20% |
| 6 | 22% | 13% | 7% | 11% | 15% | 3% | 3% | 16% |
| 7 | 11% | 4% | 4% | 7% | 9% | 4% | 2% | 14% |
| 8 | 2% | 0% | 3% | 4% | 7% | 2% | 3% | 13% |
| 9 | 4% | 1% | 1% | 2% | 5% | 0% | 0% | 8% |
| 10 | 3% | 0% | 0% | 1% | 3% | 0% | 0% | 4% |
| 11 | 1% | | | 0% | 1% | 0% | 0% | 1% |
| 12 | 1% | | | | 1% | 0% | 0% | 0% |
| 13 | 0% | | | | 0% | 0% | 0% | 0% |
| 14 | 0% | | 0% | 0% | 0% | 0% | | 0% |
| 15+ | 0% | | 0% | 0% | 0% | 0% | | 0% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 0% | | 0% | 0% | 11% | 0% | 0% | 0% |
| 2 | 6% | 1% | 0% | 1% | 33% | 3% | 3% | 3% |
| 3 | 10% | 5% | 6% | 4% | 6% | 11% | 18% | 11% |
| 4 | 10% | 19% | 16% | 15% | 6% | 18% | 16% | 18% |
| 5 | 19% | 24% | 25% | 21% | 8% | 20% | 17% | 19% |
| 6 | 21% | 19% | 27% | 19% | 8% | 21% | 13% | 20% |
| 7 | 12% | 12% | 13% | 11% | 9% | 13% | 13% | 13% |
| 8 | 8% | 10% | 6% | 11% | 8% | 8% | 10% | 8% |
| 9 | 5% | 6% | 5% | 9% | 5% | 4% | 5% | 4% |
| 10 | 4% | 2% | 1% | 4% | 5% | 1% | 4% | 2% |
| 11 | 2% | 1% | 0% | 1% | 3% | 1% | 0% | 1% |
| 12 | 1% | 0% | 0% | 3% | | 0% | 0% | 0% |
| 13 | 0% | 0% | 0% | 1% | | | 0% | 0% |
| 14 | 0% | | 0% | 0% | | | | 0% |
| 15+ | 0% | | 0% | 1% | | | | |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarters 1-4**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 0% | | | 0% | | |
| 1 | 13% | 2% | 12% | 10% | 2% | 7% | 0% | |
| 2 | 61% | 44% | 44% | 49% | 7% | 20% | 0% | |
| 3 | 17% | 27% | 23% | 27% | 5% | 9% | 3% | 2% |
| 4 | 4% | 16% | 11% | 7% | 13% | 13% | 22% | 23% |
| 5 | 1% | 2% | 2% | 3% | 17% | 14% | 10% | 10% |
| 6 | 1% | 4% | 4% | 2% | 18% | 15% | 19% | 19% |
| 7 | 1% | 0% | 1% | 1% | 13% | 10% | 11% | 10% |
| 8 | 1% | 5% | 3% | 1% | 12% | 7% | 10% | 10% |
| 9 | 0% | 0% | 0% | 0% | 8% | 3% | 18% | 19% |
| 10 | 0% | 0% | 0% | 0% | 4% | 2% | 2% | 2% |
| 11 | 0% | 0% | 0% | 0% | 1% | 1% | 3% | 4% |
| 12 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| 13 | 0% | 0% | 0% | 0% | 0% | 0% | 0% | |
| 14 | | | | 0% | 0% | 0% | 2% | 2% |
| 15+ | | | | | | | | |

| Age | 8.a | 8.b | 8.c.E | 8.c.W | 8.d | 9.a.N | 9.aC.N | All |
|---|---|---|---|---|---|---|---|---|
| 0 | 1% | 1% | 0% | | | 1% | 0% | 0% |
| 1 | 10% | 7% | 24% | | 1% | 26% | 18% | 2% |
| 2 | 30% | 22% | 10% | 0% | 0% | 33% | 31% | 7% |
| 3 | 19% | 14% | 5% | 11% | 2% | 19% | 26% | 9% |
| 4 | 9% | 8% | 12% | 9% | 23% | 5% | 3% | 14% |
| 5 | 8% | 11% | 18% | 12% | 9% | 4% | 5% | 20% |
| 6 | 8% | 13% | 13% | 24% | 18% | 6% | 4% | 18% |
| 7 | 6% | 11% | 9% | 24% | 10% | 4% | 6% | 11% |
| 8 | 4% | 7% | 6% | 12% | 10% | 2% | 3% | 9% |
| 9 | 2% | 3% | 2% | 2% | 20% | 0% | 2% | 6% |
| 10 | 1% | 1% | 1% | 3% | 2% | 1% | 1% | 3% |
| 11 | 0% | 0% | 0% | 0% | 4% | 0% | 0% | 1% |
| 12 | 0% | 0% | 0% | 1% | 0% | 0% | | 1% |
| 13 | 0% | 0% | 0% | | | | | 0% |
| 14 | | | | | 2% | | | 0% |
| 15+ | 0% | 0% | 0% | | | | | 0% |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 1**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | 1% | | | 2% | 2% | 60% | 44% | 3% |
| 3 | 3% | | | 2% | 3% | 21% | 32% | 3% |
| 4 | 15% | | | 16% | 18% | 11% | 16% | 16% |
| 5 | 20% | | | 20% | 19% | 3% | 4% | 20% |
| 6 | 17% | | | 18% | 13% | 3% | 4% | 17% |
| 7 | 15% | | | 16% | 15% | 1% | | 14% |
| 8 | 14% | | | 14% | 14% | 1% | | 13% |
| 9 | 9% | | | 10% | 10% | | | 8% |
| 10 | 4% | | | 4% | 4% | | | 4% |
| 11 | 1% | | | | 2% | | | 1% |
| 12 | 1% | | | | 1% | | | 0% |
| 13 | | | | | 0% | | | 0% |
| 14 | | | | | | | | |
| 15+ | | | | | 0% | | | 0% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | | | | | 25% | | 0% | 1% |
| 2 | 1% | | | | 71% | | 2% | 6% |
| 3 | 3% | | | | 4% | | 17% | 24% |
| 4 | 15% | | | | | | 16% | 21% |
| 5 | 20% | | | 6% | | | 18% | 9% |
| 6 | 17% | | | 13% | | | 13% | 12% |
| 7 | 16% | | | 6% | | | 14% | 8% |
| 8 | 14% | | | 19% | | | 10% | 6% |
| 9 | 9% | | | 25% | | | 6% | 9% |
| 10 | 4% | | | | | | 4% | 2% |
| 11 | 1% | | | | | | 0% | 1% |
| 12 | 1% | | | 19% | | | | |
| 13 | | | | 6% | | | | |
| 14 | | | | | | | | 1% |
| 15+ | | | | 6% | | | | |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 1**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 18% | 0% | 5% | 10% | 15% | 25% | 0% | |
| 2 | 55% | 44% | 46% | 59% | 40% | 68% | 0% | |
| 3 | 21% | 32% | 28% | 21% | 4% | 5% | 2% | 2% |
| 4 | 3% | 16% | 13% | 5% | 10% | 1% | 22% | 23% |
| 5 | 1% | 4% | 3% | 2% | 4% | 0% | 10% | 10% |
| 6 | 1% | 4% | 3% | 1% | 8% | 0% | 18% | 19% |
| 7 | 0% | | 0% | 1% | 5% | 0% | 11% | 10% |
| 8 | | | | 1% | 4% | 0% | 10% | 10% |
| 9 | | | | 1% | 9% | 0% | 19% | 19% |
| 10 | | | | 0% | 1% | 0% | 2% | 2% |
| 11 | | | | 0% | 2% | 0% | 3% | 4% |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | 0% | 1% | 0% | 2% | 2% |
| 15+ | | | | | | | | |

| Age | 8.a | 8.b | 8.c.E | 8.c.W | 8.d | 9.a.N | 9.aC.N | All |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 6% | 8% | 36% | | 0% | 6% | 1% | 4% |
| 2 | 31% | 34% | 10% | 0% | 0% | 33% | 23% | 5% |
| 3 | 25% | 25% | 4% | 18% | 2% | 18% | 67% | 5% |
| 4 | 12% | 10% | 10% | 11% | 23% | 7% | 3% | 15% |
| 5 | 10% | 8% | 14% | 13% | 9% | 8% | 3% | 19% |
| 6 | 8% | 7% | 11% | 24% | 19% | 12% | 0% | 15% |
| 7 | 5% | 4% | 8% | 19% | 10% | 9% | 1% | 13% |
| 8 | 2% | 2% | 5% | 9% | 10% | 5% | 1% | 12% |
| 9 | 1% | 1% | 2% | 2% | 20% | 1% | | 8% |
| 10 | 0% | 0% | 1% | 2% | 2% | 2% | | 3% |
| 11 | 0% | 0% | 0% | 0% | 4% | 0% | | 1% |
| 12 | 0% | 0% | 0% | 1% | 0% | 0% | | 0% |
| 13 | | 0% | 0% | | | | | 0% |
| 14 | | | | | 2% | | | 0% |
| 15+ | | | 0% | | | | | 0% |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 2**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | 0% | | 1% | |
| 2 | 4% | 5% | 51% | 5% | 4% | 85% | 46% | 1% |
| 3 | 11% | 14% | 15% | 14% | 6% | 3% | 28% | 1% |
| 4 | 17% | 21% | 13% | 21% | 10% | 2% | 15% | 18% |
| 5 | 20% | 21% | 10% | 21% | 17% | 2% | 3% | 14% |
| 6 | 20% | 23% | 4% | 23% | 13% | 2% | 4% | 13% |
| 7 | 11% | 12% | 2% | 12% | 8% | 3% | 0% | 16% |
| 8 | 2% | | 3% | | 8% | 2% | 3% | 16% |
| 9 | 5% | 2% | 1% | 2% | 12% | 0% | | 16% |
| 10 | 5% | 2% | | 2% | 11% | 0% | | 5% |
| 11 | 1% | | | | 4% | 0% | | 1% |
| 12 | 2% | | | | 6% | 0% | | 0% |
| 13 | 1% | | | | 1% | 0% | | 0% |
| 14 | 0% | | 0% | | 1% | 0% | | 0% |
| 15+ | | | 0% | | 0% | | | 0% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | | | | | | 0% | 0% | 0% |
| 2 | 3% | 1% | 1% | 0% | | 3% | 6% | 3% |
| 3 | 11% | 9% | 5% | 0% | 8% | 11% | 42% | 11% |
| 4 | 5% | 27% | 9% | 0% | 15% | 18% | 21% | 18% |
| 5 | 23% | 27% | 21% | 12% | 23% | 20% | 9% | 20% |
| 6 | 25% | 17% | 26% | 19% | 23% | 21% | 8% | 21% |
| 7 | 14% | 9% | 14% | 12% | 15% | 13% | 7% | 13% |
| 8 | 5% | 6% | 6% | 9% | 8% | 8% | 3% | 8% |
| 9 | 5% | 3% | 7% | 13% | 8% | 4% | 2% | 4% |
| 10 | 4% | 1% | 6% | 20% | | 1% | 1% | 1% |
| 11 | 1% | | 3% | 9% | | 1% | 0% | 1% |
| 12 | 2% | | 1% | 2% | | 0% | 0% | 0% |
| 13 | 1% | | 0% | 1% | | | | |
| 14 | 0% | | 0% | 1% | | | | |
| 15+ | 0% | | 0% | 0% | | | | |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 2**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 10% | 1% | 2% | 2% | 0% | 0% | 0% | |
| 2 | 35% | 44% | 38% | 26% | 1% | 3% | 0% | |
| 3 | 28% | 29% | 27% | 27% | 5% | 11% | 4% | |
| 4 | 8% | 16% | 15% | 14% | 14% | 18% | 22% | |
| 5 | 6% | 3% | 5% | 10% | 19% | 20% | 11% | |
| 6 | 5% | 4% | 6% | 7% | 21% | 21% | 19% | |
| 7 | 3% | 0% | 2% | 5% | 14% | 13% | 11% | |
| 8 | 3% | 3% | 3% | 6% | 13% | 8% | 10% | |
| 9 | 0% | | 1% | 2% | 8% | 4% | 17% | |
| 10 | 1% | 0% | 0% | 1% | 3% | 1% | 2% | |
| 11 | 0% | | 0% | 0% | 0% | 1% | 3% | |
| 12 | | | 0% | 0% | 0% | 0% | 0% | |
| 13 | | | | | | | | |
| 14 | | | | 0% | | 0% | 1% | |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | | | | | | | | |
| 1 | 7% | 4% | 1% | | 31% | 15% | 26% | 2% |
| 2 | 8% | 5% | 10% | 0% | 13% | 30% | 34% | 12% |
| 3 | 4% | 3% | 6% | 9% | 11% | 24% | 8% | 9% |
| 4 | 7% | 7% | 15% | 9% | 11% | 6% | 3% | 11% |
| 5 | 15% | 17% | 24% | 12% | 8% | 6% | 6% | 19% |
| 6 | 20% | 22% | 17% | 24% | 10% | 9% | 6% | 18% |
| 7 | 18% | 19% | 13% | 25% | 7% | 6% | 9% | 12% |
| 8 | 13% | 14% | 8% | 12% | 6% | 3% | 4% | 7% |
| 9 | 6% | 6% | 3% | 2% | 3% | 0% | 3% | 5% |
| 10 | 2% | 2% | 1% | 4% | 1% | 1% | 2% | 3% |
| 11 | 1% | 1% | 0% | 0% | 0% | 0% | 0% | 1% |
| 12 | 0% | 0% | 0% | 1% | 0% | 0% | | 1% |
| 13 | 0% | 0% | 0% | | | | | 0% |
| 14 | | | | | | | | 0% |
| 15+ | 0% | 0% | 0% | | | | | 0% |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 3**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | 1% | | | | | 1% | 3% |
| 2 | 6% | 11% | 5% | 41% | 12% | 72% | 77% | 33% |
| 3 | 12% | 22% | 14% | 15% | 9% | 5% | 8% | 8% |
| 4 | 19% | 30% | 21% | 15% | 12% | 5% | 5% | 9% |
| 5 | 21% | 21% | 21% | 12% | 24% | 5% | 1% | 7% |
| 6 | 23% | 10% | 23% | 8% | 18% | 5% | 2% | 5% |
| 7 | 11% | 3% | 12% | 4% | 7% | 5% | 3% | 9% |
| 8 | 1% | 0% | | 3% | 7% | 2% | 3% | 9% |
| 9 | 3% | 0% | 2% | 1% | 4% | 0% | | 6% |
| 10 | 3% | 0% | 2% | 0% | 5% | 0% | | 6% |
| 11 | 0% | | | | 1% | 0% | | 4% |
| 12 | 0% | | | | 1% | 0% | | 0% |
| 13 | 0% | | | | 0% | 0% | | 1% |
| 14 | 0% | | | 0% | 0% | | | 0% |
| 15+ | 0% | | | 0% | 0% | | | 0% |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 0% | | 0% | | | | 0% | 0% |
| 2 | 6% | 1% | 0% | 1% | 8% | 5% | 4% | 11% |
| 3 | 11% | 5% | 6% | 5% | | 14% | 29% | 5% |
| 4 | 10% | 19% | 16% | 19% | 8% | 21% | 18% | 9% |
| 5 | 19% | 24% | 25% | 24% | 8% | 21% | 13% | 8% |
| 6 | 21% | 20% | 27% | 20% | 8% | 23% | 10% | 7% |
| 7 | 13% | 12% | 13% | 12% | 17% | 12% | 11% | 14% |
| 8 | 8% | 10% | 6% | 10% | 17% | | 7% | 15% |
| 9 | 5% | 6% | 5% | 6% | 8% | 2% | 4% | 8% |
| 10 | 4% | 2% | 1% | 2% | 17% | 2% | 3% | 12% |
| 11 | 2% | 1% | 0% | 1% | 8% | | 0% | 8% |
| 12 | 1% | 0% | 0% | 0% | | | 0% | 0% |
| 13 | 0% | 0% | 0% | 0% | | | 0% | 1% |
| 14 | 0% | | 0% | 0% | | | | |
| 15+ | 0% | | 0% | 0% | | | | |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 3**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 24% | 4% | 16% | 5% | 0% | 0% | 0% | |
| 2 | 41% | 44% | 42% | 38% | 6% | 11% | 0% | |
| 3 | 21% | 24% | 20% | 38% | 5% | 5% | 2% | |
| 4 | 5% | 16% | 10% | 10% | 11% | 9% | 23% | |
| 5 | 2% | 0% | 1% | 4% | 16% | 8% | 9% | |
| 6 | 2% | 4% | 3% | 2% | 12% | 7% | 18% | |
| 7 | 2% | 0% | 1% | 1% | 15% | 14% | 10% | |
| 8 | 2% | 8% | 5% | 1% | 14% | 15% | 10% | |
| 9 | 1% | 0% | 0% | 0% | 8% | 8% | 20% | |
| 10 | 1% | 0% | 1% | 0% | 8% | 12% | 2% | |
| 11 | 1% | 0% | 0% | 0% | 3% | 8% | 4% | |
| 12 | | | 0% | 0% | | 0% | 0% | |
| 13 | 0% | 0% | 0% | 0% | 1% | 1% | 0% | |
| 14 | | | | | | | 2% | |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 1% | 18% | 1% | | | 4% | 100% | 0% |
| 1 | 18% | 15% | 2% | | 4% | 38% | | 0% |
| 2 | 34% | 32% | 24% | | 44% | 39% | | 5% |
| 3 | 21% | 17% | 8% | | 24% | 15% | | 9% |
| 4 | 10% | 6% | 15% | | 16% | 2% | | 13% |
| 5 | 6% | 4% | 13% | | | 0% | | 21% |
| 6 | 5% | 4% | 12% | | 4% | 0% | | 21% |
| 7 | 3% | 2% | 11% | | | 0% | | 12% |
| 8 | 2% | 2% | 8% | | 8% | 1% | | 8% |
| 9 | 1% | 0% | 3% | | | | | 5% |
| 10 | 0% | 0% | 2% | | | | | 3% |
| 11 | 0% | 0% | 1% | | | | | 1% |
| 12 | 0% | 0% | 0% | | | | | 0% |
| 13 | 0% | 0% | 0% | | | | | 0% |
| 14 | | | | | | | | 0% |
| 15+ | | | | | | | | 0% |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 0% | | | | 1% | 0% | 7% | 9% |
| 2 | 10% | 11% | | 10% | 10% | 31% | 32% | 71% |
| 3 | 12% | 11% | | 9% | 13% | 6% | 17% | 14% |
| 4 | 17% | 22% | | 16% | 17% | 10% | 12% | 4% |
| 5 | 20% | 22% | | 24% | 19% | 19% | 10% | 0% |
| 6 | 15% | 11% | | 18% | 14% | 9% | 8% | 0% |
| 7 | 9% | 11% | | 11% | 9% | 10% | 6% | 0% |
| 8 | 7% | 11% | | 6% | 7% | 8% | 6% | 0% |
| 9 | 5% | | | 4% | 5% | 3% | 1% | 0% |
| 10 | 3% | | | 2% | 3% | 3% | 1% | 0% |
| 11 | 1% | | | | 1% | 0% | 0% | 0% |
| 12 | 0% | | | | 0% | 0% | 0% | 0% |
| 13 | 0% | | | | 0% | 0% | 0% | 0% |
| 14 | 0% | | | | 0% | 0% | | |
| 15+ | 0% | | | | 0% | 0% | | |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 0% | | | 0% | | | 0% | |
| 2 | 9% | | | 6% | 8% | | 10% | |
| 3 | 5% | | 6% | 6% | | | 8% | |
| 4 | 12% | | 15% | 12% | 8% | | 16% | |
| 5 | 20% | | 25% | 17% | 8% | | 25% | |
| 6 | 22% | | 29% | 18% | 8% | | 18% | |
| 7 | 9% | | 14% | 12% | 17% | | 11% | |
| 8 | 10% | | 6% | 11% | 17% | | 6% | |
| 9 | 5% | | 5% | 9% | 8% | | 4% | |
| 10 | 5% | | 1% | 3% | 17% | | 1% | |
| 11 | 2% | | | 4% | 8% | | 0% | |
| 12 | 1% | | | 2% | | | 0% | |
| 13 | 0% | | | 1% | | | | |
| 14 | 0% | | | | | | | |
| 15+ | 0% | | | | | | | |

**Table 8.3.3.2. NE Atlantic Mackerel. Percentage catch numbers-at-age by area for 2016. Zeros represent values <0.5% (cont.).**

**Quarter 4**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 0% | | | 8% | | |
| 1 | 10% | 4% | 18% | 16% | | 10% | 8% | |
| 2 | 72% | 43% | 46% | 55% | 50% | 47% | 65% | |
| 3 | 14% | 23% | 21% | 21% | 50% | 23% | 17% | |
| 4 | 4% | 16% | 7% | 5% | | 7% | 7% | |
| 5 | 0% | 0% | 1% | 2% | | 1% | | |
| 6 | 0% | 4% | 2% | 1% | | 2% | 1% | |
| 7 | 0% | 1% | 0% | 0% | | 0% | | |
| 8 | 0% | 8% | 3% | 0% | | 3% | 2% | |
| 9 | | 0% | 0% | | | | | |
| 10 | | 0% | 0% | 0% | | | | |
| 11 | | 0% | 0% | | | | | |
| 12 | | 0% | 0% | | | | | |
| 13 | | 0% | 0% | | | | | |
| 14 | | | | | | | | |
| 15+ | | | | | | | | |

| Age | 8.a | 8.b | 8.c.E | 8.c.W | 8.d | 9.a.N | 9.aC.N | All |
|---|---|---|---|---|---|---|---|---|
| 0 | 5% | 8% | 1% | | | 0% | 100% | 0% |
| 1 | 15% | 16% | 37% | | 33% | 45% | | 2% |
| 2 | 46% | 43% | 27% | | 50% | 33% | | 11% |
| 3 | 22% | 20% | 7% | | | 17% | | 11% |
| 4 | 7% | 6% | 10% | | 17% | 3% | | 15% |
| 5 | 2% | 2% | 6% | | | 1% | | 19% |
| 6 | 1% | 2% | 4% | | | 0% | | 16% |
| 7 | 1% | 1% | 4% | | | 0% | | 9% |
| 8 | 1% | 1% | 3% | | | 0% | | 8% |
| 9 | 0% | 0% | 1% | | | | | 5% |
| 10 | 0% | 0% | 1% | | | | | 3% |
| 11 | 0% | 0% | 0% | | | | | 1% |
| 12 | 0% | 0% | 0% | | | | | 1% |
| 13 | 0% | 0% | 0% | | | | | 0% |
| 14 | | | | | | | | 0% |
| 15+ | | | | | | | | 0% |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016.**

**Quarters 1-4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 304 | 295 | 312 | 311 | 310 | 282 | 276 | 262 |
| 2 | 313 | 318 | 295 | 297 | 315 | 311 | 311 | 289 |
| 3 | 339 | 341 | 326 | 329 | 337 | 339 | 338 | 323 |
| 4 | 345 | 352 | 342 | 343 | 345 | 349 | 350 | 335 |
| 5 | 347 | 366 | 346 | 348 | 352 | 351 | 367 | 343 |
| 6 | 357 | 373 | 358 | 358 | 360 | 361 | 371 | 354 |
| 7 | 363 | 374 | 365 | 368 | 370 | 376 | 379 | 367 |
| 8 | 369 | 417 | 381 | 380 | 374 | 399 | 417 | 375 |
| 9 | 378 | 389 | 371 | 377 | 379 | 382 | 380 | 378 |
| 10 | 381 | 385 | 385 | 389 | 383 | 385 | 377 | 388 |
| 11 | 383 | 398 | 398 | 389 | 386 | 382 | 384 | 389 |
| 12 | 387 | 401 | 401 | 404 | 386 | 387 | 353 | 401 |
| 13 | 392 | 411 | 411 | 423 | 400 | 392 | 371 | 415 |
| 14 | 395 | | 375 | 375 | 393 | 395 | | 401 |
| 15+ | 399 | | 395 | 395 | 399 | 399 | | 415 |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 270 | | 200 | 312 | 262 | 262 | 264 | 262 |
| 2 | 303 | 328 | 323 | 324 | 278 | 311 | 285 | 307 |
| 3 | 307 | 336 | 351 | 336 | 302 | 326 | 322 | 325 |
| 4 | 330 | 340 | 338 | 340 | 323 | 335 | 329 | 334 |
| 5 | 341 | 348 | 352 | 347 | 330 | 346 | 342 | 346 |
| 6 | 346 | 355 | 358 | 352 | 346 | 353 | 359 | 353 |
| 7 | 350 | 367 | 372 | 364 | 356 | 366 | 367 | 366 |
| 8 | 364 | 372 | 382 | 370 | 363 | 377 | 379 | 376 |
| 9 | 369 | 375 | 375 | 372 | 364 | 383 | 383 | 381 |
| 10 | 375 | 381 | 373 | 380 | 372 | 388 | 391 | 386 |
| 11 | 379 | 397 | 391 | 382 | 380 | 393 | 408 | 390 |
| 12 | 383 | 417 | 411 | 379 | 377 | 428 | 422 | 426 |
| 13 | 386 | 380 | 390 | 381 | 371 | | 371 | 371 |
| 14 | 395 | | 406 | 410 | | | | 425 |
| 15+ | 396 | | 477 | 400 | | | | |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarters 1-4**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 172 | | | 172 | | |
| 1 | 265 | 265 | 273 | 261 | 262 | 262 | 262 | |
| 2 | 298 | 310 | 302 | 280 | 285 | 280 | 299 | |
| 3 | 307 | 340 | 328 | 299 | 325 | 319 | 325 | 325 |
| 4 | 323 | 354 | 345 | 313 | 338 | 334 | 336 | 336 |
| 5 | 323 | 382 | 360 | 317 | 345 | 345 | 354 | 357 |
| 6 | 327 | 370 | 361 | 337 | 356 | 353 | 357 | 357 |
| 7 | 331 | 351 | 346 | 348 | 369 | 366 | 368 | 368 |
| 8 | 369 | 429 | 420 | 364 | 379 | 375 | 375 | 374 |
| 9 | 365 | 360 | 372 | 379 | 384 | 380 | 376 | 376 |
| 10 | 373 | 371 | 374 | 382 | 389 | 381 | 394 | 395 |
| 11 | 380 | 380 | 381 | 384 | 384 | 386 | 385 | 385 |
| 12 | 378 | 353 | 400 | 398 | 410 | 422 | 427 | |
| 13 | 371 | 371 | 372 | 371 | 376 | 371 | 371 | |
| 14 | 425 | | | 425 | 425 | 425 | 425 | 425 |
| 15+ | 415 | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 172 | 171 | 202 | | | 147 | 180 | 166 |
| 1 | 262 | 232 | 271 | | 156 | 264 | 276 | 274 |
| 2 | 307 | 299 | 314 | 324 | 309 | 291 | 305 | 307 |
| 3 | 323 | 318 | 334 | 342 | 326 | 318 | 338 | 324 |
| 4 | 339 | 339 | 351 | 364 | 336 | 333 | 366 | 338 |
| 5 | 354 | 355 | 361 | 371 | 357 | 339 | 373 | 346 |
| 6 | 363 | 363 | 371 | 371 | 357 | 343 | 391 | 353 |
| 7 | 370 | 372 | 377 | 381 | 368 | 353 | 396 | 362 |
| 8 | 379 | 379 | 384 | 385 | 374 | 354 | 401 | 372 |
| 9 | 383 | 384 | 389 | 384 | 376 | 357 | 410 | 375 |
| 10 | 386 | 387 | 394 | 396 | 395 | 360 | 406 | 380 |
| 11 | 394 | 393 | 403 | 415 | 385 | 367 | 416 | 383 |
| 12 | 409 | 404 | 425 | 429 | 437 | 416 | | 387 |
| 13 | 418 | 428 | 436 | | | | | 389 |
| 14 | | | | | 425 | | | 401 |
| 15+ | 455 | 455 | 465 | | | | | 400 |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 1**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | 282 | | | 282 | 284 | 300 | 288 | 287 |
| 3 | 330 | | | 330 | 328 | 315 | 314 | 324 |
| 4 | 336 | | | 336 | 335 | 320 | 318 | 335 |
| 5 | 344 | | | 344 | 344 | 378 | 385 | 343 |
| 6 | 356 | | | 356 | 356 | 404 | 415 | 354 |
| 7 | 368 | | | 368 | 366 | 379 | | 367 |
| 8 | 376 | | | 376 | 373 | 402 | | 375 |
| 9 | 380 | | | 380 | 378 | 380 | | 378 |
| 10 | 389 | | | 389 | 386 | 389 | | 388 |
| 11 | 396 | | | 396 | 390 | 396 | | 389 |
| 12 | 404 | | | 404 | 392 | 404 | | 401 |
| 13 | 425 | | | 425 | 393 | 425 | | 416 |
| 14 | | | | | | | | |
| 15+ | 415 | | | 415 | 403 | 415 | | 415 |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | | | | | 262 | | 262 | 262 |
| 2 | 282 | | | | 275 | | 285 | 280 |
| 3 | 330 | | | | 278 | | 322 | 322 |
| 4 | 336 | | | | | | 329 | 329 |
| 5 | 344 | | | 340 | | | 342 | 344 |
| 6 | 356 | | | 340 | | | 359 | 359 |
| 7 | 368 | | | 360 | | | 368 | 365 |
| 8 | 376 | | | 370 | | | 379 | 376 |
| 9 | 380 | | | 370 | | | 383 | 377 |
| 10 | 389 | | | | | | 391 | 393 |
| 11 | 396 | | | | | | 408 | 386 |
| 12 | 404 | | | 377 | | | | |
| 13 | 425 | | | 380 | | | | |
| 14 | | | | | | | | 425 |
| 15+ | 415 | | | 400 | | | | |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 1**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 267 | 262 | 264 | 266 | 262 | 262 | 262 | |
| 2 | 286 | 288 | 286 | 277 | 275 | 275 | 280 | |
| 3 | 299 | 314 | 313 | 295 | 290 | 279 | 325 | 325 |
| 4 | 305 | 318 | 318 | 312 | 336 | 336 | 336 | 336 |
| 5 | 310 | 385 | 383 | 318 | 357 | 357 | 354 | 357 |
| 6 | 316 | 415 | 412 | 343 | 357 | 357 | 357 | 357 |
| 7 | 315 | | 336 | 359 | 368 | 368 | 368 | 368 |
| 8 | 322 | | | 357 | 374 | 374 | 375 | 374 |
| 9 | | | | 376 | 376 | 376 | 376 | 376 |
| 10 | 380 | | | 394 | 395 | 395 | 394 | 395 |
| 11 | | | | 385 | 385 | 385 | 385 | 385 |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | 425 | 425 | 425 | 425 | 425 |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | | | | | | | | |
| 1 | 209 | 215 | 271 | | 154 | 217 | 254 | 268 |
| 2 | 302 | 297 | 303 | 324 | 301 | 277 | 298 | 291 |
| 3 | 319 | 315 | 325 | 341 | 325 | 295 | 337 | 321 |
| 4 | 336 | 333 | 341 | 360 | 336 | 310 | 357 | 334 |
| 5 | 348 | 347 | 352 | 365 | 357 | 316 | 341 | 344 |
| 6 | 355 | 353 | 362 | 368 | 357 | 318 | 375 | 355 |
| 7 | 362 | 360 | 369 | 379 | 368 | 330 | 370 | 367 |
| 8 | 376 | 374 | 376 | 382 | 374 | 333 | 387 | 375 |
| 9 | 382 | 380 | 381 | 382 | 376 | 332 | | 378 |
| 10 | 389 | 387 | 384 | 394 | 395 | 351 | | 388 |
| 11 | 396 | 394 | 389 | 415 | 385 | 365 | | 389 |
| 12 | 420 | 414 | 403 | 430 | 437 | 388 | | 394 |
| 13 | 449 | 449 | 436 | | | | | 393 |
| 14 | | | | | 425 | | | 425 |
| 15+ | 455 | 455 | 455 | | | | | 402 |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 2**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | 262 | | 265 | 262 |
| 2 | 314 | 314 | 295 | 314 | 300 | 311 | 306 | 277 |
| 3 | 339 | 340 | 324 | 340 | 330 | 340 | 337 | 307 |
| 4 | 345 | 345 | 341 | 345 | 338 | 353 | 346 | 353 |
| 5 | 346 | 347 | 346 | 347 | 345 | 353 | 384 | 361 |
| 6 | 357 | 357 | 359 | 357 | 354 | 363 | 380 | 375 |
| 7 | 363 | 363 | 368 | 363 | 362 | 379 | 380 | 383 |
| 8 | 366 | | 381 | | 368 | 404 | 429 | 391 |
| 9 | 375 | 385 | 366 | 385 | 373 | 374 | 410 | 400 |
| 10 | 380 | 385 | | 385 | 378 | 379 | | 404 |
| 11 | 382 | | | | 383 | 382 | | 377 |
| 12 | 387 | | | | 387 | 387 | | 394 |
| 13 | 391 | | | | 391 | 391 | | 397 |
| 14 | 395 | | 375 | | 395 | 395 | | 410 |
| 15+ | | | 395 | | 395 | | | 433 |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | | | | | 262 | 262 | 262 | 262 |
| 2 | 281 | 325 | 259 | 250 | 311 | 311 | 286 | 311 |
| 3 | 290 | 332 | 333 | 288 | 325 | 325 | 321 | 325 |
| 4 | 321 | 336 | 336 | 310 | 335 | 335 | 323 | 335 |
| 5 | 331 | 342 | 347 | 334 | 346 | 346 | 338 | 346 |
| 6 | 338 | 350 | 351 | 338 | 353 | 353 | 360 | 353 |
| 7 | 345 | 361 | 362 | 345 | 367 | 367 | 363 | 367 |
| 8 | 364 | 373 | 372 | 355 | 377 | 377 | 379 | 377 |
| 9 | 370 | 371 | 370 | 367 | 383 | 383 | 383 | 383 |
| 10 | 378 | 385 | 378 | 379 | 388 | 388 | 391 | 388 |
| 11 | 382 | | 374 | 374 | 393 | 393 | 401 | 393 |
| 12 | 386 | | 391 | 396 | 428 | 428 | 428 | 428 |
| 13 | 394 | | 396 | 390 | | | | |
| 14 | 395 | | 410 | 410 | | | | |
| 15+ | 411 | | 490 | 490 | | | | |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 2**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 265 | 265 | 265 | 265 | 262 | 262 | 262 | |
| 2 | 305 | 305 | 306 | 291 | 303 | 311 | 311 | |
| 3 | 314 | 337 | 335 | 308 | 327 | 325 | 325 | |
| 4 | 315 | 346 | 344 | 324 | 340 | 335 | 336 | |
| 5 | 330 | 385 | 362 | 338 | 347 | 346 | 353 | |
| 6 | 333 | 380 | 367 | 344 | 357 | 354 | 356 | |
| 7 | 330 | 333 | 367 | 352 | 372 | 367 | 368 | |
| 8 | 369 | 430 | 412 | 371 | 381 | 377 | 375 | |
| 9 | 382 | 383 | 385 | 391 | 388 | 384 | 376 | |
| 10 | 379 | 379 | 390 | 384 | 397 | 389 | 394 | |
| 11 | 393 | 393 | 393 | 386 | 395 | 393 | 385 | |
| 12 | 425 | 428 | 428 | 428 | 417 | 428 | 428 | |
| 13 | 425 | | | | 425 | | | |
| 14 | 425 | | | 425 | | 425 | 425 | |
| 15+ | 415 | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | | | | | | | | |
| 1 | 207 | 202 | 278 | | 155 | 238 | 277 | 243 |
| 2 | 287 | 288 | 331 | 324 | 305 | 279 | 307 | 307 |
| 3 | 317 | 323 | 347 | 342 | 334 | 320 | 341 | 319 |
| 4 | 347 | 348 | 363 | 365 | 340 | 350 | 370 | 346 |
| 5 | 358 | 358 | 372 | 372 | 351 | 355 | 381 | 352 |
| 6 | 365 | 365 | 381 | 372 | 360 | 362 | 391 | 357 |
| 7 | 374 | 374 | 386 | 382 | 372 | 371 | 397 | 367 |
| 8 | 380 | 379 | 393 | 386 | 387 | 375 | 402 | 381 |
| 9 | 384 | 384 | 397 | 384 | 387 | 379 | 410 | 380 |
| 10 | 387 | 387 | 403 | 396 | 391 | 384 | 406 | 383 |
| 11 | 393 | 393 | 413 | 415 | 395 | 388 | 416 | 385 |
| 12 | 400 | 400 | 437 | 429 | 437 | 420 | | 389 |
| 13 | 448 | 448 | 444 | | | | | 393 |
| 14 | | | | | | | | 405 |
| 15+ | 455 | 455 | 465 | | | | | 446 |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 3**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | 295 | | | | | 265 | 262 |
| 2 | 313 | 318 | 314 | 296 | 305 | 311 | 314 | 298 |
| 3 | 339 | 341 | 340 | 327 | 327 | 339 | 346 | 312 |
| 4 | 345 | 352 | 345 | 342 | 338 | 347 | 361 | 331 |
| 5 | 347 | 369 | 347 | 346 | 345 | 349 | 355 | 332 |
| 6 | 356 | 380 | 357 | 358 | 354 | 359 | 359 | 351 |
| 7 | 363 | 383 | 363 | 365 | 360 | 373 | 380 | 360 |
| 8 | 367 | 420 | | 381 | 369 | 400 | 413 | 368 |
| 9 | 379 | 394 | 385 | 372 | 372 | 381 | | 375 |
| 10 | 382 | 385 | 385 | 385 | 377 | 382 | | 374 |
| 11 | 382 | | | | 382 | 382 | | 380 |
| 12 | 387 | | | | 387 | 385 | | 353 |
| 13 | 391 | | | | 390 | 392 | | 371 |
| 14 | 393 | | | 375 | 375 | | | 375 |
| 15+ | 399 | | | 395 | 395 | 399 | | 395 |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 200 | | 200 | | | | 265 | 265 |
| 2 | 301 | 328 | 324 | 327 | 302 | 314 | 286 | 310 |
| 3 | 305 | 336 | 351 | 336 | 300 | 340 | 321 | 329 |
| 4 | 327 | 340 | 338 | 340 | 307 | 345 | 325 | 319 |
| 5 | 340 | 348 | 352 | 348 | 311 | 347 | 340 | 311 |
| 6 | 344 | 355 | 358 | 355 | 335 | 357 | 359 | 336 |
| 7 | 348 | 367 | 372 | 367 | 351 | 363 | 366 | 351 |
| 8 | 361 | 372 | 382 | 372 | 358 | | 379 | 362 |
| 9 | 368 | 375 | 375 | 375 | 360 | 385 | 382 | 360 |
| 10 | 374 | 381 | 373 | 381 | 371 | 385 | 390 | 371 |
| 11 | 378 | 397 | 394 | 397 | 380 | | 395 | 380 |
| 12 | 382 | 417 | 419 | 416 | 353 | | 353 | 353 |
| 13 | 385 | 380 | 382 | 380 | 371 | | 371 | 371 |
| 14 | 396 | | 394 | 400 | | | | |
| 15+ | 393 | | 447 | 398 | | | | |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 3**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 268 | 265 | 272 | 256 | 265 | 265 | 265 | |
| 2 | 295 | 322 | 311 | 290 | 312 | 311 | 317 | |
| 3 | 304 | 360 | 342 | 301 | 333 | 332 | 327 | |
| 4 | 309 | 375 | 366 | 311 | 332 | 321 | 336 | |
| 5 | 313 | 311 | 312 | 314 | 336 | 311 | 356 | |
| 6 | 321 | 345 | 338 | 332 | 352 | 336 | 357 | |
| 7 | 334 | 349 | 336 | 340 | 361 | 351 | 368 | |
| 8 | 366 | 430 | 421 | 355 | 372 | 363 | 374 | |
| 9 | 360 | 360 | 360 | 360 | 372 | 360 | 376 | |
| 10 | 371 | 371 | 371 | 378 | 378 | 371 | 393 | |
| 11 | 380 | 380 | 380 | 380 | 381 | 380 | 385 | |
| 12 | 353 | 353 | 353 | 353 | 353 | 353 | 353 | |
| 13 | 371 | 371 | 371 | 371 | 371 | 371 | 371 | |
| 14 | | | | | | | 425 | |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 172 | 166 | 208 | | | 147 | 180 | 157 |
| 1 | 304 | 268 | 300 | | 265 | 281 | | 278 |
| 2 | 324 | 306 | 338 | | 322 | 302 | | 305 |
| 3 | 338 | 335 | 342 | | 360 | 334 | | 315 |
| 4 | 343 | 347 | 350 | | 375 | 345 | | 335 |
| 5 | 361 | 365 | 361 | | | 355 | | 344 |
| 6 | 375 | 379 | 375 | | 345 | 350 | | 349 |
| 7 | 376 | 379 | 377 | | | 354 | | 356 |
| 8 | 377 | 388 | 381 | | 430 | 353 | | 367 |
| 9 | 381 | 380 | 387 | | | | | 371 |
| 10 | 377 | 380 | 385 | | | | | 376 |
| 11 | 395 | 402 | 405 | | | | | 381 |
| 12 | 398 | 424 | 383 | | | | | 384 |
| 13 | 411 | 436 | 418 | | | | | 385 |
| 14 | | | | | | | | 396 |
| 15+ | | | | | | | | 393 |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 304 | 309 | 312 | 311 | 310 | 282 | 302 | 262 |
| 2 | 314 | 314 | 314 | 314 | 316 | 313 | 320 | 299 |
| 3 | 336 | 338 | 338 | 338 | 338 | 333 | 349 | 307 |
| 4 | 345 | 345 | 345 | 347 | 345 | 346 | 359 | 332 |
| 5 | 352 | 353 | 352 | 354 | 352 | 351 | 352 | 322 |
| 6 | 362 | 365 | 365 | 361 | 361 | 365 | 365 | 340 |
| 7 | 372 | 373 | 372 | 376 | 370 | 375 | 372 | 353 |
| 8 | 378 | 378 | 377 | 382 | 374 | 380 | 406 | 360 |
| 9 | 382 | 382 | 382 | 381 | 379 | 391 | 380 | 361 |
| 10 | 384 | 391 | 391 | 396 | 383 | 394 | 377 | 372 |
| 11 | 388 | 398 | 398 | 378 | 386 | 383 | 384 | 380 |
| 12 | 391 | 401 | 401 | 405 | 386 | 387 | 353 | 353 |
| 13 | 402 | 411 | 411 | 411 | 401 | 392 | 371 | 371 |
| 14 | 395 | | | | 395 | 395 | | |
| 15+ | 399 | | | | 399 | 399 | | |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 318 | | | 312 | | | 311 | 265 |
| 2 | 309 | | | 301 | 302 | | 314 | 322 |
| 3 | 332 | | 356 | 320 | 300 | | 337 | 360 |
| 4 | 342 | | 338 | 334 | 307 | | 348 | 375 |
| 5 | 347 | | 354 | 340 | 311 | | 353 | |
| 6 | 355 | | 359 | 344 | 335 | | 361 | 345 |
| 7 | 363 | | 374 | 361 | 351 | | 376 | |
| 8 | 372 | | 386 | 367 | 358 | | 382 | 430 |
| 9 | 372 | | 376 | 372 | 360 | | 380 | |
| 10 | 378 | | 370 | 372 | 371 | | 397 | |
| 11 | 381 | | | 380 | 380 | | 375 | |
| 12 | 387 | | | 378 | 353 | | 405 | |
| 13 | 391 | | | 405 | 371 | | | |
| 14 | 395 | | | | | | | |
| 15+ | 399 | | | | | | | |

**Table 8.4.1.1. NE Atlantic Mackerel. Mean length (mm) -at-age by area for 2016 (cont.).**

**Quarter 4**

| AGE | 7.A | 7.D | 7.E | 7.F | 7.G | 7.H | 7.J | 7.K |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 172 | | | 172 | | |
| 1 | 263 | 265 | 275 | 260 | 265 | 259 | 262 | |
| 2 | 299 | 322 | 305 | 276 | 322 | 304 | 303 | |
| 3 | 307 | 360 | 328 | 297 | 360 | 330 | 326 | |
| 4 | 333 | 374 | 357 | 313 | 375 | 363 | 359 | |
| 5 | 313 | 311 | 316 | 306 | | 368 | | |
| 6 | 317 | 344 | 330 | 330 | 345 | 361 | 345 | |
| 7 | 287 | 351 | 313 | 333 | | 369 | | |
| 8 | 425 | 426 | 425 | 389 | 430 | 425 | 430 | |
| 9 | | 360 | 360 | | | 378 | | |
| 10 | 375 | 371 | 371 | 375 | | 385 | | |
| 11 | | 380 | 380 | | | 405 | | |
| 12 | | 353 | 360 | | | 425 | | |
| 13 | | 371 | 374 | | | 436 | | |
| 14 | | | | | | | | |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 172 | 174 | 202 | | | 147 | 180 | 175 |
| 1 | 290 | 283 | 269 | | 305 | 268 | | 293 |
| 2 | 309 | 308 | 313 | | 320 | 305 | | 313 |
| 3 | 323 | 325 | 316 | | 328 | 323 | | 337 |
| 4 | 335 | 336 | 321 | | 333 | 328 | | 344 |
| 5 | 361 | 362 | 336 | | 354 | 332 | | 351 |
| 6 | 374 | 376 | 370 | | 372 | 329 | | 359 |
| 7 | 368 | 370 | 373 | | 374 | 345 | | 368 |
| 8 | 383 | 384 | 372 | | 368 | 334 | | 374 |
| 9 | 383 | 383 | 390 | | 385 | | | 377 |
| 10 | 378 | 379 | 389 | | 369 | | | 381 |
| 11 | 396 | 397 | 403 | | 385 | | | 384 |
| 12 | 416 | 417 | 395 | | 385 | | | 386 |
| 13 | 420 | 421 | 412 | | | | | 398 |
| 14 | | | | | | | | 395 |
| 15+ | | | | | | | | 399 |

**Table 8.4.1.2. NE Atlantic Mackerel. Percentage length composition in catches by country and fleet in 2016. Zeros represent values <0.5%. Handline Fleets/Purse Seiners**

| | UKE LINES | | | | | | | | NO PS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7.e | | | | 7.f | | | | 2.a | | | |
| Length cm | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | 1% | | | | | | | | | | |
| 21 | | 2% | | | | | | 0% | | | | |
| 22 | | 1% | | | 0% | | | | | | | |
| 23 | | 0% | 0% | | 0% | | 0% | | | | | |
| 24 | 0% | 1% | 0% | 0% | 0% | 0% | 1% | 1% | | | | |
| 25 | 10% | 1% | 6% | 3% | 3% | 1% | 4% | 14% | | | | |
| 26 | 16% | 2% | 9% | 6% | 26% | 3% | 5% | 31% | | | | |
| 27 | 19% | 6% | 12% | 11% | 28% | 8% | 4% | 12% | | | | |
| 28 | 11% | 14% | 22% | 17% | 14% | 9% | 13% | 8% | | | | |
| 29 | 12% | 16% | 28% | 33% | 12% | 12% | 31% | 17% | | | | |
| 30 | 12% | 11% | 15% | 17% | 10% | 13% | 24% | 11% | | 0% | 3% | 0% |
| 31 | 7% | 14% | 4% | 10% | 5% | 14% | 9% | 3% | 1% | 0% | 5% | 7% |
| 32 | 5% | 11% | 2% | 3% | 2% | 16% | 4% | 1% | 2% | 1% | 6% | 4% |
| 33 | 2% | 5% | 1% | 0% | 0% | 9% | 2% | 0% | 8% | 5% | 10% | 8% |
| 34 | 3% | 7% | 0% | 0% | 0% | 6% | 2% | 0% | 17% | 17% | 27% | 23% |
| 35 | 2% | 3% | 0% | | 0% | 3% | 0% | 0% | 10% | 11% | 24% | 28% |
| 36 | 0% | 3% | 0% | | 0% | 2% | 0% | | 19% | 16% | 12% | 14% |
| 37 | 1% | 2% | 0% | | 0% | 2% | 0% | 0% | 28% | 28% | 11% | 13% |
| 38 | 1% | 1% | | | 0% | 1% | 0% | | 15% | 16% | 2% | 4% |
| 39 | 0% | 0% | | | 0% | 1% | | | 0% | 4% | 0% | 0% |
| 40 | 0% | 0% | | | | 0% | | | | 0% | | 0% |
| 41 | 0% | | 0% | | | 0% | 0% | | | | | 0% |
| 42 | 0% | 0% | | | 0% | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |

**Table 8.4.1.2. NE Atlantic Mackerel. Percentage length composition in catches by country and fleet in 2016. Zeros represent values <0.5% (cont.). Southern Fleets**

| | ES Purse Seine | | | | ES Trawl | | | | ES Artisanal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| length cm | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | 0% | | | | | |
| 20 | | | | | | 0% | 3% | | | | | |
| 21 | | | | | | 0% | 6% | | | | | |
| 22 | | | | | | 0% | 5% | | | | | |
| 23 | | 0% | 0% | 0% | 0% | 3% | 3% | | | | 0% | 0% |
| 24 | | 0% | | 1% | 3% | 4% | 1% | | | | 1% | 1% |
| 25 | 0% | 0% | 0% | 6% | 11% | 2% | 0% | 1% | | | 1% | 1% |
| 26 | 0% | 1% | 1% | 14% | 30% | 0% | 1% | 3% | | | 7% | 5% |
| 27 | 1% | 4% | 6% | 15% | 26% | 2% | 10% | 6% | | | 7% | 6% |
| 28 | 4% | 8% | 16% | 8% | 16% | 0% | 30% | 19% | | | 15% | 12% |
| 29 | 6% | 9% | 25% | 6% | 9% | 0% | 22% | 20% | 0% | 0% | 4% | 3% |
| 30 | 3% | 7% | 18% | 14% | 2% | 4% | 10% | 17% | 0% | 0% | 6% | 6% |
| 31 | 1% | 4% | 6% | 16% | 0% | 4% | 4% | 14% | 0% | 0% | 6% | 7% |
| 32 | 2% | 3% | 4% | 4% | 1% | 1% | 1% | 5% | 0% | 1% | 13% | 14% |
| 33 | 5% | 4% | 5% | 3% | 1% | 9% | 1% | 4% | 2% | 2% | 5% | 6% |
| 34 | 9% | 5% | 9% | 5% | 1% | 8% | 1% | 6% | 8% | 6% | 6% | 7% |
| 35 | 14% | 11% | 6% | 3% | 1% | 11% | 1% | 4% | 12% | 11% | 13% | 15% |
| 36 | 18% | 12% | 2% | 2% | 0% | 10% | 1% | 2% | 21% | 20% | 7% | 8% |
| 37 | 18% | 11% | 1% | 1% | 0% | 15% | 1% | 0% | 24% | 25% | 4% | 5% |
| 38 | 10% | 9% | 0% | 1% | 0% | 9% | 0% | | 18% | 18% | 1% | 1% |
| 39 | 5% | 8% | 0% | 0% | | 3% | 0% | | 8% | 9% | 2% | 2% |
| 40 | 3% | 3% | | 0% | | 5% | 0% | 0% | 3% | 5% | | |
| 41 | 1% | 2% | | 0% | | 3% | 0% | | 1% | 2% | 0% | 1% |
| 42 | 1% | 1% | 0% | 0% | | 3% | | | 1% | 1% | | |
| 43 | 0% | 0% | | | | | | | 0% | 0% | | |
| 44 | | | | | | 1% | | | 0% | 0% | | |
| 45 | 0% | | | | | | | | | 0% | | |
| 46 | | | | | | 1% | | | | | | |
| 47 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |

**Table 8.4.1.2. NE Atlantic Mackerel. Percentage length composition in catches by country and fleet in 2016. Zeros represent values <0.5% (cont.). Southern Fleets (cont.).**

| | BQ Purse Seine | | | | BQ Artisanal | | | | BQ Trawl | | PT All | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| length cm | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q1 | Q2 |
| 11 | | | 0% | | | | | | | | | |
| 12 | | | 0% | | | | | | | | | |
| 13 | | | 0% | | | | | | | | | |
| 14 | | | 0% | | | | | | | | | |
| 15 | | | 0% | | | | | | | | | |
| 16 | | | 0% | | | | | | | | | |
| 17 | | | 0% | | | | | | | | | |
| 18 | | | 0% | | | | | | | | | |
| 19 | | | 0% | | | | | | | | | |
| 20 | | | 3% | | | | | | | | | |
| 21 | | | 10% | | | | | | | | | |
| 22 | | | 4% | | | | | | | | 2% | |
| 23 | | | 0% | | | | | | | | 13% | |
| 24 | | 0% | | | | | | | 1% | 0% | 14% | |
| 25 | | 0% | | | | | 1% | | 2% | 0% | 10% | |
| 26 | | 0% | | | | | | | 7% | 0% | 6% | 1% |
| 27 | | 0% | | | | 0% | | | 19% | 0% | 9% | 9% |
| 28 | 1% | 0% | 3% | 3% | 0% | 0% | | 2% | 32% | 0% | 11% | 31% |
| 29 | 2% | 0% | 3% | 8% | 0% | 0% | 1% | 2% | 21% | 0% | 5% | 20% |
| 30 | 4% | 0% | 6% | 17% | 0% | 0% | 1% | 12% | 10% | 0% | 2% | 8% |
| 31 | 7% | 0% | 9% | 23% | 0% | 0% | 4% | 26% | 5% | | 3% | 0% |
| 32 | 7% | 1% | 28% | 23% | 2% | 2% | 10% | 26% | 2% | | 4% | 0% |
| 33 | 8% | 5% | 14% | 14% | 8% | 3% | 11% | 13% | 1% | 5% | 8% | 0% |
| 34 | 12% | 9% | 12% | 5% | 10% | 5% | 16% | 9% | 0% | 11% | 4% | 1% |
| 35 | 15% | 15% | 6% | 4% | 16% | 10% | 15% | 3% | 0% | 10% | 3% | 2% |
| 36 | 14% | 22% | 0% | 1% | 18% | 16% | 13% | 3% | 0% | 17% | 3% | 3% |
| 37 | 16% | 23% | 0% | 1% | 22% | 23% | 13% | 1% | 0% | 19% | 2% | 5% |
| 38 | 8% | 14% | 0% | | 14% | 22% | 8% | 1% | 0% | 20% | 1% | 8% |
| 39 | 4% | 7% | 0% | 1% | 5% | 11% | 5% | 0% | 0% | 11% | 1% | 7% |
| 40 | 2% | 2% | 0% | 0% | 2% | 4% | 0% | | | 3% | 0% | 4% |
| 41 | 0% | 1% | 0% | | 1% | 2% | 1% | 0% | | 1% | 0% | 1% |
| 42 | 0% | 0% | | | 0% | 1% | | 0% | | 1% | 0% | 1% |
| 43 | 0% | 0% | | | 0% | 0% | 0% | | | 1% | | 0% |
| 44 | | 0% | | | | 0% | | | | | | 0% |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |

**Table 8.4.1.2. NE Atlantic Mackerel. Percentage length composition in catches by country and fleet in 2016. Zeros represent values <0.5% (cont.). Pelagic Trawl Fleets**

| | IE | | | | UKS | | | IS | | | DK |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.a | 6.a | | 7.b | 4.a | | 6.a | 2.a, 5.a, 14.b | | | 4.a |
| Length cm | Q4 | Q1 | Q4 | Q1 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q4 |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | 1% | | | | 0% | | | | |
| 25 | | 0% | 3% | | | | 0% | | | | |
| 26 | | 0% | 3% | 0% | | | 0% | | | | |
| 27 | | 0% | 4% | 0% | | 0% | 0% | | | | |
| 28 | | 0% | 15% | 0% | | 0% | 0% | | 0% | 0% | |
| 29 | 1% | 0% | 27% | 0% | | 2% | 0% | | 0% | 0% | |
| 30 | 4% | 0% | 27% | 0% | 1% | 4% | 1% | 1% | 0% | 4% | 0% |
| 31 | 4% | 1% | 12% | 0% | 4% | 3% | 2% | 7% | 1% | 4% | 3% |
| 32 | 3% | 6% | 4% | 7% | 5% | 5% | 9% | 22% | 3% | 3% | 3% |
| 33 | 8% | 14% | 1% | 14% | 16% | 15% | 15% | 27% | 12% | 12% | 3% |
| 34 | 21% | 17% | | 18% | 31% | 22% | 13% | 16% | 21% | 24% | 5% |
| 35 | 22% | 13% | | 14% | 17% | 16% | 13% | 9% | 19% | 20% | 15% |
| 36 | 12% | 14% | | 11% | 13% | 12% | 17% | 10% | 14% | 13% | 20% |
| 37 | 10% | 15% | 1% | 15% | 7% | 10% | 15% | 4% | 15% | 10% | 15% |
| 38 | 8% | 10% | | 10% | 5% | 6% | 8% | 2% | 9% | 7% | 11% |
| 39 | 3% | 6% | | 6% | | 3% | 4% | 0% | 4% | 3% | 12% |
| 40 | 2% | 3% | | 2% | | 1% | 1% | 0% | 1% | 0% | 7% |
| 41 | 0% | 1% | | 1% | | 0% | 1% | 0% | 0% | | 3% |
| 42 | 0% | 0% | | 0% | | 0% | 0% | 0% | 0% | | 1% |
| 43 | 0% | 0% | | 0% | | 0% | 0% | 0% | 0% | | 0% |
| 44 | | | | | | | | | | | 0% |
| 45 | | | | | | | | | | | |

**Table 8.4.1.2. NE Atlantic Mackerel. Percentage length composition in catches by country and fleet in 2016. Zeros represent values <0.5% (cont.). Freezer Trawlers**

| | NL | | | | DE | | | RU | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2.a,4.a,4.b,6.a,7.b,7.d,7.j | | | | 6.a | 4.a | 2.a | 2.a | | 5.b |
| length cm | Q1 | Q2 | Q3 | Q4 | Q1 | Q3 | Q4 | Q2 | Q3 | Q2 |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | 0% | |
| 21 | | | | | | | | | 0% | |
| 22 | | | | | | | | | 0% | |
| 23 | | | | | | | | | 0% | |
| 24 | | | | | 0% | | | | 0% | |
| 25 | | | | | 0% | 1% | | 0% | 0% | |
| 26 | 0% | | 0% | | 1% | 6% | | 0% | 0% | |
| 27 | 0% | | 0% | | 1% | 17% | | 1% | 0% | |
| 28 | 0% | | 3% | | 1% | 22% | 0% | 4% | 3% | 0% |
| 29 | 2% | | 5% | | 1% | 11% | 1% | 4% | 6% | 0% |
| 30 | 1% | | 18% | | 1% | 7% | 2% | 3% | 7% | 0% |
| 31 | 4% | | 18% | 0% | 6% | 6% | 1% | 3% | 5% | 0% |
| 32 | 9% | 2% | 12% | 0% | 13% | 8% | 5% | 9% | 6% | 3% |
| 33 | 21% | 2% | 10% | 0% | 16% | 8% | 16% | 28% | 19% | 11% |
| 34 | 16% | 4% | 9% | 12% | 12% | 6% | 18% | 27% | 25% | 15% |
| 35 | 15% | 4% | 10% | 32% | 12% | 3% | 16% | 11% | 14% | 12% |
| 36 | 14% | 6% | 7% | 12% | 14% | 3% | 17% | 5% | 7% | 12% |
| 37 | 10% | 18% | 3% | 20% | 11% | 1% | 13% | 3% | 5% | 17% |
| 38 | 6% | 24% | 2% | 12% | 6% | 1% | 7% | 1% | 3% | 14% |
| 39 | 1% | 18% | 2% | 8% | 3% | 0% | 2% | 1% | 1% | 8% |
| 40 | 1% | 14% | 0% | 0% | 1% | | 1% | 0% | 0% | 4% |
| 41 | 1% | 6% | 0% | 4% | 0% | | 0% | 0% | 0% | 2% |
| 42 | 0% | 2% | 0% | 0% | 0% | | 0% | 0% | 0% | 1% |
| 43 | 0% | | 1% | | 0% | | | 0% | 0% | 0% |
| 44 | | | 0% | | 0% | | | | 0% | |
| 45 | | | | | | | | | 0% | |
| 46 | | | | | | | | | 0% | |
| 47 | | | | | | | | | 0% | |
| 48 | | | | | | | | | 0% | |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016.**

**Quarters 1-4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 229 | 219 | 240 | 239 | 260 | 176 | 173 | 131 |
| 2 | 261 | 278 | 226 | 227 | 264 | 256 | 252 | 178 |
| 3 | 341 | 348 | 301 | 307 | 328 | 382 | 342 | 257 |
| 4 | 359 | 382 | 344 | 342 | 351 | 369 | 371 | 289 |
| 5 | 367 | 434 | 366 | 361 | 374 | 401 | 459 | 311 |
| 6 | 403 | 463 | 399 | 394 | 407 | 455 | 611 | 347 |
| 7 | 426 | 473 | 423 | 425 | 439 | 534 | 552 | 392 |
| 8 | 427 | 652 | 481 | 462 | 456 | 643 | 684 | 419 |
| 9 | 466 | 535 | 451 | 456 | 477 | 493 | 469 | 434 |
| 10 | 478 | 521 | 521 | 508 | 494 | 503 | 450 | 472 |
| 11 | 469 | 564 | 564 | 482 | 510 | 475 | 459 | 484 |
| 12 | 479 | 555 | 555 | 546 | 505 | 483 | 342 | 531 |
| 13 | 496 | 646 | 646 | 640 | 572 | 507 | 399 | 597 |
| 14 | 509 | | 385 | 385 | 527 | 510 | | 483 |
| 15+ | 542 | | 447 | 448 | 546 | 563 | | 607 |

| AGE | 2.a | 5.a | 14.b | 5.b | 5.b1 | 6.b | 7.b | 7.c |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 195 | | 50 | 266 | 125 | 125 | 130 | 126 |
| 2 | 251 | 322 | 318 | 310 | 151 | 211 | 165 | 203 |
| 3 | 270 | 345 | 407 | 344 | 196 | 240 | 242 | 236 |
| 4 | 328 | 355 | 365 | 355 | 242 | 260 | 254 | 256 |
| 5 | 361 | 380 | 404 | 371 | 260 | 286 | 290 | 283 |
| 6 | 381 | 400 | 419 | 381 | 299 | 305 | 335 | 303 |
| 7 | 400 | 437 | 466 | 418 | 340 | 340 | 365 | 338 |
| 8 | 439 | 452 | 492 | 429 | 361 | 364 | 402 | 366 |
| 9 | 460 | 464 | 488 | 426 | 367 | 384 | 415 | 384 |
| 10 | 479 | 487 | 482 | 449 | 401 | 401 | 446 | 401 |
| 11 | 502 | 546 | 527 | 447 | 430 | 412 | 506 | 414 |
| 12 | 514 | 623 | 603 | 419 | 403 | 530 | 525 | 526 |
| 13 | 526 | 485 | 522 | 430 | 399 | | 399 | 399 |
| 14 | 560 | | 529 | 515 | | | | 578 |
| 15+ | 559 | | 711 | 482 | | | | |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarters 1-4**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 35 | | | 35 | | |
| 1 | 146 | 145 | 158 | 130 | 126 | 125 | 127 | |
| 2 | 204 | 239 | 216 | 161 | 170 | 155 | 193 | |
| 3 | 227 | 341 | 295 | 205 | 251 | 227 | 233 | 229 |
| 4 | 272 | 399 | 358 | 238 | 276 | 259 | 270 | 270 |
| 5 | 256 | 493 | 391 | 245 | 296 | 282 | 309 | 316 |
| 6 | 281 | 686 | 546 | 304 | 330 | 304 | 325 | 325 |
| 7 | 283 | 341 | 308 | 315 | 369 | 338 | 360 | 360 |
| 8 | 385 | 695 | 649 | 382 | 404 | 369 | 378 | 375 |
| 9 | 369 | 363 | 375 | 405 | 415 | 382 | 403 | 403 |
| 10 | 397 | 401 | 402 | 430 | 448 | 401 | 479 | 492 |
| 11 | 430 | 431 | 429 | 400 | 427 | 421 | 396 | 395 |
| 12 | 407 | 342 | 460 | 455 | 518 | 514 | 527 | |
| 13 | 399 | 399 | 402 | 399 | 420 | 400 | 399 | |
| 14 | 578 | | | 578 | 578 | 578 | 578 | 578 |
| 15+ | 607 | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 35 | 34 | 62 | | | 35 | 45 | 35 |
| 1 | 145 | 100 | 139 | | 26 | 144 | 167 | 158 |
| 2 | 211 | 191 | 218 | 241 | 236 | 186 | 217 | 240 |
| 3 | 244 | 230 | 262 | 286 | 237 | 238 | 302 | 297 |
| 4 | 281 | 280 | 300 | 350 | 270 | 267 | 372 | 329 |
| 5 | 321 | 322 | 327 | 373 | 316 | 272 | 386 | 356 |
| 6 | 345 | 344 | 358 | 373 | 326 | 281 | 435 | 383 |
| 7 | 369 | 371 | 378 | 405 | 360 | 304 | 453 | 411 |
| 8 | 394 | 393 | 402 | 420 | 376 | 309 | 471 | 438 |
| 9 | 410 | 409 | 420 | 413 | 403 | 313 | 494 | 453 |
| 10 | 420 | 421 | 437 | 458 | 491 | 320 | 481 | 479 |
| 11 | 445 | 441 | 470 | 529 | 395 | 336 | 515 | 499 |
| 12 | 508 | 486 | 554 | 587 | 625 | 488 | | 510 |
| 13 | 544 | 584 | 578 | | | | | 530 |
| 14 | | | | | 578 | | | 557 |
| 15+ | 630 | 630 | 669 | | | | | 536 |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 1**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | 166 | | | 166 | 174 | 210 | 155 | 174 |
| 3 | 275 | | | 275 | 275 | 222 | 211 | 259 |
| 4 | 291 | | | 291 | 294 | 212 | 200 | 289 |
| 5 | 316 | | | 316 | 322 | 488 | 503 | 311 |
| 6 | 356 | | | 356 | 362 | 600 | 628 | 347 |
| 7 | 393 | | | 393 | 395 | 562 | | 393 |
| 8 | 422 | | | 422 | 421 | 662 | | 419 |
| 9 | 438 | | | 438 | 438 | 438 | | 434 |
| 10 | 477 | | | 477 | 472 | 477 | | 472 |
| 11 | 502 | | | 502 | 487 | 502 | | 485 |
| 12 | 536 | | | 536 | 492 | 536 | | 531 |
| 13 | 639 | | | 639 | 489 | 639 | | 601 |
| 14 | | | | | | | | |
| 15+ | 607 | | | 607 | 503 | 607 | | 607 |

| AGE | 2.a | 5.a | 14.b | 5.b | 5.b1 | 6.b | 7.b | 7.c |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | 125 | | 125 | 125 |
| 2 | 166 | | | | 144 | | 165 | 155 |
| 3 | 275 | | | | 150 | | 242 | 235 |
| 4 | 291 | | | | | | 255 | 255 |
| 5 | 316 | | | 309 | | | 290 | 291 |
| 6 | 356 | | | 310 | | | 335 | 327 |
| 7 | 393 | | | 361 | | | 365 | 356 |
| 8 | 422 | | | 390 | | | 402 | 386 |
| 9 | 438 | | | 390 | | | 415 | 405 |
| 10 | 477 | | | | | | 446 | 466 |
| 11 | 502 | | | | | | 507 | 398 |
| 12 | 536 | | | 410 | | | | |
| 13 | 639 | | | 419 | | | | |
| 14 | | | | | | | | 578 |
| 15+ | 607 | | | 482 | | | | |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 1**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 121 | 125 | 129 | 114 | 125 | 125 | 125 | |
| 2 | 152 | 155 | 154 | 129 | 144 | 144 | 154 | |
| 3 | 172 | 211 | 211 | 157 | 169 | 151 | 233 | 229 |
| 4 | 180 | 200 | 201 | 192 | 270 | 270 | 270 | 270 |
| 5 | 189 | 503 | 494 | 206 | 316 | 316 | 310 | 316 |
| 6 | 199 | 628 | 615 | 277 | 325 | 325 | 326 | 325 |
| 7 | 198 | | 289 | 327 | 360 | 360 | 361 | 360 |
| 8 | 204 | | | 319 | 375 | 375 | 380 | 375 |
| 9 | | | | 403 | 403 | 403 | 404 | 403 |
| 10 | 332 | | | 484 | 492 | 492 | 479 | 492 |
| 11 | | | | 395 | 395 | 395 | 396 | 395 |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | 578 | 578 | 578 | 578 | 578 |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | | | | | | | | |
| 1 | 72 | 75 | 138 | | 23 | 78 | 115 | 135 |
| 2 | 194 | 185 | 196 | 240 | 194 | 150 | 199 | 176 |
| 3 | 229 | 221 | 241 | 284 | 229 | 181 | 303 | 245 |
| 4 | 269 | 263 | 277 | 340 | 270 | 207 | 369 | 284 |
| 5 | 301 | 298 | 305 | 354 | 316 | 219 | 316 | 310 |
| 6 | 322 | 317 | 335 | 362 | 325 | 222 | 437 | 345 |
| 7 | 344 | 339 | 358 | 396 | 360 | 246 | 418 | 388 |
| 8 | 383 | 381 | 380 | 409 | 376 | 255 | 485 | 415 |
| 9 | 405 | 401 | 397 | 407 | 403 | 250 | | 430 |
| 10 | 427 | 425 | 409 | 450 | 492 | 294 | | 469 |
| 11 | 454 | 450 | 430 | 529 | 395 | 330 | | 472 |
| 12 | 554 | 529 | 485 | 592 | 625 | 396 | | 497 |
| 13 | 605 | 605 | 556 | | | | | 485 |
| 14 | | | | | 578 | | | 578 |
| 15+ | 630 | 630 | 630 | | | | | 500 |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 2**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | | | | 125 | | 145 | 125 |
| 2 | 263 | 263 | 225 | 263 | 230 | 256 | 224 | 161 |
| 3 | 342 | 345 | 294 | 345 | 290 | 396 | 324 | 230 |
| 4 | 359 | 363 | 338 | 363 | 311 | 380 | 358 | 292 |
| 5 | 363 | 371 | 365 | 371 | 329 | 435 | 501 | 324 |
| 6 | 401 | 407 | 389 | 407 | 355 | 496 | 673 | 366 |
| 7 | 423 | 430 | 415 | 430 | 379 | 563 | 571 | 381 |
| 8 | 398 | | 481 | | 395 | 674 | 702 | 414 |
| 9 | 445 | 521 | 429 | 521 | 419 | 435 | 618 | 431 |
| 10 | 460 | 521 | | 521 | 438 | 452 | | 470 |
| 11 | 455 | | | | 454 | 455 | | 415 |
| 12 | 472 | | | | 473 | 472 | | 476 |
| 13 | 489 | | | | 489 | 489 | | 518 |
| 14 | 505 | | 385 | | 503 | 505 | | 515 |
| 15+ | | | 447 | | 447 | | | 612 |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | | | | | 125 | 125 | 125 | 125 |
| 2 | 223 | 298 | 149 | 117 | 208 | 208 | 166 | 208 |
| 3 | 236 | 316 | 345 | 180 | 235 | 235 | 241 | 235 |
| 4 | 294 | 325 | 357 | 223 | 256 | 256 | 237 | 256 |
| 5 | 326 | 343 | 371 | 264 | 283 | 283 | 277 | 283 |
| 6 | 347 | 364 | 380 | 285 | 302 | 302 | 325 | 302 |
| 7 | 363 | 395 | 411 | 304 | 337 | 337 | 350 | 337 |
| 8 | 417 | 430 | 438 | 335 | 364 | 364 | 396 | 364 |
| 9 | 419 | 427 | 432 | 373 | 382 | 382 | 410 | 382 |
| 10 | 438 | 472 | 428 | 414 | 396 | 396 | 442 | 396 |
| 11 | 455 | | 395 | 395 | 412 | 412 | 466 | 412 |
| 12 | 472 | | 453 | 446 | 530 | 530 | 530 | 530 |
| 13 | 500 | | 510 | 482 | | | | |
| 14 | 505 | | 515 | 515 | | | | |
| 15+ | 570 | | 627 | 627 | | | | |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 2**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 139 | 145 | 148 | 126 | 125 | 125 | 125 | |
| 2 | 218 | 221 | 224 | 170 | 195 | 208 | 208 | |
| 3 | 230 | 323 | 314 | 200 | 245 | 235 | 232 | |
| 4 | 228 | 357 | 340 | 233 | 275 | 257 | 268 | |
| 5 | 261 | 503 | 377 | 265 | 299 | 284 | 305 | |
| 6 | 266 | 677 | 496 | 280 | 330 | 303 | 321 | |
| 7 | 263 | 269 | 337 | 298 | 372 | 338 | 355 | |
| 8 | 347 | 702 | 586 | 352 | 408 | 365 | 374 | |
| 9 | 389 | 382 | 388 | 417 | 424 | 385 | 402 | |
| 10 | 373 | 371 | 403 | 388 | 468 | 400 | 478 | |
| 11 | 419 | 412 | 412 | 397 | 439 | 411 | 396 | |
| 12 | 530 | 530 | 530 | 530 | 542 | 530 | 530 | |
| 13 | 639 | | | | 610 | | | |
| 14 | 578 | | | 578 | | 578 | 578 | |
| 15+ | 607 | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | | | | | | | | |
| 1 | 66 | 61 | 150 | | 25 | 96 | 168 | 109 |
| 2 | 165 | 168 | 250 | 241 | 218 | 154 | 223 | 227 |
| 3 | 227 | 240 | 289 | 288 | 300 | 228 | 299 | 267 |
| 4 | 299 | 300 | 327 | 353 | 306 | 294 | 374 | 315 |
| 5 | 330 | 330 | 351 | 378 | 321 | 306 | 403 | 337 |
| 6 | 350 | 350 | 381 | 376 | 370 | 325 | 435 | 359 |
| 7 | 377 | 377 | 399 | 406 | 377 | 349 | 454 | 380 |
| 8 | 394 | 394 | 424 | 421 | 441 | 360 | 470 | 415 |
| 9 | 410 | 410 | 441 | 414 | 424 | 371 | 494 | 417 |
| 10 | 421 | 421 | 461 | 459 | 438 | 386 | 481 | 437 |
| 11 | 440 | 439 | 501 | 529 | 456 | 399 | 515 | 436 |
| 12 | 467 | 468 | 590 | 587 | 625 | 498 | | 475 |
| 13 | 601 | 601 | 587 | | | | | 496 |
| 14 | | | | | | | | 526 |
| 15+ | 630 | 630 | 669 | | | | | 631 |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 3**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | | 219 | | | | | 145 | 131 |
| 2 | 261 | 280 | 263 | 226 | 244 | 256 | 265 | 210 |
| 3 | 342 | 349 | 345 | 304 | 303 | 372 | 410 | 247 |
| 4 | 360 | 385 | 363 | 345 | 337 | 367 | 426 | 282 |
| 5 | 369 | 446 | 371 | 367 | 364 | 391 | 452 | 288 |
| 6 | 403 | 486 | 407 | 400 | 391 | 432 | 580 | 331 |
| 7 | 427 | 506 | 430 | 424 | 412 | 510 | 571 | 354 |
| 8 | 432 | 668 | | 481 | 444 | 652 | 690 | 381 |
| 9 | 490 | 554 | 521 | 458 | 456 | 499 | | 389 |
| 10 | 499 | 521 | 521 | 521 | 475 | 506 | | 408 |
| 11 | 489 | | | | 486 | 488 | | 431 |
| 12 | 506 | | | | 516 | 510 | | 342 |
| 13 | 523 | | | | 524 | 536 | | 399 |
| 14 | 527 | | | 385 | 385 | | | 385 |
| 15+ | 539 | | | 447 | 451 | 570 | | 447 |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 50 | | 50 | | | | 145 | 145 |
| 2 | 250 | 323 | 320 | 322 | 212 | 263 | 169 | 242 |
| 3 | 266 | 347 | 407 | 346 | 208 | 345 | 242 | 318 |
| 4 | 321 | 356 | 365 | 356 | 224 | 363 | 246 | 276 |
| 5 | 361 | 381 | 404 | 381 | 232 | 371 | 286 | 232 |
| 6 | 380 | 401 | 419 | 401 | 295 | 407 | 333 | 318 |
| 7 | 397 | 438 | 467 | 438 | 341 | 430 | 361 | 341 |
| 8 | 435 | 453 | 492 | 453 | 361 | | 402 | 379 |
| 9 | 463 | 465 | 489 | 465 | 363 | 521 | 414 | 363 |
| 10 | 482 | 487 | 484 | 486 | 401 | 521 | 443 | 401 |
| 11 | 508 | 546 | 553 | 543 | 431 | | 471 | 431 |
| 12 | 521 | 623 | 660 | 616 | 342 | | 342 | 342 |
| 13 | 528 | 485 | 536 | 484 | 399 | | 399 | 399 |
| 14 | 573 | | 577 | 480 | | | | |
| 15+ | 556 | | 898 | 452 | | | | |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 3**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 168 | 145 | 175 | 142 | 145 | 145 | 145 | |
| 2 | 221 | 287 | 263 | 205 | 250 | 245 | 268 | |
| 3 | 246 | 436 | 375 | 230 | 311 | 327 | 240 | |
| 4 | 261 | 514 | 481 | 255 | 284 | 283 | 271 | |
| 5 | 258 | 238 | 245 | 261 | 279 | 232 | 315 | |
| 6 | 298 | 727 | 607 | 319 | 336 | 323 | 325 | |
| 7 | 306 | 337 | 308 | 329 | 357 | 341 | 360 | |
| 8 | 404 | 702 | 661 | 391 | 397 | 382 | 377 | |
| 9 | 363 | 363 | 363 | 363 | 390 | 363 | 403 | |
| 10 | 404 | 401 | 401 | 448 | 416 | 401 | 484 | |
| 11 | 431 | 431 | 431 | 431 | 433 | 431 | 396 | |
| 12 | 342 | 342 | 342 | 342 | 342 | 342 | 342 | |
| 13 | 399 | 399 | 399 | 399 | 399 | 399 | 399 | |
| 14 | | | | | | | 578 | |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 35 | 31 | 62 | | | 36 | 45 | 34 |
| 1 | 207 | 146 | 218 | | 145 | 174 | | 170 |
| 2 | 252 | 210 | 298 | | 287 | 213 | | 257 |
| 3 | 288 | 277 | 307 | | 436 | 292 | | 292 |
| 4 | 305 | 314 | 334 | | 514 | 320 | | 343 |
| 5 | 354 | 361 | 367 | | | 347 | | 373 |
| 6 | 397 | 407 | 411 | | 727 | 333 | | 391 |
| 7 | 403 | 407 | 422 | | | 345 | | 415 |
| 8 | 407 | 440 | 434 | | 703 | 341 | | 447 |
| 9 | 417 | 408 | 455 | | | | | 466 |
| 10 | 404 | 409 | 451 | | | | | 483 |
| 11 | 469 | 482 | 526 | | | | | 513 |
| 12 | 487 | 567 | 442 | | | | | 526 |
| 13 | 516 | 622 | 577 | | | | | 526 |
| 14 | | | | | | | | 569 |
| 15+ | | | | | | | | 546 |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 4**

| AGE | 3.A | 3.B | 3.C | 3.D | 4.A | 4.B | 4.C | 6.A |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | |
| 1 | 229 | 235 | 240 | 239 | 260 | 176 | 241 | 131 |
| 2 | 260 | 256 | 255 | 246 | 265 | 259 | 282 | 202 |
| 3 | 323 | 325 | 324 | 313 | 329 | 326 | 391 | 220 |
| 4 | 349 | 348 | 347 | 341 | 352 | 341 | 433 | 293 |
| 5 | 374 | 372 | 370 | 361 | 375 | 363 | 389 | 269 |
| 6 | 413 | 419 | 417 | 389 | 408 | 432 | 505 | 317 |
| 7 | 450 | 447 | 444 | 443 | 440 | 461 | 459 | 350 |
| 8 | 475 | 468 | 465 | 467 | 457 | 481 | 597 | 367 |
| 9 | 492 | 488 | 486 | 461 | 479 | 533 | 469 | 371 |
| 10 | 498 | 523 | 523 | 527 | 496 | 541 | 450 | 405 |
| 11 | 520 | 564 | 564 | 451 | 512 | 496 | 459 | 431 |
| 12 | 523 | 555 | 555 | 560 | 507 | 509 | 342 | 342 |
| 13 | 591 | 646 | 646 | 646 | 583 | 532 | 399 | 399 |
| 14 | 541 | | | | 541 | 541 | | |
| 15+ | 562 | | | | 562 | 562 | | |
| **AGE** | **2.a** | **5.a** | **14.b** | **5.b** | **5.b1** | **6.b** | **7.b** | **7.c** |
| 0 | | | | | | | | |
| 1 | 294 | | | 266 | | | 238 | 145 |
| 2 | 253 | | | 236 | 212 | | 245 | 287 |
| 3 | 321 | | 426 | 287 | 208 | | 311 | 436 |
| 4 | 349 | | 368 | 330 | 224 | | 339 | 514 |
| 5 | 366 | | 411 | 346 | 232 | | 359 | |
| 6 | 393 | | 422 | 360 | 295 | | 386 | 727 |
| 7 | 429 | | 472 | 419 | 341 | | 441 | |
| 8 | 452 | | 504 | 440 | 361 | | 465 | 703 |
| 9 | 454 | | 493 | 461 | 363 | | 457 | |
| 10 | 473 | | 478 | 464 | 401 | | 527 | |
| 11 | 486 | | | 493 | 431 | | 435 | |
| 12 | 508 | | | 483 | 342 | | 560 | |
| 13 | 525 | | | 600 | 399 | | | |
| 14 | 541 | | | | | | | |
| 15+ | 562 | | | | | | | |

**Table 8.4.2.1. NE Atlantic Mackerel. Mean weight (g) -at-age by area for 2016 (cont.).**

**Quarter 4**

| Age | 7.a | 7.d | 7.e | 7.f | 7.g | 7.h | 7.j | 7.k |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 35 | | | 35 | | |
| 1 | 133 | 145 | 153 | 136 | 145 | 128 | 133 | |
| 2 | 202 | 287 | 222 | 164 | 287 | 213 | 217 | |
| 3 | 220 | 435 | 299 | 207 | 436 | 291 | 300 | |
| 4 | 296 | 509 | 435 | 252 | 514 | 439 | 431 | |
| 5 | 225 | 232 | 231 | 222 | | 362 | | |
| 6 | 324 | 701 | 510 | 372 | 727 | 581 | 727 | |
| 7 | 177 | 341 | 244 | 284 | | 373 | | |
| 8 | 681 | 681 | 677 | 532 | 703 | 667 | 703 | |
| 9 | | 363 | 363 | | | 395 | | |
| 10 | 407 | 401 | 401 | 407 | | 417 | | |
| 11 | | 431 | 431 | | | 490 | | |
| 12 | | 342 | 365 | | | 571 | | |
| 13 | | 399 | 409 | | | 624 | | |
| 14 | | | | | | | | |
| 15+ | | | | | | | | |
| **Age** | **8.a** | **8.b** | **8.c.E** | **8.c.W** | **8.d** | **9.a.N** | **9.aC.N** | **All** |
| 0 | 35 | 36 | 62 | | | 23 | 45 | 37 |
| 1 | 182 | 170 | 158 | | 219 | 150 | | 213 |
| 2 | 215 | 214 | 238 | | 255 | 221 | | 258 |
| 3 | 247 | 253 | 242 | | 275 | 264 | | 327 |
| 4 | 278 | 281 | 260 | | 289 | 277 | | 352 |
| 5 | 350 | 353 | 301 | | 347 | 289 | | 372 |
| 6 | 391 | 394 | 401 | | 403 | 281 | | 404 |
| 7 | 378 | 384 | 410 | | 409 | 323 | | 437 |
| 8 | 423 | 425 | 412 | | 390 | 294 | | 457 |
| 9 | 424 | 421 | 465 | | 446 | | | 472 |
| 10 | 406 | 407 | 464 | | 391 | | | 488 |
| 11 | 471 | 472 | 517 | | 446 | | | 502 |
| 12 | 542 | 546 | 482 | | 446 | | | 508 |
| 13 | 552 | 559 | 551 | | | | | 567 |
| 14 | | | | | | | | 541 |
| 15+ | | | | | | | | 562 |

**Table 8.5.4.1. Numbers of RFID tagged and recaptured mackerel by tagging experiment.**

| Year | Period | Area | N-Released | N-Recaptured |
|---|---|---|---|---|
| 2011 | May-June | Ireland-Hebrides | 18645 | 126 |
| 2011 | Sep | Norwegian west coast | 31257 | 132 |
| 2012 | May-June | Ireland-Hebrides | 32139 | 266 |
| 2013 | May-June | Ireland-Hebrides | 22794 | 308 |
| 2014 | May-June | Ireland-Hebrides | 55187 | 778 |
| 2015 | May-June | Ireland-Hebrides | 43914 | 439 |
| 2015 | August | Iceland | 806 | 10 |
| 2016 | May-June | Ireland-Hebrides | 43959 | 288 |
| 2016 | August | Iceland | 4884 | 74 |
| 2017 | May-June | Ireland-Hebrides | 56082 | 9 |
| 2017 | August | Iceland | 3891 | 0 |
| Total | | | 313558 | 2430 |

**Table 8.5.4.2. Numbers of recaptured mackerel with RFID tags by factory and recapture year.**

| Factory | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | All Years |
|---|---|---|---|---|---|---|---|
| DK01 Sæby | 0 | 0 | 8 | 11 | 0 | 0 | 19 |
| FO01 Vardin Pelagic | 0 | 0 | 15 | 37 | 23 | 13 | 88 |
| GB01 Peterhead Denholm | 0 | 0 | 25 | 74 | 89 | 85 | 273 |
| GB02 Lunar Freezing Peterhead | 0 | 0 | 33 | 51 | 60 | 36 | 180 |
| GB03 Lunar Freezing Fraserburgh | 0 | 0 | 0 | 9 | 16 | 4 | 29 |
| GB04 Lerwick Shetland Catch | 0 | 0 | 25 | 130 | 162 | 69 | 386 |
| IC01 Vopnafjord | 0 | 0 | 24 | 61 | 81 | 48 | 214 |
| IC02 Neskaupstad | 0 | 0 | 0 | 19 | 93 | 36 | 148 |
| IC03 Höfn | 0 | 0 | 0 | 1 | 0 | 1 | 2 |
| NO01 Pelagia Egersund Seafood | 12 | 25 | 19 | 7 | 1 | 0 | 64 |
| NO02 Skude Fryseri | 6 | 9 | 21 | 19 | 27 | 21 | 103 |
| NO03 Pelagia Austevoll | 1 | 1 | 7 | 5 | 1 | 0 | 15 |
| NO04 Pelagia Florø | 6 | 19 | 33 | 22 | 18 | 0 | 98 |
| NO05 Pelagia Måløy | 6 | 19 | 21 | 46 | 42 | 38 | 172 |
| NO06 Pelagia Selje | 19 | 35 | 38 | 77 | 59 | 32 | 260 |
| NO07 Pelagia Liawågen | 10 | 13 | 34 | 34 | 30 | 10 | 131 |
| NO08 Brødrene Sperre | 7 | 18 | 21 | 66 | 117 | 19 | 248 |
| All Factories | 67 | 139 | 324 | 669 | 819 | 412 | 2430 |

**Table 8.5.5.2.1. Biomass, abundance, mean length and mean weight at age of mackerel from the Spanish spring acoustics surveys (PELACUS) from 2001 to 2017.**

| | 2001 | | | | 2002 | | | | 2003 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGE | Number (millions) | L (cm) | W (g) | Biomass t ('000) | Number (millions) | L (cm) | W (g) | Biomass t ('000) | Number (millions) | L (cm) | W (g) | Biomass t ('000) |
| 1 | 29 | 25.9 | 126.2 | 3.7 | 621.4 | 23.3 | 80.5 | 50 | 5678.6 | 23.1 | 81.6 | 463.2 |
| 2 | 47.6 | 31 | 213.7 | 10.2 | 94.8 | 32 | 221.9 | 21 | 324.5 | 28.9 | 165.1 | 53.6 |
| 3 | 184.3 | 33.7 | 277.3 | 51.1 | 378.1 | 34.3 | 277.1 | 104.8 | 109 | 33.5 | 261.3 | 28.5 |
| 4 | 386.6 | 36.1 | 340.3 | 131.6 | 706.8 | 35.8 | 317.9 | 224.7 | 229 | 35 | 299.7 | 68.6 |
| 5 | 382.1 | 37.5 | 383 | 146.4 | 1065.9 | 36.8 | 348 | 370.9 | 265.2 | 37.1 | 359.1 | 95.2 |
| 6 | 393.6 | 38 | 397.7 | 156.5 | 604.6 | 38.2 | 390.9 | 236.3 | 230.1 | 38 | 385.7 | 88.8 |
| 7 | 202.7 | 39.5 | 446.7 | 90.5 | 674.5 | 39.1 | 419.2 | 282.8 | 94.3 | 39.8 | 443.4 | 41.8 |
| 8 | 143.5 | 40 | 464.5 | 66.7 | 191.4 | 39.9 | 447.2 | 85.6 | 88.5 | 40.1 | 454.6 | 40.2 |
| 9 | 83.7 | 40.5 | 481.7 | 40.3 | 158.4 | 40.3 | 461.4 | 73.1 | 19.6 | 41.5 | 505.1 | 9.9 |
| 10 | 17 | 40.2 | 469.3 | 8 | 100.2 | 41 | 490.2 | 49.1 | 10 | 41.9 | 519.9 | 5.2 |
| 11 | 26.3 | 42.1 | 541.4 | 14.2 | 54 | 41.4 | 504 | 27.2 | 14 | 42.6 | 549.6 | 7.7 |
| 12 | 12.3 | 41.9 | 533.8 | 6.5 | 12.4 | 43.5 | 586.7 | 7.3 | 3.8 | 41.5 | 503.1 | 1.9 |
| 13 | 1.9 | 41.5 | 517.1 | 1 | 0 | 0 | 0 | 0 | 3.7 | 43.1 | 566.9 | 2.1 |
| 14 | 6.1 | 43.5 | 596.5 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15+ | 9.4 | 42.8 | 568.1 | 5.3 | 2.9 | 45.5 | 676.9 | 2 | 2 | 43.3 | 578.1 | 1.2 |
| TOTAL | 1926.2 | 37.3 | 381.9 | 735.6 | 4665.3 | 35.5 | 329 | 1534.8 | 7072.1 | 25.5 | 128.4 | 907.8 |

| | 2004 | | | | 2005 | | | | 2006 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 195.2 | 25 | 114.6 | 22.4 | 43.4 | 24.8 | 112.1 | 4.6 | 83.7 | 20.8 | 58.5 | 4.9 |
| 2 | 952.4 | 28.3 | 164.5 | 156.6 | 106.5 | 29.2 | 181.8 | 19 | 9.3 | 29.7 | 177.2 | 1.7 |
| 3 | 599.3 | 32.8 | 258.1 | 154.7 | 229.1 | 32.3 | 245.4 | 56.1 | 57.3 | 31.9 | 223.1 | 12.8 |
| 4 | 227.5 | 37.5 | 377.8 | 86 | 259.6 | 36.5 | 349.4 | 92.4 | 230.7 | 33.5 | 262.7 | 60.6 |
| 5 | 425.6 | 38.1 | 395.5 | 168.3 | 82.6 | 38.3 | 403.4 | 34.2 | 104.7 | 36.7 | 345 | 36.1 |
| 6 | 336.7 | 39.1 | 428.4 | 144.2 | 163.8 | 38.8 | 417.6 | 70.4 | 34.2 | 38.5 | 398.1 | 13.6 |
| 7 | 181.5 | 40.1 | 461.7 | 83.8 | 114.9 | 39.5 | 438.4 | 52 | 22.2 | 39.2 | 420.5 | 9.3 |
| 8 | 106.1 | 40.8 | 483.2 | 51.3 | 63.8 | 39.8 | 451.7 | 29.8 | 7.6 | 40.9 | 483.3 | 3.6 |
| 9 | 76.5 | 41 | 492.5 | 37.7 | 33.6 | 41 | 493.9 | 17.2 | 2 | 41.9 | 513.6 | 1 |
| 10 | 31.1 | 42.3 | 538 | 16.7 | 15.3 | 42.3 | 535.4 | 8.5 | 3.4 | 41.3 | 495.1 | 1.7 |
| 11 | 18.9 | 42.2 | 533.9 | 10.1 | 13.7 | 41.8 | 518.8 | 7.4 | 1.4 | 42.7 | 545.7 | 0.8 |
| 12 | 13.5 | 43.3 | 573.8 | 7.7 | 6.6 | 42 | 526.6 | 3.6 | 0.5 | 42.8 | 551.1 | 0.3 |
| 13 | 3.2 | 43.9 | 599.8 | 1.9 | 11.3 | 42.5 | 544.1 | 6.4 | 0.1 | 43.8 | 590.7 | 0.1 |
| 14 | 0 | 0 | 0 | 0 | 5.1 | 43.8 | 592.6 | 3.2 | 0 | 0 | 0 | 0 |
| 15+ | 5.9 | 46.4 | 710.5 | 4.2 | 7.3 | 43.7 | 594.9 | 4.6 | 0 | 44.5 | 621 | 0 |
| TOTAL | 3173.2 | 33.8 | 298 | 945.6 | 1156.6 | 35.9 | 346.7 | 409.5 | 557.3 | 32.7 | 263 | 146.6 |

| | 2007 | | | | 2008 | | | | 2009 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 182.2 | 21.5 | 64.1 | 11.7 | 407.1 | 24.4 | 100.4 | 40.9 | 7.5 | 24.3 | 98.5 | 0.7 |
| 2 | 34.6 | 25.6 | 110.5 | 3.8 | 100.5 | 27.1 | 135.2 | 13.6 | 65.1 | 29.3 | 176.1 | 11.5 |
| 3 | 22.1 | 33.4 | 254.5 | 5.6 | 327.4 | 29.8 | 180.7 | 59.1 | 148.4 | 30 | 189.4 | 28.1 |
| 4 | 129.6 | 34.9 | 291.7 | 37.8 | 125.8 | 33.5 | 261.9 | 32.9 | 201.7 | 32.5 | 248.1 | 50 |
| 5 | 189.4 | 36.1 | 324 | 61.4 | 233.6 | 36.2 | 328.2 | 76.5 | 86.8 | 35 | 314.3 | 27.3 |
| 6 | 117.5 | 38.1 | 379.7 | 44.6 | 277.5 | 36.3 | 328.5 | 91 | 148.8 | 36.9 | 370 | 55 |
| 7 | 31.9 | 39.8 | 435.9 | 13.9 | 131 | 37.9 | 374.1 | 48.9 | 180.8 | 37.7 | 394.7 | 71.3 |
| 8 | 20.5 | 39.7 | 431.5 | 8.8 | 25.2 | 39.5 | 423.4 | 10.6 | 93 | 39.5 | 454.8 | 42.2 |
| 9 | 4.8 | 41.2 | 484 | 2.3 | 20.1 | 39.5 | 422.7 | 8.5 | 32.6 | 40.2 | 484.7 | 15.7 |
| 10 | 6.1 | 40.7 | 464.7 | 2.8 | 20.5 | 40.2 | 443.6 | 9 | 14.9 | 40.7 | 500.8 | 7.5 |
| 11 | 1.5 | 41.4 | 490.3 | 0.8 | 9.2 | 41.1 | 474.8 | 4.4 | 4.6 | 41.6 | 537 | 2.4 |
| 12 | 4.7 | 44.5 | 608.6 | 2.8 | 7.3 | 41.8 | 500 | 3.6 | 3.5 | 42.2 | 561.9 | 2 |
| 13 | 0.7 | 43.5 | 567.6 | 0.4 | 2.4 | 43.4 | 561.4 | 1.3 | 4.1 | 42.4 | 569.2 | 2.3 |
| 14 | 2.6 | 44 | 591.5 | 1.5 | 1.1 | 44.6 | 607.1 | 0.7 | 0 | 0 | 0 | 0 |
| 15+ | 0.7 | 46.5 | 697.9 | 0.5 | 0.4 | 46.5 | 690.3 | 0.3 | 0 | 0 | 0 | 0 |
| TOTAL | 748.9 | 32.5 | 265.4 | 198.8 | 1689.2 | 31.7 | 238 | 401.4 | 991.8 | 34.8 | 319 | 316.2 |

| | 2010 | | | | 2011 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 431.8 | 23.6 | 89.2 | 38.6 | 1936.9 | 22.5 | 77.4 | 149.3 | 698.05 | 22.07 | 74.36 | 51.83 |
| 2 | 72.7 | 30.6 | 194.8 | 14.2 | 29.7 | 30.5 | 201.3 | 6 | 16.7 | 27.71 | 150.62 | 2.5 |
| 3 | 189.6 | 31.5 | 214.9 | 40.9 | 63.1 | 32.3 | 239.2 | 15.1 | 11.18 | 33.27 | 265.58 | 2.98 |
| 4 | 662.7 | 33.6 | 262.3 | 174.1 | 90.6 | 33.7 | 273.6 | 24.7 | 32.34 | 34.63 | 299.04 | 9.69 |
| 5 | 873.3 | 35 | 296.3 | 258.8 | 154.8 | 35 | 308.5 | 47.6 | 60.04 | 35.62 | 325.28 | 19.53 |
| 6 | 306.6 | 36.8 | 346.3 | 106.1 | 144.1 | 36.1 | 340.6 | 49 | 147.09 | 36.58 | 353.17 | 51.84 |
| 7 | 388.9 | 38.1 | 385.6 | 149.8 | 57.7 | 38.2 | 406.2 | 23.4 | 121.31 | 37.66 | 386.73 | 46.77 |
| 8 | 239.2 | 38.2 | 388.3 | 92.8 | 54.2 | 39.5 | 446.9 | 24.1 | 61.9 | 39.43 | 445.95 | 27.53 |
| 9 | 113.9 | 39.5 | 427.5 | 48.6 | 31.2 | 39.6 | 451.5 | 14 | 32.39 | 40.12 | 470.22 | 15.19 |
| 10 | 26.4 | 40.8 | 470.2 | 12.4 | 10.3 | 41 | 503.5 | 5.2 | 19.11 | 40.54 | 485.42 | 9.26 |
| 11 | 16.5 | 40.9 | 475.8 | 7.8 | 4.7 | 41 | 503.1 | 2.4 | 8.07 | 40.66 | 489.56 | 3.94 |
| 12 | 10.3 | 41.4 | 492.4 | 5 | 3.1 | 41.8 | 533.3 | 1.6 | 2.78 | 41.94 | 538.24 | 1.49 |
| 13 | 7.5 | 41.9 | 509.7 | 3.8 | 2.4 | 41.6 | 527.1 | 1.2 | 1.36 | 42.38 | 555.37 | 0.75 |
| 14 | 5.3 | 42.4 | 530.5 | 2.8 | 0 | 0 | 0 | 0 | 1.36 | 42.38 | 555.37 | 0.75 |
| 15+ | 3 | 43.1 | 557.7 | 1.7 | 0 | 0 | 0 | 0 | 1.19 | 44.53 | 649.03 | 0.78 |
| TOTAL | 3347.8 | 34 | 286 | 957.5 | 2582.9 | 25.8 | 141.2 | 363.7 | 1214.88 | 28.46 | 201.91 | 244.81 |

| | 2013 | | | | 2014 | | | | 2015 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 99 | 24.5 | 93 | 9 | 68.1 | 22.5 | 71.5 | 5.1 | 101.38 | 22.34 | 69.55 | 7.5 |
| 2 | 653 | 26.5 | 119.1 | 81 | 42.8 | 32 | 217.4 | 9.1 | 11.91 | 31.88 | 214.66 | 2.6 |
| 3 | 123 | 28.6 | 152.4 | 20 | 157.4 | 32.3 | 223.7 | 34.6 | 43.16 | 32.69 | 232.42 | 10.2 |
| 4 | 114 | 34.2 | 267.6 | 31 | 340.4 | 33.3 | 245.5 | 81.9 | 112.36 | 34.05 | 264.52 | 29.81 |
| 5 | 228 | 35.3 | 296 | 68 | 675.8 | 34.5 | 275.3 | 181.7 | 299.5 | 35.09 | 290.94 | 86.92 |
| 6 | 235 | 36.2 | 322.3 | 76 | 581.1 | 36.1 | 318 | 179.5 | 348.66 | 36.4 | 326.84 | 112.95 |
| 7 | 178 | 36.7 | 335.3 | 60 | 502.4 | 36.6 | 333.9 | 163 | 344.06 | 37.03 | 345.17 | 117.63 |
| 8 | 64 | 37.6 | 361.4 | 23 | 246.9 | 36.7 | 335.2 | 80.4 | 164.59 | 37.02 | 344.84 | 56.24 |
| 9 | 11 | 38.1 | 378.2 | 4 | 84.5 | 38.2 | 381.8 | 31.3 | 71.17 | 38.37 | 386.31 | 27.15 |
| 10 | 8 | 40 | 439.4 | 4 | 33.1 | 39.2 | 414.3 | 13.3 | 29.5 | 39.17 | 412.51 | 12 |
| 11 | 3 | 40.8 | 470.1 | 1 | 34.7 | 39.4 | 420.9 | 14.2 | 29.95 | 39.24 | 414.69 | 12.25 |
| 12 | 2 | 41.2 | 490.3 | 1 | 34.7 | 39.4 | 420.9 | 14.2 | 29.95 | 39.24 | 414.69 | 12.25 |
| 13 | | | | | | | | | | | | 0 |
| 14 | | | | | | | | | | | | 0 |
| 15+ | | | | | | | | | | | | 0 |
| TOTAL | 1718 | 31.2 | 200.2 | 379 | 2802 | 35.1 | 291 | 808.4 | 1586.2 | 35.4 | 299.24 | 487.49 |

| | 2016 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 12.61 | 22.4 | 74 | 1 | 170.5 | 21.9 | 67.2 | 12.4 |
| 2 | 73.54 | 28 | 144.1 | 11.2 | 12.4 | 27.8 | 141.3 | 1.9 |
| 3 | 26.62 | 30.9 | 193.1 | 5.3 | 91.4 | 62.8 | 234.2 | 22.6 |
| 4 | 54.98 | 34.5 | 268.2 | 14.8 | 115.6 | 64.8 | 283.1 | 34.5 |
| 5 | 230.22 | 35.7 | 297.7 | 68.9 | 438.3 | 65.4 | 298.2 | 137.2 |
| 6 | 406.48 | 36.4 | 315.3 | 128.9 | 421.2 | 36.1 | 316.4 | 139.9 |
| 7 | 318.08 | 37.3 | 337.3 | 107.8 | 278.3 | 37.1 | 344.8 | 100.7 |
| 8 | 271.41 | 37.8 | 353.4 | 96.2 | 128.7 | 38.1 | 374.3 | 50.4 |
| 9 | 102.7 | 38.3 | 365.1 | 37.6 | 84.4 | 38.2 | 377 | 33.2 |
| 10 | 50.36 | 38.4 | 367.8 | 18.6 | 21.8 | 38.4 | 384.1 | 8.7 |
| 11 | 13.83 | 38.9 | 383.8 | 5.3 | 11.8 | 40.1 | 439.1 | 5.4 |
| 12 | 5.31 | 39.4 | 398.6 | 2.1 | 2.7 | 39.5 | 418 | 1.2 |
| 13 | | - | - | - | | | | |
| 14 | - | - | | - | | | | |
| 15+ | ´- | - | - | - | | | | |
| TOTAL | 1566.14 | 36.3 | 311.7 | 497.7 | 1777 | 34.7 | | 548.2 |

**Table 8.5.5.2.2. Mackerel abundance and biomass by ICES sub-divisions from Spanish spring acoustic surveys (PELACUS) from 2001 to 2017.**

| | ICES 9A-N | | ICES 8C-W | | 8C-EW | | 8C-EE | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Abund. (109) | Biomass (kt) | Abund. (109) | Biomass (kt) | Abund. (109) | Biomass (kt) | Abund. (109) | Biomass (kt) | Abund. (109) | Biomass (kt) |
| 2001 | 0.02 | 7.4 | 0.31 | 120.1 | 1.23 | 489.1 | 0.36 | 119.1 | 1.93 | 735.7 |
| 2002 | 0.00 | 0.0 | 0.82 | 333.7 | 3.80 | 1191.1 | 0.04 | 10.0 | 4.67 | 1534.8 |
| 2003 | 4.58 | 376.6 | 1.07 | 184.4 | 0.88 | 202.5 | 0.54 | 144.3 | 7.14 | 907.8 |
| 2004 | 0.61 | 118.6 | 1.03 | 304.3 | 1.50 | 515.7 | 0.03 | 7.0 | 3.17 | 945.6 |
| 2005 | 0.16 | 45.6 | 0.23 | 13.0 | 0.60 | 228.6 | 0.16 | 32.3 | 1.06 | 409.5 |
| 2006 | 0.01 | 0.7 | 0.39 | 100.5 | 0.15 | 41.5 | 0.02 | 4.0 | 0.56 | 146.6 |
| 2007 | 0.16 | 11.2 | 0.22 | 77.4 | 0.36 | 108.4 | 0.01 | 1.8 | 0.75 | 198.8 |
| 2008 | 0.16 | 21.4 | 0.38 | 109.0 | 0.84 | 235.0 | 0.05 | 4.2 | 1.42 | 369.7 |
| 2009 | 0.06 | 11.8 | 0.04 | 10.1 | 0.57 | 220.2 | 0.33 | 74.1 | 0.99 | 316.2 |
| 2010 | 0.38 | 34.2 | 0.88 | 293.7 | 2.09 | 628.6 | 0.00 | 1.0 | 3.35 | 957.5 |
| 2011 | 1.42 | 109.2 | 0.51 | 39.4 | 0.65 | 212.4 | 0.01 | 2.7 | 2.58 | 363.7 |
| 2012 | 0.61 | 45.03 | 0.02 | 1.3 | 0.57 | 190.7 | 0.02 | 7.8 | 1.21 | 244.8 |
| 2013 | 0.00 | 00.00 | 0.46 | 58.0 | 1.06 | 270.9 | 0.19 | 49.7 | 1.72 | 378.6 |
| 2014* | 0.02 | 2.4 | 0.03 | 3.0 | | | 2.75 | 803 | 2.80 | 808.4 |
| 2015* | 0.21 | 73.6 | 0.3 | 7.4 | | | 1.36 | 410 | 1.57 | 483.3 |
| 2016* | 0.00 | 0.2 | 0.09 | 13.7 | | | 1.48 | 484 | 1.57 | 498 |
| 2017 | .17 | 14.7 | .36 | 119.0 | | | 1.25 | 415 | 1.78 | 548.7 |

*** Without split 8cEw and 8cEe**

**Table 8.6.1.1. NE Atlantic mackerel. Input data and parameters and the model configurations for the assessment.**

**Input data types and characteristics:**

| Name | Year range | Age range | Variable from year to year | |
|---|---|---|---|---|
| Catch in tonnes | 1980 -2016 | | Yes | |
| Catch-at-age in numbers | 1980 -2016 | 0-12+ | Yes | |
| Weight-at-age in the commercial catch | 1980 – 2016 | 0-12+ | Yes | |
| Weight-at-age of the spawning stock at spawning time. | 1980 – 2017 | 0-12+ | Yes | |
| Proportion of natural mortality before spawning | 1980 -2017 | 0-12+ | Yes | |
| Proportion of fishing mortality before spawning | 1980 -2017 | 0-12+ | Yes | |
| Proportion mature-at-age | 1980 -2017 | 0-12+ | Yes | |
| Natural mortality | 1980 -2017 | 0-12+ | No, fixed at 0.15 | |

**Tuning data:**

| Type | Name | Year range | Age range |
|---|---|---|---|
| Survey (SSB) | ICES Triennial Mackerel and Horse Mackerel Egg Survey | 1992, 1995, 1998, 2001, 2004, 2007, 2010, 2013,2016. | Not applicable (gives SSB) |
| Survey (abundance index) | IBTS Recruitment index (log transformed) | 1998-2015 | Age 0 |
| Survey (abundance index) | International Ecosystem Summer Survey in the Nordic Seas (IESSNS) | 2010, 2012-2017 | Ages 3-11 |
| Tagging/re capture | Norwegian tagging program | Steal tags : 1980 (release year)-2006 (recapture years)<br>RFID tags : 2011 (release year) 2016 (recapture year) | Ages 2 and older (age at release) |

| **SAM parameter configuration :** | | |
|---|---|---|
| Setting | Value | Description |
| Coupling of fishing mortality states | 1/2/3/4/5/6/7/8/8/8/8/8/8 | Different F states for ages 0 to 6, one same F state for ages 7 and older |
| Correlated random walks for the fishing mortalities | 0 | F random walk of different ages are independent |
| Coupling of catchability parameters | 0/0/0/0/0/0/0/0/0/0/0/0/0 | No catchability parameter for the catches |
| | 1/0/0/0/0/0/0/0/0/0/0/0/0 | One catchability parameter estimated for the egg |
| | 2/0/0/0/0/0/0/0/0/0/0/0/0 | One catchability parameter estimated for the recruitment index |
| | 0/0/0/3/4/5/6/7/8/9/10/10/0 | One catchability parameter for each age group estimated for the IESSNS (age 3 to11) |
| Power law model | 0 | No power law model used for any of the surveys |
| Coupling of fishing mortality random walk variances | 1/1/1/1/1/1/1/1/1/1/1/1 | Same variance used for the F random walk of all ages |
| Coupling of log abundance random walk variances | 1/2/2/2/2/2/2/2/2/2/2/2 | Same variance used for the log abundance random walk of all ages except for the recruits (age 0) |
| Coupling of the observation variances | 1/1/1/1/1/1/1/1/1/1/1/1 | Same observation variance for all ages in the catches |
| | 0/0/0/0/0/0/0/0/0/0/0/0/0 | One observation variance for the egg survey |
| | 2/0/0/0/0/0/0/0/0/0/0/0/0 | One observation variance for the recruitment index |
| | 0/0/0/3/4/4/4/4/4/4/4/4/0 | 2 observation variances for the IESSNS (age 3 and ages 4 and older) |
| Stock recruitment model | 0 | No stock-recruiment model |
| Correlation structure | "ID", "ID", "ID", "AR" | Auto-regressive correlation structure for the IESSNS index, independent observations assumed for the other data sources |

**Table 8.6.1.2. NE Atlantic Mackerel. CATCH IN NUMBER**

Units : thousands

| age | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 33101 | 56682 | 11180 | 7333 | 287287 | 81799 | 49983 | 7403 | 57644 | 65400 | 24246 | 10007 |
| 1 | 411327 | 276229 | 213936 | 47914 | 31901 | 268960 | 58126 | 40126 | 152656 | 64263 | 140534 | 58459 |
| 2 | 393025 | 502365 | 432867 | 668909 | 86064 | 20893 | 424563 | 156670 | 137635 | 312739 | 209848 | 212521 |
| 3 | 64549 | 231814 | 472457 | 433744 | 682491 | 58346 | 38387 | 663378 | 190403 | 207689 | 410751 | 206421 |
| 4 | 328206 | 32814 | 184581 | 373262 | 387582 | 445357 | 76545 | 56680 | 538394 | 167588 | 208146 | 375451 |
| 5 | 254172 | 184867 | 26544 | 126533 | 251503 | 252217 | 364119 | 89003 | 72914 | 362469 | 156742 | 188623 |
| 6 | 142978 | 173349 | 138970 | 20175 | 98063 | 165219 | 208021 | 244570 | 87323 | 48696 | 254015 | 129145 |
| 7 | 145385 | 116328 | 112476 | 90151 | 22086 | 62363 | 126174 | 150588 | 201021 | 58116 | 42549 | 197888 |
| 8 | 54778 | 125548 | 89672 | 72031 | 61813 | 19562 | 42569 | 85863 | 122496 | 111251 | 49698 | 51077 |
| 9 | 130771 | 41186 | 88726 | 48668 | 47925 | 47560 | 13533 | 34795 | 55913 | 68240 | 85447 | 43415 |
| 10 | 39920 | 146186 | 27552 | 49252 | 37482 | 37607 | 32786 | 19658 | 20710 | 32228 | 33041 | 70839 |
| 11 | 56210 | 31639 | 91743 | 19745 | 30105 | 26965 | 22971 | 25747 | 13178 | 13904 | 16587 | 29743 |
| 12 | 104927 | 199615 | 156121 | 132040 | 69183 | 97652 | 81153 | 63146 | 57494 | 35814 | 27905 | 52986 |

| age | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 43447 | 19354 | 25368 | 14759 | 37956 | 36012 | 61127 | 67003 | 36345 | 26034 | 70409 | 14744 |
| 1 | 83583 | 128144 | 147315 | 81529 | 119852 | 144390 | 99352 | 73597 | 102407 | 40315 | 222577 | 187997 |
| 2 | 156292 | 210319 | 221489 | 340898 | 168882 | 186481 | 229767 | 132994 | 142898 | 158943 | 70041 | 275661 |
| 3 | 356209 | 266677 | 306979 | 340215 | 333365 | 238426 | 264566 | 223639 | 275376 | 234186 | 367902 | 91075 |
| 4 | 266591 | 398240 | 267420 | 275031 | 279182 | 378881 | 323186 | 261778 | 390858 | 297206 | 350163 | 295777 |
| 5 | 306143 | 244285 | 301346 | 186855 | 177667 | 246781 | 361945 | 281041 | 295516 | 309937 | 262716 | 235052 |
| 6 | 156070 | 255472 | 184925 | 197856 | 96303 | 135059 | 207619 | 244212 | 241550 | 231804 | 237066 | 183036 |
| 7 | 113899 | 149932 | 189847 | 142342 | 119831 | 84378 | 118388 | 159019 | 175608 | 195250 | 151320 | 133595 |
| 8 | 138458 | 97746 | 106108 | 113413 | 55812 | 66504 | 72745 | 86739 | 106291 | 120241 | 118870 | 94168 |
| 9 | 51208 | 121400 | 80054 | 69191 | 59801 | 39450 | 47353 | 50613 | 52394 | 72205 | 79945 | 75701 |
| 10 | 36612 | 38794 | 57622 | 42441 | 25803 | 26735 | 24386 | 30363 | 31280 | 42529 | 43789 | 45951 |
| 11 | 40956 | 29067 | 20407 | 37960 | 18353 | 13950 | 16551 | 17048 | 18918 | 20546 | 21611 | 25797 |
| 12 | 68205 | 68217 | 57551 | 39753 | 30648 | 24974 | 22932 | 32446 | 34202 | 40706 | 40280 | 30890 |

| age | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 11553 | 12426 | 75651 | 19302 | 25886 | 17615 | 23453 | 30429 | 23872 | 11325 | 62100 | 6732 |
| 1 | 31421 | 46840 | 149425 | 88439 | 59899 | 36514 | 78605 | 62708 | 66196 | 47020 | 43173 | 104019 |
| 2 | 453133 | 135648 | 173646 | 190857 | 167748 | 113574 | 137101 | 115346 | 200167 | 235411 | 137788 | 124411 |
| 3 | 529753 | 668588 | 159455 | 220575 | 399086 | 455113 | 303928 | 322725 | 214043 | 399751 | 669949 | 248852 |
| 4 | 147973 | 293579 | 470063 | 215655 | 284660 | 616963 | 739221 | 469953 | 415884 | 370551 | 829399 | 579835 |
| 5 | 258177 | 120538 | 195594 | 455131 | 260314 | 319465 | 611729 | 654395 | 456404 | 442597 | 564508 | 646894 |
| 6 | 145899 | 121477 | 97061 | 203492 | 255675 | 224848 | 284788 | 488713 | 511270 | 429324 | 549985 | 450344 |
| 7 | 89856 | 63612 | 73510 | 77859 | 124382 | 194326 | 143039 | 244210 | 323835 | 336701 | 503300 | 415107 |
| 8 | 65669 | 38763 | 33399 | 59652 | 57297 | 73171 | 102072 | 113012 | 142948 | 188910 | 339538 | 355997 |
| 9 | 40443 | 23947 | 18961 | 30494 | 32343 | 29738 | 45841 | 53363 | 69551 | 112765 | 141344 | 205691 |
| 10 | 35654 | 18612 | 13987 | 16039 | 19482 | 14989 | 21222 | 25046 | 30619 | 45938 | 63614 | 107685 |
| 11 | 16430 | 7955 | 8334 | 11416 | 6798 | 7470 | 6255 | 12311 | 11603 | 18928 | 21294 | 26939 |
| 12 | 19509 | 10669 | 10186 | 12801 | 9581 | 5003 | 8523 | 10775 | 11678 | 17857 | 13136 | 22700 |

| age | 2016 |
|---|---|
| 0 | 716 |
| 1 | 45199 |
| 2 | 203753 |
| 3 | 257293 |
| 4 | 424843 |
| 5 | 589549 |
| 6 | 532890 |
| 7 | 340155 |
| 8 | 269962 |
| 9 | 170373 |
| 10 | 94778 |
| 11 | 33896 |
| 12 | 24420 |

**Table 8.6.1.3. NE Atlantic Mackerel. WEIGHTS AT AGE IN THE CATCH**

Units : Kg

year

| age | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.057 | 0.060 | 0.053 | 0.050 | 0.031 | 0.055 | 0.039 | 0.076 | 0.055 | 0.049 | 0.085 | 0.068 | 0.051 | 0.061 |
| 1 | 0.131 | 0.132 | 0.131 | 0.168 | 0.102 | 0.144 | 0.146 | 0.179 | 0.133 | 0.136 | 0.156 | 0.156 | 0.167 | 0.134 |
| 2 | 0.249 | 0.248 | 0.249 | 0.219 | 0.184 | 0.262 | 0.245 | 0.223 | 0.259 | 0.237 | 0.233 | 0.253 | 0.239 | 0.240 |
| 3 | 0.285 | 0.287 | 0.285 | 0.276 | 0.295 | 0.357 | 0.335 | 0.318 | 0.323 | 0.320 | 0.336 | 0.327 | 0.333 | 0.317 |
| 4 | 0.345 | 0.344 | 0.345 | 0.310 | 0.326 | 0.418 | 0.423 | 0.399 | 0.388 | 0.377 | 0.379 | 0.394 | 0.397 | 0.376 |
| 5 | 0.378 | 0.377 | 0.378 | 0.386 | 0.344 | 0.417 | 0.471 | 0.474 | 0.456 | 0.433 | 0.423 | 0.423 | 0.460 | 0.436 |
| 6 | 0.454 | 0.454 | 0.454 | 0.425 | 0.431 | 0.436 | 0.444 | 0.512 | 0.524 | 0.456 | 0.467 | 0.469 | 0.495 | 0.483 |
| 7 | 0.498 | 0.499 | 0.496 | 0.435 | 0.542 | 0.521 | 0.457 | 0.493 | 0.555 | 0.543 | 0.528 | 0.506 | 0.532 | 0.527 |
| 8 | 0.520 | 0.513 | 0.513 | 0.498 | 0.480 | 0.555 | 0.543 | 0.498 | 0.555 | 0.592 | 0.552 | 0.554 | 0.555 | 0.548 |
| 9 | 0.542 | 0.543 | 0.541 | 0.545 | 0.569 | 0.564 | 0.591 | 0.580 | 0.562 | 0.578 | 0.606 | 0.609 | 0.597 | 0.583 |
| 10 | 0.574 | 0.573 | 0.574 | 0.606 | 0.628 | 0.629 | 0.552 | 0.634 | 0.613 | 0.581 | 0.606 | 0.630 | 0.651 | 0.595 |
| 11 | 0.590 | 0.576 | 0.574 | 0.608 | 0.636 | 0.679 | 0.694 | 0.635 | 0.624 | 0.648 | 0.591 | 0.649 | 0.663 | 0.647 |
| 12 | 0.580 | 0.584 | 0.582 | 0.614 | 0.663 | 0.710 | 0.688 | 0.718 | 0.697 | 0.739 | 0.713 | 0.708 | 0.669 | 0.679 |

year

| age | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.046 | 0.072 | 0.058 | 0.076 | 0.065 | 0.062 | 0.063 | 0.069 | 0.052 | 0.081 | 0.067 | 0.048 | 0.038 | 0.089 |
| 1 | 0.136 | 0.143 | 0.143 | 0.143 | 0.157 | 0.176 | 0.135 | 0.172 | 0.160 | 0.170 | 0.156 | 0.151 | 0.071 | 0.120 |
| 2 | 0.255 | 0.234 | 0.226 | 0.230 | 0.227 | 0.235 | 0.227 | 0.224 | 0.256 | 0.267 | 0.263 | 0.268 | 0.197 | 0.215 |
| 3 | 0.339 | 0.333 | 0.313 | 0.295 | 0.310 | 0.306 | 0.306 | 0.305 | 0.307 | 0.336 | 0.323 | 0.306 | 0.307 | 0.292 |
| 4 | 0.390 | 0.390 | 0.377 | 0.359 | 0.354 | 0.361 | 0.363 | 0.376 | 0.368 | 0.385 | 0.400 | 0.366 | 0.357 | 0.372 |
| 5 | 0.448 | 0.452 | 0.425 | 0.415 | 0.408 | 0.404 | 0.427 | 0.424 | 0.424 | 0.438 | 0.419 | 0.434 | 0.428 | 0.408 |
| 6 | 0.512 | 0.501 | 0.484 | 0.453 | 0.452 | 0.452 | 0.463 | 0.474 | 0.461 | 0.477 | 0.485 | 0.440 | 0.479 | 0.456 |
| 7 | 0.543 | 0.539 | 0.518 | 0.481 | 0.462 | 0.500 | 0.501 | 0.496 | 0.512 | 0.522 | 0.519 | 0.496 | 0.494 | 0.512 |
| 8 | 0.590 | 0.577 | 0.551 | 0.524 | 0.518 | 0.536 | 0.534 | 0.540 | 0.536 | 0.572 | 0.554 | 0.539 | 0.543 | 0.534 |
| 9 | 0.583 | 0.594 | 0.576 | 0.553 | 0.550 | 0.569 | 0.567 | 0.577 | 0.580 | 0.612 | 0.573 | 0.556 | 0.584 | 0.573 |
| 10 | 0.627 | 0.606 | 0.596 | 0.577 | 0.573 | 0.586 | 0.586 | 0.603 | 0.600 | 0.631 | 0.595 | 0.583 | 0.625 | 0.571 |
| 11 | 0.678 | 0.631 | 0.603 | 0.591 | 0.591 | 0.607 | 0.594 | 0.611 | 0.629 | 0.648 | 0.630 | 0.632 | 0.636 | 0.585 |
| 12 | 0.713 | 0.672 | 0.670 | 0.636 | 0.631 | 0.687 | 0.644 | 0.666 | 0.665 | 0.715 | 0.684 | 0.655 | 0.689 | 0.666 |

year

| age | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.051 | 0.104 | 0.048 | 0.029 | 0.089 | 0.091 | 0.043 | 0.051 | 0.035 |
| 1 | 0.105 | 0.153 | 0.118 | 0.113 | 0.123 | 0.173 | 0.127 | 0.154 | 0.158 |
| 2 | 0.222 | 0.213 | 0.221 | 0.231 | 0.187 | 0.234 | 0.232 | 0.242 | 0.240 |
| 3 | 0.292 | 0.283 | 0.291 | 0.282 | 0.285 | 0.277 | 0.282 | 0.294 | 0.297 |
| 4 | 0.370 | 0.331 | 0.331 | 0.334 | 0.340 | 0.336 | 0.324 | 0.320 | 0.329 |
| 5 | 0.418 | 0.389 | 0.365 | 0.368 | 0.375 | 0.360 | 0.362 | 0.351 | 0.356 |
| 6 | 0.444 | 0.424 | 0.418 | 0.411 | 0.401 | 0.386 | 0.395 | 0.392 | 0.383 |
| 7 | 0.497 | 0.450 | 0.471 | 0.451 | 0.431 | 0.406 | 0.422 | 0.420 | 0.411 |
| 8 | 0.551 | 0.497 | 0.487 | 0.494 | 0.469 | 0.431 | 0.444 | 0.443 | 0.438 |
| 9 | 0.571 | 0.538 | 0.515 | 0.540 | 0.503 | 0.454 | 0.468 | 0.465 | 0.453 |
| 10 | 0.620 | 0.586 | 0.573 | 0.580 | 0.537 | 0.472 | 0.482 | 0.489 | 0.479 |
| 11 | 0.595 | 0.599 | 0.604 | 0.611 | 0.538 | 0.493 | 0.523 | 0.522 | 0.499 |
| 12 | 0.662 | 0.630 | 0.630 | 0.664 | 0.585 | 0.554 | 0.583 | 0.560 | 0.520 |

**Table 8.6.1.4. NE Atlantic Mackerel. WEIGHTS AT AGE IN THE STOCK**

Units : Kg

| age \ year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.063 | 0.063 | 0.063 | 0.063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.125 | 0.123 | 0.122 | 0.122 | 0.119 | 0.123 | 0.115 | 0.076 | 0.111 | 0.114 | 0.096 | 0.174 | 0.130 | 0.145 |
| 2 | 0.205 | 0.179 | 0.159 | 0.179 | 0.204 | 0.244 | 0.184 | 0.157 | 0.181 | 0.162 | 0.166 | 0.184 | 0.201 | 0.190 |
| 3 | 0.287 | 0.258 | 0.217 | 0.233 | 0.251 | 0.281 | 0.269 | 0.234 | 0.238 | 0.230 | 0.247 | 0.243 | 0.260 | 0.266 |
| 4 | 0.322 | 0.312 | 0.300 | 0.282 | 0.293 | 0.308 | 0.301 | 0.318 | 0.298 | 0.272 | 0.290 | 0.303 | 0.308 | 0.323 |
| 5 | 0.356 | 0.335 | 0.368 | 0.341 | 0.326 | 0.336 | 0.350 | 0.368 | 0.348 | 0.338 | 0.332 | 0.347 | 0.360 | 0.359 |
| 6 | 0.377 | 0.376 | 0.362 | 0.416 | 0.395 | 0.356 | 0.350 | 0.414 | 0.392 | 0.392 | 0.383 | 0.392 | 0.397 | 0.410 |
| 7 | 0.402 | 0.415 | 0.411 | 0.404 | 0.430 | 0.407 | 0.374 | 0.415 | 0.445 | 0.388 | 0.435 | 0.423 | 0.419 | 0.432 |
| 8 | 0.434 | 0.431 | 0.456 | 0.438 | 0.455 | 0.455 | 0.434 | 0.431 | 0.442 | 0.449 | 0.447 | 0.492 | 0.458 | 0.459 |
| 9 | 0.438 | 0.454 | 0.455 | 0.475 | 0.489 | 0.447 | 0.428 | 0.483 | 0.466 | 0.432 | 0.494 | 0.500 | 0.487 | 0.480 |
| 10 | 0.484 | 0.450 | 0.473 | 0.467 | 0.507 | 0.519 | 0.467 | 0.487 | 0.506 | 0.429 | 0.473 | 0.546 | 0.513 | 0.515 |
| 11 | 0.520 | 0.524 | 0.536 | 0.544 | 0.513 | 0.538 | 0.506 | 0.492 | 0.567 | 0.482 | 0.495 | 0.526 | 0.543 | 0.547 |
| 12 | 0.534 | 0.531 | 0.544 | 0.528 | 0.567 | 0.591 | 0.542 | 0.581 | 0.594 | 0.556 | 0.536 | 0.615 | 0.568 | 0.577 |

| age \ year | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.114 | 0.116 | 0.097 | 0.084 | 0.083 | 0.087 | 0.093 | 0.113 | 0.109 | 0.112 | 0.112 | 0.106 | 0.108 | 0.083 |
| 2 | 0.163 | 0.201 | 0.185 | 0.196 | 0.172 | 0.210 | 0.194 | 0.190 | 0.206 | 0.181 | 0.158 | 0.140 | 0.164 | 0.149 |
| 3 | 0.240 | 0.278 | 0.250 | 0.257 | 0.248 | 0.260 | 0.253 | 0.246 | 0.245 | 0.251 | 0.258 | 0.221 | 0.236 | 0.206 |
| 4 | 0.306 | 0.327 | 0.322 | 0.310 | 0.299 | 0.317 | 0.301 | 0.303 | 0.288 | 0.277 | 0.318 | 0.328 | 0.291 | 0.288 |
| 5 | 0.368 | 0.385 | 0.372 | 0.356 | 0.348 | 0.356 | 0.357 | 0.342 | 0.333 | 0.341 | 0.355 | 0.378 | 0.333 | 0.330 |
| 6 | 0.418 | 0.432 | 0.425 | 0.401 | 0.383 | 0.392 | 0.394 | 0.398 | 0.360 | 0.401 | 0.406 | 0.403 | 0.400 | 0.362 |
| 7 | 0.459 | 0.458 | 0.446 | 0.460 | 0.409 | 0.424 | 0.416 | 0.417 | 0.418 | 0.407 | 0.449 | 0.464 | 0.413 | 0.451 |
| 8 | 0.480 | 0.491 | 0.471 | 0.473 | 0.455 | 0.456 | 0.438 | 0.451 | 0.429 | 0.489 | 0.482 | 0.481 | 0.437 | 0.452 |
| 9 | 0.496 | 0.511 | 0.513 | 0.505 | 0.475 | 0.489 | 0.464 | 0.484 | 0.458 | 0.490 | 0.506 | 0.547 | 0.455 | 0.508 |
| 10 | 0.550 | 0.517 | 0.508 | 0.511 | 0.530 | 0.508 | 0.489 | 0.521 | 0.511 | 0.488 | 0.519 | 0.538 | 0.469 | 0.527 |
| 11 | 0.592 | 0.560 | 0.538 | 0.546 | 0.500 | 0.545 | 0.514 | 0.535 | 0.523 | 0.521 | 0.579 | 0.509 | 0.531 | 0.533 |
| 12 | 0.604 | 0.602 | 0.573 | 0.585 | 0.547 | 0.576 | 0.551 | 0.574 | 0.557 | 0.540 | 0.588 | 0.603 | 0.566 | 0.586 |

| age \ year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.133 | 0.107 | 0.096 | 0.080 | 0.089 | 0.075 | 0.107 | 0.151 | 0.058 |
| 2 | 0.160 | 0.162 | 0.161 | 0.175 | 0.155 | 0.144 | 0.165 | 0.206 | 0.181 |
| 3 | 0.207 | 0.214 | 0.201 | 0.223 | 0.216 | 0.179 | 0.199 | 0.247 | 0.237 |
| 4 | 0.260 | 0.268 | 0.249 | 0.274 | 0.255 | 0.249 | 0.238 | 0.254 | 0.280 |
| 5 | 0.346 | 0.295 | 0.297 | 0.332 | 0.288 | 0.281 | 0.291 | 0.288 | 0.297 |
| 6 | 0.354 | 0.351 | 0.342 | 0.369 | 0.312 | 0.318 | 0.321 | 0.336 | 0.333 |
| 7 | 0.393 | 0.386 | 0.389 | 0.389 | 0.360 | 0.341 | 0.341 | 0.350 | 0.363 |
| 8 | 0.448 | 0.437 | 0.411 | 0.430 | 0.390 | 0.374 | 0.387 | 0.381 | 0.381 |
| 9 | 0.452 | 0.461 | 0.442 | 0.452 | 0.453 | 0.414 | 0.416 | 0.412 | 0.403 |
| 10 | 0.478 | 0.517 | 0.491 | 0.495 | 0.498 | 0.441 | 0.466 | 0.447 | 0.426 |
| 11 | 0.487 | 0.548 | 0.535 | 0.518 | 0.503 | 0.499 | 0.472 | 0.485 | 0.442 |
| 12 | 0.511 | 0.559 | 0.573 | 0.525 | 0.557 | 0.520 | 0.517 | 0.549 | 0.471 |

**Table 8.6.1.5. NE Atlantic Mackerel. NATURAL MORTALITY**

Units : NA

| age | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 1 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 2 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 3 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 4 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 5 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 6 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 7 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 8 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 9 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 10 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 11 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 12 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |

| age | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 1 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 2 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 3 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 4 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 5 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 6 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 7 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 8 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 9 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 10 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 11 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 12 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |

| age | 2014 | 2015 | 2016 |
|---|---|---|---|
| 0 | 0.15 | 0.15 | 0.15 |
| 1 | 0.15 | 0.15 | 0.15 |
| 2 | 0.15 | 0.15 | 0.15 |
| 3 | 0.15 | 0.15 | 0.15 |
| 4 | 0.15 | 0.15 | 0.15 |
| 5 | 0.15 | 0.15 | 0.15 |
| 6 | 0.15 | 0.15 | 0.15 |
| 7 | 0.15 | 0.15 | 0.15 |
| 8 | 0.15 | 0.15 | 0.15 |
| 9 | 0.15 | 0.15 | 0.15 |
| 10 | 0.15 | 0.15 | 0.15 |
| 11 | 0.15 | 0.15 | 0.15 |
| 12 | 0.15 | 0.15 | 0.15 |

**Table 8.6.1.6. NE Atlantic Mackerel. PROPORTION MATURE**

| age \ year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.093 | 0.097 | 0.097 | 0.098 | 0.103 | 0.103 | 0.103 | 0.103 | 0.103 | 0.103 | 0.103 | 0.103 | 0.103 | 0.103 |
| 2 | 0.521 | 0.497 | 0.498 | 0.485 | 0.467 | 0.516 | 0.522 | 0.352 | 0.360 | 0.372 | 0.392 | 0.435 | 0.520 | 0.534 |
| 3 | 0.872 | 0.837 | 0.857 | 0.863 | 0.853 | 0.885 | 0.926 | 0.922 | 0.901 | 0.915 | 0.909 | 0.912 | 0.928 | 0.934 |
| 4 | 0.949 | 0.934 | 0.930 | 0.940 | 0.938 | 0.940 | 0.983 | 0.994 | 0.989 | 0.994 | 0.996 | 0.991 | 0.996 | 0.996 |
| 5 | 0.972 | 0.976 | 0.969 | 0.972 | 0.966 | 0.966 | 0.965 | 0.997 | 0.994 | 0.996 | 0.998 | 0.996 | 0.997 | 0.997 |
| 6 | 0.984 | 0.984 | 0.987 | 0.999 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.996 | 0.994 | 0.994 |
| 7 | 0.990 | 0.987 | 0.985 | 0.984 | 0.975 | 0.976 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 8 | 1.000 | 0.999 | 0.999 | 0.999 | 0.999 | 0.999 | 0.991 | 0.992 | 0.991 | 0.993 | 0.995 | 1.000 | 1.000 | 1.000 |
| 9 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 10 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 11 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 12 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

| age \ year | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.103 | 0.103 | 0.103 | 0.097 | 0.097 | 0.097 | 0.104 | 0.104 | 0.104 | 0.107 | 0.107 | 0.107 | 0.095 | 0.095 |
| 2 | 0.621 | 0.599 | 0.586 | 0.621 | 0.688 | 0.669 | 0.692 | 0.675 | 0.710 | 0.690 | 0.761 | 0.616 | 0.589 | 0.546 |
| 3 | 0.938 | 0.931 | 0.936 | 0.880 | 0.886 | 0.876 | 0.909 | 0.909 | 0.937 | 0.940 | 0.962 | 0.959 | 0.928 | 0.921 |
| 4 | 0.994 | 0.993 | 1.000 | 0.993 | 0.994 | 0.989 | 0.989 | 0.987 | 0.992 | 0.988 | 0.993 | 0.993 | 0.994 | 0.994 |
| 5 | 0.997 | 0.994 | 1.000 | 0.998 | 0.999 | 0.999 | 0.998 | 0.998 | 1.000 | 1.000 | 0.999 | 0.999 | 1.000 | 1.000 |
| 6 | 0.993 | 0.987 | 0.994 | 0.999 | 0.999 | 0.999 | 0.999 | 0.999 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 7 | 0.999 | 0.999 | 0.999 | 1.000 | 1.000 | 1.000 | 1.000 | 0.999 | 1.000 | 0.999 | 0.999 | 0.999 | 1.000 | 1.000 |
| 8 | 1.000 | 1.000 | 1.000 | 0.994 | 0.995 | 0.996 | 0.997 | 0.997 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 9 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 10 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 11 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 12 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

| age \ year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.095 | 0.096 | 0.096 | 0.096 | 0.094 | 0.092 | 0.092 | 0.104 | 0.104 |
| 2 | 0.524 | 0.541 | 0.667 | 0.655 | 0.604 | 0.683 | 0.675 | 0.763 | 0.761 |
| 3 | 0.917 | 0.919 | 0.930 | 0.927 | 0.926 | 0.921 | 0.916 | 0.948 | 0.947 |
| 4 | 0.999 | 0.999 | 0.999 | 0.999 | 0.999 | 0.998 | 0.999 | 0.998 | 0.998 |
| 5 | 0.999 | 1.000 | 1.000 | 1.000 | 0.999 | 1.000 | 1.000 | 0.999 | 0.999 |
| 6 | 1.000 | 1.000 | 0.999 | 0.999 | 0.999 | 0.999 | 0.999 | 1.000 | 1.000 |
| 7 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.999 | 0.999 | 0.998 |
| 8 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 9 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 10 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 11 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| 12 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

**Table 8.6.1.7. NE Atlantic Mackerel. FRACTION OF HARVEST BEFORE SPAWNING**

| age \ year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.177 | 0.179 | 0.181 | 0.216 |
| 2 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.174 | 0.177 | 0.179 | 0.181 | 0.216 |
| 3 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.253 | 0.285 | 0.316 | 0.318 |
| 4 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.222 | 0.253 | 0.285 | 0.316 | 0.318 |
| 5 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 6 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 7 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 8 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 9 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 10 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 11 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |
| 12 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.381 | 0.392 | 0.403 | 0.414 | 0.439 |

| age \ year | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.252 | 0.287 | 0.250 | 0.212 | 0.175 | 0.179 | 0.183 | 0.187 | 0.201 | 0.216 | 0.231 | 0.230 | 0.229 | 0.229 |
| 2 | 0.252 | 0.287 | 0.250 | 0.212 | 0.175 | 0.179 | 0.183 | 0.187 | 0.201 | 0.216 | 0.231 | 0.230 | 0.229 | 0.229 |
| 3 | 0.321 | 0.323 | 0.328 | 0.334 | 0.339 | 0.364 | 0.390 | 0.415 | 0.408 | 0.400 | 0.393 | 0.375 | 0.357 | 0.338 |
| 4 | 0.321 | 0.323 | 0.328 | 0.334 | 0.339 | 0.364 | 0.390 | 0.415 | 0.408 | 0.400 | 0.393 | 0.375 | 0.357 | 0.338 |
| 5 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 6 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 7 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 8 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 9 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 10 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 11 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |
| 12 | 0.464 | 0.489 | 0.492 | 0.494 | 0.497 | 0.462 | 0.425 | 0.390 | 0.405 | 0.420 | 0.434 | 0.402 | 0.368 | 0.336 |

| age \ year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 0.197 | 0.165 | 0.133 | 0.126 | 0.119 | 0.111 | 0.137 | 0.164 | 0.190 |
| 2 | 0.197 | 0.165 | 0.133 | 0.126 | 0.119 | 0.111 | 0.137 | 0.164 | 0.190 |
| 3 | 0.305 | 0.270 | 0.237 | 0.183 | 0.129 | 0.075 | 0.121 | 0.168 | 0.213 |
| 4 | 0.305 | 0.270 | 0.237 | 0.183 | 0.129 | 0.075 | 0.121 | 0.168 | 0.213 |
| 5 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 6 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 7 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 8 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 9 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 10 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 11 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |
| 12 | 0.305 | 0.272 | 0.241 | 0.232 | 0.223 | 0.214 | 0.199 | 0.183 | 0.168 |

**Table 8.6.1.8. NE Atlantic Mackerel. FRACTION OF NATURAL MORTALITY BEFORE SPAWNING**

year

| age | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 1 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 2 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 3 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 4 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 5 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 6 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 7 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 8 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 9 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 10 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 11 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |
| 12 | 0.397 | 0.396 | 0.394 | 0.392 | 0.394 | 0.396 | 0.397 | 0.388 | 0.378 | 0.369 | 0.357 | 0.345 | 0.333 | 0.341 |

year

| age | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 1 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 2 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 3 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 4 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 5 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 6 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 7 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 8 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 9 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 10 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 11 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |
| 12 | 0.349 | 0.357 | 0.339 | 0.322 | 0.304 | 0.325 | 0.346 | 0.366 | 0.361 | 0.355 | 0.350 | 0.346 | 0.342 | 0.339 |

year

| age | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 1 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 2 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 3 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 4 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 5 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 6 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 7 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 8 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 9 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 10 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 11 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |
| 12 | 0.311 | 0.283 | 0.255 | 0.252 | 0.249 | 0.246 | 0.278 | 0.311 | 0.343 |

**Table 8.6.1.9. NE Atlantic Mackerel. SURVEY INDICES**

```
Some random text
103
SSB-egg-based-survey

1992     2017
1        1        0        0
-1       -1
1        3874476.93
1        -1
1        -1
1        3766378.516
1        -1
1        -1
1        4198626.531
1        -1
1        -1
1        3233833.244
1        -1
1        -1
1        3106808.703
1        -1
1        -1
1        3782966.707
1        -1
1        -1
1        4810751.571
1        -1
1        -1
1        4831948.353
1        -1
1        -1
1        3524054.85
1        -1
R-idx(sqrt transf)

1998     2016
1        1        0        0
0        0
1        0.015720899
1        0.017996206
1        0.012743674
1        0.022164525
1        0.023618634
1        0.013230785
1        0.024607411
1        0.038156211
1        0.037598707
1        0.020352249
1        0.018292615
1        0.015170405
1        0.027764032
1        0.036979005
1        0.02420564
1        0.023257095
1        0.025778066
1        0.023169671
1        -1
Swept-idx
2010     2017
1        1        0.58     0.75
3        11
1        1617005  4035646  3059146  1591100  691936   413253   198106   65803    24747
1        -1       -1       -1       -1       -1       -1       -1       -1       -1
1        1283247  2383260  2164365  2850847  1783942  740361   299490   149282   84344
1        9201746  2456618  3073772  3218990  2540444  1087937  377406   144695   146826
1        7034162  4896456  2659443  2630617  2768227  1910160  849010   379745   95304
1        2539963  6409324  4802298  1795564  1628872  1254859  727691   270562   72410
1        1374705  2635033  5243607  4368491  1893026  1658839  1107866  754993   450100
1        3562908  1953609  3318099  4680603  4653944  1754954  1944991  626406   507546
```

**Table 8.6.2.1. NE Atlantic Mackerel. SAM parameter estimates for the 2017 update.**

| | estimate | std. dev | confidence interval lower bound | confidence interval upper bound |
|---|---|---|---|---|
| observation standard deviations | | | | |
| Catches | 0.19 | 0.12 | 0.15 | 0.25 |
| Egg survey | 0.22 | 0.30 | 0.12 | 0.40 |
| Recruitment index | 0.34 | 0.23 | 0.22 | 0.53 |
| IESSNS age 3 | 0.68 | 0.30 | 0.38 | 1.23 |
| IESSNS ages 4-11 | 0.36 | 0.23 | 0.23 | 0.57 |
| Recapture overdispersion steal tags | 1.21 | 0.27 | 1.36 | 1.12 |
| Recapture overdispersion RFID tags | 1.07 | 1.38 | 2.05 | 1.00 |
| random walk standard deviation | | | | |
| F | 0.18 | 0.20 | 0.12 | 0.27 |
| N@age0 | 0.68 | 0.15 | 0.50 | 0.93 |
| process error standard deviation | | | | |
| N@age1-12+ | 0.17 | 0.12 | 0.13 | 0.22 |
| catchabilities | | | | |
| egg survey | 1.37 | 0.09 | 1.15 | 1.64 |
| recruitment index | 0.00 | 0.12 | 0.00 | 0.00 |
| IESSNS age 3 | 1.03 | 0.29 | 0.58 | 1.82 |
| IESSNS age 4 | 1.45 | 0.18 | 1.01 | 2.08 |
| IESSNS age 5 | 1.91 | 0.18 | 1.33 | 2.74 |
| IESSNS age 6 | 2.32 | 0.18 | 1.61 | 3.34 |
| IESSNS age 7 | 2.68 | 0.19 | 1.85 | 3.89 |
| IESSNS age 8 | 2.63 | 0.19 | 1.80 | 3.84 |
| IESSNS age 9 | 2.49 | 0.19 | 1.70 | 3.64 |
| IESSNS ages 10-11 | 2.26 | 0.19 | 1.55 | 3.30 |
| post tagging survival steal tags | 0.39 | 0.10 | 0.34 | 0.44 |
| post tagging survival RFID tags | 0.09 | 0.09 | 0.08 | 0.11 |

**Table 8.6.3.1. NE Atlantic Mackerel. STOCK SUMMARY. Low = lower limit and High = higher limit of 95% confidence interval.**

| Year | R(age 0) | Low | High | SSB | Low | High | Fbar(4-8) | Low | High | TSB | Low | High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | 7773191 | 3567817 | 16935421 | 4036576 | 1943665 | 8383104 | 0.193 | 0.11 | 0.337 | 5924362 | 3257147 | 10775710 |
| **1981** | 6285233 | 3282738 | 12033906 | 3615334 | 1950102 | 6702543 | 0.193 | 0.114 | 0.327 | 5712650 | 3523170 | 9262789 |
| **1982** | 2180823 | 1053773 | 4513296 | 3599277 | 2165453 | 5982488 | 0.194 | 0.118 | 0.318 | 5408028 | 3564478 | 8205064 |
| **1983** | 1797083 | 820125 | 3937823 | 3910341 | 2611402 | 5855386 | 0.195 | 0.122 | 0.311 | 5345274 | 3737105 | 7645477 |
| **1984** | 5616260 | 2885438 | 10931574 | 4130866 | 2921889 | 5840077 | 0.197 | 0.127 | 0.306 | 5192990 | 3753231 | 7185048 |
| **1985** | 3944367 | 2120562 | 7336748 | 3971447 | 2920811 | 5400004 | 0.201 | 0.133 | 0.304 | 5333223 | 4026040 | 7064825 |
| **1986** | 3905543 | 2178876 | 7000520 | 3583193 | 2707359 | 4742362 | 0.207 | 0.14 | 0.305 | 4879533 | 3758012 | 6335754 |
| **1987** | 5278605 | 3046735 | 9145419 | 3590025 | 2724305 | 4730852 | 0.214 | 0.149 | 0.308 | 4646346 | 3601549 | 5994233 |
| **1988** | 3441359 | 2004787 | 5907336 | 3510794 | 2731026 | 4513203 | 0.223 | 0.159 | 0.312 | 4813042 | 3837633 | 6036369 |
| **1989** | 3590783 | 2086572 | 6179382 | 3250962 | 2582028 | 4093200 | 0.237 | 0.173 | 0.324 | 4452266 | 3607277 | 5495190 |
| **1990** | 2673069 | 1506137 | 4744120 | 3312346 | 2685009 | 4086258 | 0.255 | 0.191 | 0.342 | 4361416 | 3582198 | 5310134 |
| **1991** | 3273685 | 1923108 | 5572759 | 3166759 | 2602456 | 3853422 | 0.279 | 0.212 | 0.368 | 4317183 | 3585692 | 5197899 |
| **1992** | 3854604 | 2262751 | 6566333 | 2867966 | 2388319 | 3443940 | 0.305 | 0.233 | 0.399 | 3876024 | 3248624 | 4624593 |
| **1993** | 3057498 | 1800578 | 5191829 | 2535427 | 2123861 | 3026746 | 0.327 | 0.251 | 0.426 | 3652383 | 3069208 | 4346364 |
| **1994** | 2887906 | 1713507 | 4867209 | 2234166 | 1881148 | 2653432 | 0.338 | 0.261 | 0.437 | 3116273 | 2634488 | 3686164 |
| **1995** | 2470007 | 1457872 | 4184824 | 2232404 | 1891822 | 2634299 | 0.325 | 0.257 | 0.411 | 3099152 | 2631583 | 3649798 |
| **1996** | 3363562 | 1853371 | 6104308 | 2120986 | 1804466 | 2493028 | 0.301 | 0.242 | 0.374 | 2834200 | 2416216 | 3324492 |
| **1997** | 2742677 | 1565533 | 4804928 | 2093848 | 1803473 | 2430976 | 0.284 | 0.229 | 0.354 | 2836242 | 2437855 | 3299731 |
| **1998** | 3306357 | 2158900 | 5063689 | 2105465 | 1807100 | 2453092 | 0.289 | 0.234 | 0.357 | 2793029 | 2392838 | 3260149 |
| **1999** | 3849324 | 2582314 | 5737989 | 2254352 | 1942842 | 2615808 | 0.308 | 0.254 | 0.373 | 3058394 | 2646360 | 3534580 |
| **2000** | 2863744 | 1962734 | 4178371 | 2196893 | 1927028 | 2504551 | 0.335 | 0.29 | 0.387 | 3036062 | 2684238 | 3434000 |
| **2001** | 5285076 | 3718792 | 7511048 | 2091244 | 1845757 | 2369382 | 0.378 | 0.327 | 0.437 | 2860944 | 2542161 | 3219702 |
| **2002** | 8772674 | 6111298 | 12593039 | 1937534 | 1694029 | 2216042 | 0.416 | 0.357 | 0.484 | 2994025 | 2619771 | 3421746 |
| **2003** | 2948913 | 2078929 | 4182966 | 1967596 | 1701779 | 2274933 | 0.442 | 0.375 | 0.521 | 3391057 | 2914867 | 3945041 |
| **2004** | 3661615 | 2506031 | 5350064 | 2474424 | 2103173 | 2911208 | 0.406 | 0.345 | 0.478 | 3354736 | 2881520 | 3905667 |
| **2005** | 5756518 | 3886870 | 8525497 | 2290788 | 1925370 | 2725558 | 0.326 | 0.278 | 0.382 | 3075067 | 2626192 | 3600664 |
| **2006** | 10776411 | 7493514 | 15497542 | 2181467 | 1846737 | 2576868 | 0.301 | 0.257 | 0.354 | 3322606 | 2833805 | 3895719 |
| **2007** | 5022076 | 3493924 | 7218602 | 2337973 | 2000809 | 2731954 | 0.335 | 0.287 | 0.391 | 3614788 | 3081370 | 4240546 |
| **2008** | 5174147 | 3604674 | 7426967 | 2826957 | 2379741 | 3358217 | 0.326 | 0.279 | 0.382 | 4227193 | 3545850 | 5039458 |
| **2009** | 4831392 | 3365715 | 6935332 | 3410558 | 2853173 | 4076832 | 0.301 | 0.256 | 0.354 | 4540767 | 3816537 | 5402429 |
| **2010** | 6375424 | 4432759 | 9169466 | 3754871 | 3177110 | 4437698 | 0.297 | 0.252 | 0.35 | 4780952 | 4069689 | 5616524 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2011** | 7489933 | 5196809 | 10794914 | 4368310 | 3704846 | 5150587 | 0.297 | 0.25 | 0.353 | 5462678 | 4659287 | 6404595 |
| **2012** | 5142363 | 3545547 | 7458338 | 4006048 | 3391787 | 4731555 | 0.29 | 0.24 | 0.351 | 5249216 | 4454246 | 6186069 |
| **2013** | 3674235 | 2457420 | 5493566 | 3830769 | 3208884 | 4573176 | 0.315 | 0.26 | 0.382 | 4754879 | 3997917 | 5655163 |
| **2014** | 9258549 | 6081492 | 14095345 | 3997626 | 3313256 | 4823358 | 0.338 | 0.275 | 0.416 | 4917040 | 4096759 | 5901562 |
| **2015** | 2802372 | 1700294 | 4618782 | 4216594 | 3405884 | 5220280 | 0.344 | 0.269 | 0.44 | 5733541 | 4635943 | 7091005 |
| **2016** | 331585 | 155246 | 708223 | 3970981 | 3024616 | 5213451 | 0.322 | 0.238 | 0.435 | 4752564 | 3656190 | 6177706 |
| **2017** | 331585 | 69354 | 1585331 | 3510202 | 2468507 | 4991485 | 0.313 | 0.22 | 0.446 | 4029685 | 2866809 | 5664264 |

**Table 8.6.3.2. NE Atlantic Mackerel. ESTIMATED POPULATION ABUNDANCE**

Units : Thousands

| Year | Age 0 | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 | Age 8 | Age 9 | Age 10 | Age 11 | Age 12+ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 7773191 | 4835732 | 2108959 | 902255 | 1521850 | 3254541 | 2604785 | 827957 | 310983 | 856058 | 235238 | 344340 | 697704 |
| 1981 | 6285233 | 6730348 | 4011834 | 1709735 | 704392 | 1139393 | 2357751 | 1815963 | 577305 | 216835 | 597142 | 164039 | 727080 |
| 1982 | 2180823 | 5650000 | 5683307 | 3336899 | 1312683 | 516550 | 836768 | 1640176 | 1266629 | 402155 | 151108 | 416000 | 620684 |
| 1983 | 1797083 | 1763867 | 4955233 | 4929335 | 2765833 | 930226 | 385885 | 584150 | 1141145 | 883154 | 279907 | 105273 | 720345 |
| 1984 | 5616260 | 1412361 | 1393376 | 4575125 | 4159025 | 2105376 | 660249 | 276204 | 403523 | 792538 | 615077 | 194711 | 573044 |
| 1985 | 3944367 | 5230451 | 1084892 | 1073603 | 4023399 | 3232157 | 1579818 | 467137 | 197910 | 281964 | 549451 | 427160 | 532429 |
| 1986 | 3905543 | 3282535 | 4750620 | 831930 | 851084 | 3082396 | 2352250 | 1085707 | 318076 | 139651 | 197809 | 378575 | 660573 |
| 1987 | 5278605 | 3261479 | 2672908 | 4340968 | 614756 | 683900 | 2157751 | 1603598 | 762833 | 215335 | 96219 | 135709 | 706808 |
| 1988 | 3441359 | 4735948 | 2668052 | 2131395 | 3766868 | 421181 | 540532 | 1435593 | 1090149 | 531698 | 144463 | 65651 | 568010 |
| 1989 | 3590783 | 2843061 | 4150677 | 2290301 | 1655814 | 2905367 | 292642 | 420029 | 1032325 | 741602 | 360071 | 94669 | 422497 |
| 1990 | 2673069 | 3119880 | 2296838 | 3842228 | 1801843 | 1096616 | 1975257 | 193558 | 310909 | 687357 | 478242 | 237942 | 339085 |
| 1991 | 3273685 | 2208510 | 2645450 | 2015493 | 2935452 | 1245304 | 791175 | 1251704 | 124735 | 215137 | 447819 | 296937 | 366772 |
| 1992 | 3854604 | 2806372 | 1783541 | 2443493 | 1465622 | 1862186 | 934658 | 498149 | 732475 | 78473 | 134831 | 268417 | 400010 |
| 1993 | 3057498 | 3365931 | 2351017 | 1512265 | 1951912 | 960496 | 1148876 | 583322 | 307597 | 400967 | 45044 | 78671 | 376371 |
| 1994 | 2887906 | 2580541 | 2870096 | 1923622 | 1059563 | 1341289 | 595945 | 660154 | 328052 | 172777 | 203962 | 24079 | 253417 |
| 1995 | 2470007 | 2477196 | 2124345 | 2368260 | 1404750 | 679507 | 944059 | 361764 | 289553 | 167542 | 96512 | 113134 | 151007 |
| 1996 | 3363562 | 2047346 | 2072990 | 2111432 | 1776329 | 961930 | 491553 | 571018 | 214034 | 141759 | 87279 | 53263 | 147157 |
| 1997 | 2742677 | 2958710 | 1655534 | 1903135 | 1745073 | 1195354 | 708832 | 327405 | 337903 | 145473 | 87232 | 47742 | 117637 |
| 1998 | 3306357 | 2278570 | 2540949 | 1236161 | 1611985 | 1457267 | 848968 | 469800 | 255764 | 208997 | 98495 | 55095 | 106919 |
| 1999 | 3849324 | 2772716 | 1845827 | 2395083 | 1157078 | 1248283 | 902664 | 597083 | 304098 | 177260 | 131537 | 63013 | 107848 |
| 2000 | 2863744 | 3327541 | 2275456 | 1644156 | 1835350 | 890423 | 857397 | 614726 | 368919 | 187794 | 114180 | 74008 | 113851 |
| 2001 | 5285076 | 1755786 | 2660571 | 1750417 | 1205306 | 1262898 | 574874 | 568919 | 410490 | 234882 | 116127 | 69604 | 116234 |
| 2002 | 8772674 | 5850887 | 1188994 | 2345091 | 1413742 | 896901 | 809318 | 356501 | 326102 | 217759 | 122540 | 59903 | 102374 |
| 2003 | 2948913 | 7805592 | 4959505 | 870422 | 1540627 | 853992 | 528227 | 392693 | 210220 | 172104 | 106438 | 60047 | 75407 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | 3661615 | 2296446 | 6497745 | 3733585 | 728013 | 957199 | 450472 | 259771 | 177475 | 104550 | 78874 | 44308 | 53993 |
| 2005 | 5756518 | 3221057 | 2133534 | 4912409 | 2017780 | 532009 | 498076 | 232833 | 126225 | 84787 | 54539 | 32170 | 41125 |
| 2006 | 10776411 | 6356804 | 3071832 | 1751990 | 3151823 | 1159285 | 371439 | 281581 | 133197 | 70007 | 49428 | 29851 | 38228 |
| 2007 | 5022076 | 7653868 | 5381377 | 2548400 | 1480508 | 2007985 | 746522 | 250126 | 169649 | 87101 | 41734 | 29907 | 37183 |
| 2008 | 5174147 | 4569776 | 6144877 | 4670885 | 2060087 | 1178173 | 1113932 | 429804 | 160239 | 90875 | 50873 | 20644 | 30548 |
| 2009 | 4831392 | 4250642 | 4000425 | 5498441 | 3874296 | 1625206 | 833320 | 636073 | 249102 | 97977 | 46634 | 26849 | 22538 |
| 2010 | 6375424 | 4743147 | 4310598 | 3658886 | 4670162 | 2847413 | 1219828 | 527071 | 332723 | 154694 | 62535 | 23865 | 29333 |
| 2011 | 7489933 | 5796892 | 3768734 | 4282282 | 3296947 | 3385924 | 1965435 | 817511 | 349936 | 186796 | 84154 | 38453 | 32804 |
| 2012 | 5142363 | 6415634 | 5570157 | 2857514 | 3214926 | 2586743 | 2440038 | 1299158 | 520875 | 220128 | 110102 | 48413 | 39154 |
| 2013 | 3674235 | 3934707 | 5931182 | 4995080 | 2082181 | 2192013 | 1884892 | 1422641 | 692375 | 298841 | 113987 | 70711 | 46942 |
| 2014 | 9258549 | 3128895 | 3060970 | 5257475 | 3771436 | 1661151 | 1582461 | 1356851 | 916597 | 430457 | 192457 | 61921 | 51436 |
| 2015 | 2802372 | 6947597 | 2608289 | 2464263 | 4104493 | 2887102 | 1243130 | 1169656 | 929735 | 644938 | 300887 | 97937 | 64547 |
| 2016 | 331585 | 2577874 | 5120236 | 2000351 | 2158411 | 2876256 | 2058132 | 859475 | 782552 | 490597 | 329493 | 158110 | 85221 |
| 2017 | 331585 | 284613 | 2180461 | 3992814 | 1457054 | 1618881 | 1833549 | 1370222 | 501980 | 558290 | 245131 | 200240 | 140753 |

**Table 8.6.3.3. NE Atlantic Mackerel. ESTIMATED FISHING MORTALITY**

| Year | Age 0 | Age 1 | Age 2 | Age 3 | Age 4 | Age 5 | Age 6 | Age 7 and older |
|---|---|---|---|---|---|---|---|---|
| 1980 | 0.01 | 0.034 | 0.055 | 0.096 | 0.16 | 0.171 | 0.211 | 0.211 |
| 1981 | 0.01 | 0.034 | 0.054 | 0.096 | 0.16 | 0.172 | 0.212 | 0.211 |
| 1982 | 0.01 | 0.034 | 0.054 | 0.096 | 0.161 | 0.172 | 0.213 | 0.211 |
| 1983 | 0.01 | 0.033 | 0.054 | 0.096 | 0.161 | 0.175 | 0.215 | 0.212 |
| 1984 | 0.01 | 0.033 | 0.054 | 0.097 | 0.162 | 0.176 | 0.219 | 0.213 |
| 1985 | 0.01 | 0.033 | 0.054 | 0.099 | 0.165 | 0.18 | 0.224 | 0.218 |
| 1986 | 0.01 | 0.033 | 0.053 | 0.101 | 0.17 | 0.184 | 0.23 | 0.225 |
| 1987 | 0.01 | 0.033 | 0.053 | 0.104 | 0.179 | 0.187 | 0.236 | 0.235 |
| 1988 | 0.01 | 0.033 | 0.053 | 0.107 | 0.186 | 0.195 | 0.242 | 0.247 |
| 1989 | 0.01 | 0.033 | 0.053 | 0.11 | 0.197 | 0.202 | 0.257 | 0.264 |
| 1990 | 0.01 | 0.033 | 0.054 | 0.114 | 0.206 | 0.208 | 0.273 | 0.295 |
| 1991 | 0.01 | 0.033 | 0.054 | 0.118 | 0.214 | 0.216 | 0.287 | 0.34 |
| 1992 | 0.01 | 0.033 | 0.055 | 0.122 | 0.219 | 0.229 | 0.3 | 0.388 |
| 1993 | 0.01 | 0.033 | 0.056 | 0.126 | 0.221 | 0.236 | 0.312 | 0.434 |
| 1994 | 0.01 | 0.033 | 0.057 | 0.128 | 0.222 | 0.237 | 0.314 | 0.458 |
| 1995 | 0.01 | 0.033 | 0.058 | 0.13 | 0.22 | 0.241 | 0.312 | 0.427 |
| 1996 | 0.01 | 0.032 | 0.059 | 0.132 | 0.217 | 0.249 | 0.306 | 0.366 |
| 1997 | 0.01 | 0.032 | 0.061 | 0.135 | 0.213 | 0.265 | 0.306 | 0.319 |
| 1998 | 0.01 | 0.032 | 0.062 | 0.142 | 0.218 | 0.287 | 0.311 | 0.314 |
| 1999 | 0.01 | 0.032 | 0.064 | 0.153 | 0.23 | 0.309 | 0.331 | 0.334 |
| 2000 | 0.01 | 0.031 | 0.067 | 0.167 | 0.25 | 0.343 | 0.363 | 0.359 |
| 2001 | 0.007 | 0.029 | 0.066 | 0.161 | 0.268 | 0.335 | 0.419 | 0.435 |
| 2002 | 0.007 | 0.031 | 0.066 | 0.161 | 0.271 | 0.351 | 0.428 | 0.515 |
| 2003 | 0.005 | 0.025 | 0.066 | 0.144 | 0.245 | 0.35 | 0.438 | 0.589 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2004 | 0.004 | 0.019 | 0.069 | 0.151 | 0.225 | 0.329 | 0.41 | 0.534 |
| 2005 | 0.004 | 0.018 | 0.064 | 0.139 | 0.197 | 0.284 | 0.357 | 0.395 |
| 2006 | 0.005 | 0.019 | 0.055 | 0.114 | 0.184 | 0.254 | 0.337 | 0.366 |
| 2007 | 0.005 | 0.015 | 0.042 | 0.103 | 0.174 | 0.266 | 0.335 | 0.45 |
| 2008 | 0.005 | 0.014 | 0.035 | 0.098 | 0.17 | 0.258 | 0.318 | 0.443 |
| 2009 | 0.004 | 0.012 | 0.034 | 0.094 | 0.177 | 0.246 | 0.315 | 0.384 |
| 2010 | 0.004 | 0.014 | 0.035 | 0.092 | 0.178 | 0.247 | 0.297 | 0.381 |
| 2011 | 0.004 | 0.013 | 0.036 | 0.09 | 0.173 | 0.239 | 0.297 | 0.389 |
| 2012 | 0.004 | 0.012 | 0.039 | 0.092 | 0.175 | 0.24 | 0.29 | 0.372 |
| 2013 | 0.004 | 0.013 | 0.043 | 0.1 | 0.199 | 0.259 | 0.305 | 0.406 |
| 2014 | 0.004 | 0.015 | 0.047 | 0.12 | 0.213 | 0.294 | 0.358 | 0.413 |
| 2015 | 0.003 | 0.016 | 0.048 | 0.123 | 0.195 | 0.271 | 0.374 | 0.44 |
| 2016 | 0.003 | 0.017 | 0.046 | 0.135 | 0.21 | 0.259 | 0.346 | 0.397 |
| 2017 | 0.003 | 0.017 | 0.046 | 0.136 | 0.211 | 0.255 | 0.35 | 0.375 |

**Table 8.7.2.1. RCT3 output.**

```
Analysis by RCT3_R ver3.1 of data from file :

RCT3/RCT3init.txt

RCT3 for NEA Mackerel

Data for 1 surveys over 26 years :  1990 - 2015

Regression type = c
Tapered time weighting applied
Power = 3 over 20 years
Survey weighting not applied
Final estimates shrunk towards mean
Minimum S.E. for any survey taken as 0.000
Minimum of    3 points used for regression

Forecast/Hindcast variance correction used.


yearclass = 2015

          I-----------Regression----------I  I-----------Prediction---------I

 Survey/  Slope  Inter-   Std  Rsquare  No.  Index Predicted   Std     WAP
 Series           cept   Error          Pts  Value   Value    Error   Weights

 IBTS.index  78.88  13.64   0.52  0.389     17   0.02   15.46    0.595    0.284

                                        VPA Mean =    15.63    0.375    0.716
```

| Year Class | Weighted Average Prediction | Log WAP | Int Std Error | Ext Std Error | Var Ratio | VPA | Log VPA |
|---|---|---|---|---|---|---|---|
| 2015 | 5850212 | 15.58 | 0.32 | 0.07 | 0.06 | | |

**Table 8.7.3.1. NE Atlantic Mackerel. Short-term prediction: INPUT DATA**

| | Stock Numbers | M | Maturity ogive | Prop of F before spw. | Prop of M before spw. | Weights in the stock | Exploitation pattern | Weights in the catch |
|---|---|---|---|---|---|---|---|---|
| 2017 | | | | | | | | |
| 0 | 4255854 | 0,15 | 0 | 0 | 0,310667 | 0 | 0,003465 | 0,043 |
| 1 | 4913608 | 0,15 | 0,1 | 0,163667 | 0,310667 | 0,105333 | 0,016141 | 0,146333 |
| 2 | 2180461 | 0,15 | 0,733 | 0,163667 | 0,310667 | 0,184 | 0,047166 | 0,238 |
| 3 | 3992814 | 0,15 | 0,937 | 0,167333 | 0,310667 | 0,227667 | 0,126306 | 0,291 |
| 4 | 1457054 | 0,15 | 0,998333 | 0,167333 | 0,310667 | 0,257333 | 0,206194 | 0,324333 |
| 5 | 1618881 | 0,15 | 0,999333 | 0,183333 | 0,310667 | 0,292 | 0,274777 | 0,356333 |
| 6 | 1833549 | 0,15 | 0,999667 | 0,183333 | 0,310667 | 0,33 | 0,359467 | 0,39 |
| 7 | 1370222 | 0,15 | 0,998667 | 0,183333 | 0,310667 | 0,351333 | 0,416827 | 0,417667 |
| 8 | 501980 | 0,15 | 1 | 0,183333 | 0,310667 | 0,383 | 0,416827 | 0,441667 |
| 9 | 558290 | 0,15 | 1 | 0,183333 | 0,310667 | 0,410333 | 0,416827 | 0,462 |
| 10 | 245131 | 0,15 | 1 | 0,183333 | 0,310667 | 0,446333 | 0,416827 | 0,483333 |
| 11 | 200240 | 0,15 | 1 | 0,183333 | 0,310667 | 0,466333 | 0,416827 | 0,514667 |
| 12+ | 140753 | 0,15 | 1 | 0,183333 | 0,310667 | 0,512333 | 0,416827 | 0,554333 |
| 2018 | | | | | | | | |
| 0 | 4255854 | 0,15 | 0 | 0 | 0,310667 | 0 | 0,003465 | 0,043 |
| 1 | - | 0,15 | 0,1 | 0,163667 | 0,310667 | 0,105333 | 0,016141 | 0,146333 |
| 2 | - | 0,15 | 0,733 | 0,163667 | 0,310667 | 0,184 | 0,047166 | 0,238 |
| 3 | - | 0,15 | 0,937 | 0,167333 | 0,310667 | 0,227667 | 0,126306 | 0,291 |
| 4 | - | 0,15 | 0,998333 | 0,167333 | 0,310667 | 0,257333 | 0,206194 | 0,324333 |
| 5 | - | 0,15 | 0,999333 | 0,183333 | 0,310667 | 0,292 | 0,274777 | 0,356333 |
| 6 | - | 0,15 | 0,999667 | 0,183333 | 0,310667 | 0,33 | 0,359467 | 0,39 |
| 7 | - | 0,15 | 0,998667 | 0,183333 | 0,310667 | 0,351333 | 0,416827 | 0,417667 |
| 8 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,383 | 0,416827 | 0,441667 |
| 9 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,410333 | 0,416827 | 0,462 |
| 10 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,446333 | 0,416827 | 0,483333 |
| 11 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,466333 | 0,416827 | 0,514667 |
| 12+ | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,512333 | 0,416827 | 0,554333 |
| 2019 | | | | | | | | |
| 0 | 4255854 | 0,15 | 0 | 0 | 0,310667 | 0 | 0,003465 | 0,043 |
| 1 | - | 0,15 | 0,1 | 0,163667 | 0,310667 | 0,105333 | 0,016141 | 0,146333 |
| 2 | - | 0,15 | 0,733 | 0,163667 | 0,310667 | 0,184 | 0,047166 | 0,238 |
| 3 | - | 0,15 | 0,937 | 0,167333 | 0,310667 | 0,227667 | 0,126306 | 0,291 |
| 4 | - | 0,15 | 0,998333 | 0,167333 | 0,310667 | 0,257333 | 0,206194 | 0,324333 |
| 5 | - | 0,15 | 0,999333 | 0,183333 | 0,310667 | 0,292 | 0,274777 | 0,356333 |
| 6 | - | 0,15 | 0,999667 | 0,183333 | 0,310667 | 0,33 | 0,359467 | 0,39 |
| 7 | - | 0,15 | 0,998667 | 0,183333 | 0,310667 | 0,351333 | 0,416827 | 0,417667 |
| 8 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,383 | 0,416827 | 0,441667 |
| 9 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,410333 | 0,416827 | 0,462 |
| 10 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,446333 | 0,416827 | 0,483333 |
| 11 | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,466333 | 0,416827 | 0,514667 |
| 12+ | - | 0,15 | 1 | 0,183333 | 0,310667 | 0,512333 | 0,416827 | 0,554333 |

**Table 8.7.3.2. NE Atlantic Mackerel. Short-term prediction: Multi-option table for 1 179 kt catch in 2017 and a range of F-values in 2018.**

| 2017 | | | |
|---|---|---|---|
| TSB | SSB | Fbar | Landings |
| 4 458 196 | 3 443926 | 0.405 | 1 178 850 |

| 2018 | | | | 2019 | | |
|---|---|---|---|---|---|---|
| TSB | SSB | Fbar | Landings | TSB | SSB | Implied change in the landings |
| 3943363 | 3213067 | 0 | 0 | 4429078 | 3698314 | -100% |
| - | 3208726 | 0,01 | 28707,78 | 4404470 | 3669832 | -98% |
| - | 3204392 | 0,02 | 57151,52 | 4380095 | 3641670 | -95% |
| - | 3200066 | 0,03 | 85334 | 4355949 | 3613824 | -93% |
| - | 3195748 | 0,04 | 113258 | 4332030 | 3586290 | -90% |
| - | 3191438 | 0,05 | 140926,2 | 4308336 | 3559064 | -88% |
| - | 3187135 | 0,06 | 168341,4 | 4284864 | 3532143 | -86% |
| - | 3182841 | 0,07 | 195506,2 | 4261612 | 3505521 | -83% |
| - | 3178554 | 0,08 | 222423,2 | 4238577 | 3479196 | -81% |
| - | 3174274 | 0,09 | 249095,2 | 4215758 | 3453164 | -79% |
| - | 3170003 | 0,1 | 275524,5 | 4193151 | 3427421 | -77% |
| - | 3165739 | 0,11 | 301713,8 | 4170755 | 3401963 | -74% |
| - | 3161483 | 0,12 | 327665,7 | 4148568 | 3376787 | -72% |
| - | 3157234 | 0,13 | 353382,6 | 4126586 | 3351889 | -70% |
| - | 3152993 | 0,14 | 378866,9 | 4104808 | 3327266 | -68% |
| - | 3148760 | 0,15 | 404121,2 | 4083232 | 3302914 | -66% |
| - | 3144534 | 0,16 | 429147,8 | 4061856 | 3278831 | -64% |
| - | 3140316 | 0,17 | 453949,1 | 4040677 | 3255011 | -61% |
| - | 3136105 | 0,18 | 478527,5 | 4019694 | 3231453 | -59% |
| - | 3131902 | 0,19 | 502885,3 | 3998903 | 3208152 | -57% |
| - | 3127707 | 0,2 | 527024,8 | 3978304 | 3185107 | -55% |
| - | 3123519 | 0,21 | 550948,3 | 3957894 | 3162312 | -53% |
| - | 3119338 | 0,22 | 574658 | 3937672 | 3139767 | -51% |

| | | | | | | |
|---|---|---|---|---|---|---|
| - | 3115166 | 0,23 | 598156,2 | 3917634 | 3117466 | -49% |
| - | 3111000 | 0,24 | 621445,1 | 3897780 | 3095407 | -47% |
| - | 3106842 | 0,25 | 644526,9 | 3878107 | 3073588 | -45% |
| - | 3102692 | 0,26 | 667403,7 | 3858613 | 3052005 | -43% |
| - | 3098548 | 0,27 | 690077,6 | 3839297 | 3030654 | -41% |
| - | 3094413 | 0,28 | 712550,8 | 3820157 | 3009535 | -40% |
| - | 3090285 | 0,29 | 734825,4 | 3801190 | 2988642 | -38% |
| - | 3086164 | 0,3 | 756903,3 | 3782395 | 2967975 | -36% |
| - | 3082050 | 0,31 | 778786,7 | 3763770 | 2947529 | -34% |
| - | 3077944 | 0,32 | 800477,5 | 3745314 | 2927302 | -32% |
| - | 3073845 | 0,33 | 821977,8 | 3727024 | 2907291 | -30% |
| - | 3069754 | 0,34 | 843289,5 | 3708899 | 2887494 | -28% |
| - | 3065670 | 0,35 | 864414,6 | 3690937 | 2867908 | -27% |
| - | 3061593 | 0,36 | 885355 | 3673136 | 2848531 | -25% |
| - | 3057523 | 0,37 | 906112,6 | 3655495 | 2829359 | -23% |
| - | 3053461 | 0,38 | 926689,3 | 3638012 | 2810391 | -21% |
| - | 3049406 | 0,39 | 947086,9 | 3620685 | 2791623 | -20% |
| - | 3045358 | 0,4 | 967307,4 | 3603513 | 2773054 | -18% |
| - | 3041318 | 0,41 | 987352,4 | 3586493 | 2754680 | -16% |
| - | 3037284 | 0,42 | 1007224 | 3569626 | 2736500 | -15% |
| - | 3033258 | 0,43 | 1026924 | 3552908 | 2718511 | -13% |
| - | 3029239 | 0,44 | 1046453 | 3536338 | 2700711 | -11% |
| - | 3025228 | 0,45 | 1065815 | 3519915 | 2683097 | -10% |
| - | 3021223 | 0,46 | 1085009 | 3503638 | 2665667 | -8% |
| - | 3017226 | 0,47 | 1104039 | 3487504 | 2648419 | -6% |
| - | 3013235 | 0,48 | 1122906 | 3471512 | 2631351 | -5% |
| - | 3009252 | 0,49 | 1141612 | 3455661 | 2614460 | -3% |
| - | 3005276 | 0,5 | 1160157 | 3439949 | 2597744 | -2% |

**Table 8.7.3.3. NE Atlantic Mackerel. Short-term prediction: Management option table for 1 179 kt catch in 2017 and a range of catch options in 2018.**

| Rationale | Catch (2018) | Fbar (2018) | SSB (2019) | %chang-eSSB | %change TAC |
|---|---|---|---|---|---|
| F = 0.21 (Fmsy) | 550948 | 0.21 | 3162312 | 1.2% | -53% |
| F = 0 | 0 | 0 | 3698314 | 15% | -100% |
| Fpa | 864415 | 0.35 | 2867908 | -6.5% | -27% |
| Flim | 1122906 | 0.48 | 2631351 | -13% | -4.7% |
| SSB(2019) = Blim | 1915301 | 1 | 1944804 | -31% | 62% |
| SSB(2019) = Bpa | 1196775 | 0.52 | 2564830 | -14% | 1.5% |
| SSB(2019) = MSY Btrigger | 1196775 | 0.52 | 2564830 | -14% | 1.5% |
| F = F2017 | 977765 | 0.405 | 2763463 | -9.2% | -17% |
| F = 0.24 (Fmp) | 621445 | 0.24 | 3095407 | -0.5% | -47% |
| Catch(2018) = 2017 catch - 20% | 943080 | 0.388 | 2795307 | -8.4% | -20% |
| Catch(2018) = 2017 catch | 1178850 | 0.510 | 2580927 | -14% | 0.0% |
| Catch(2018) = 2017 +20% | 1414620 | 0.647 | 2371562 | -20% | 20% |
| F = 0.20 | 527025 | 0.2 | 3185107 | 1.8% | -55% |
| F = 0.22 | 574658 | 0.22 | 3139767 | 0.7% | -51% |
| F = 0.23 | 598156 | 0.23 | 3117466 | 0.1% | -49% |
| F = 0.25 | 644527 | 0.25 | 3073588 | -1.1% | -45% |
| F = 0.26 | 667404 | 0.26 | 3052005 | -1.6% | -43% |
| F = 0.27 | 690078 | 0.27 | 3030654 | -2.2% | -41% |
| F = 0.28 | 712551 | 0.28 | 3009535 | -2.7% | -40% |
| F = 0.29 | 734825 | 0.29 | 2988642 | -3.3% | -38% |
| F = 0.30 | 756903 | 0.3 | 2967975 | -3.8% | -36% |

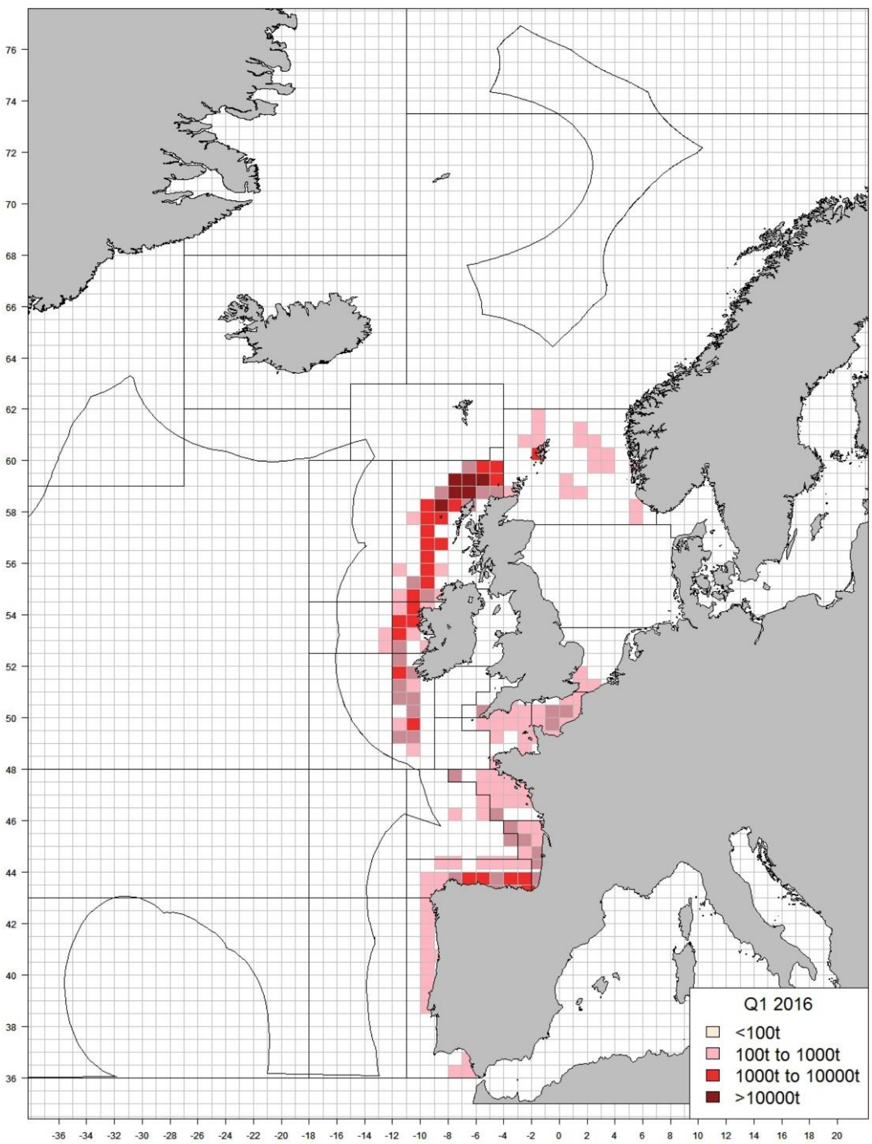


**Figure 8.4.2.1. NE Atlantic Mackerel. Commercial catches in 2016, quarter 1.**

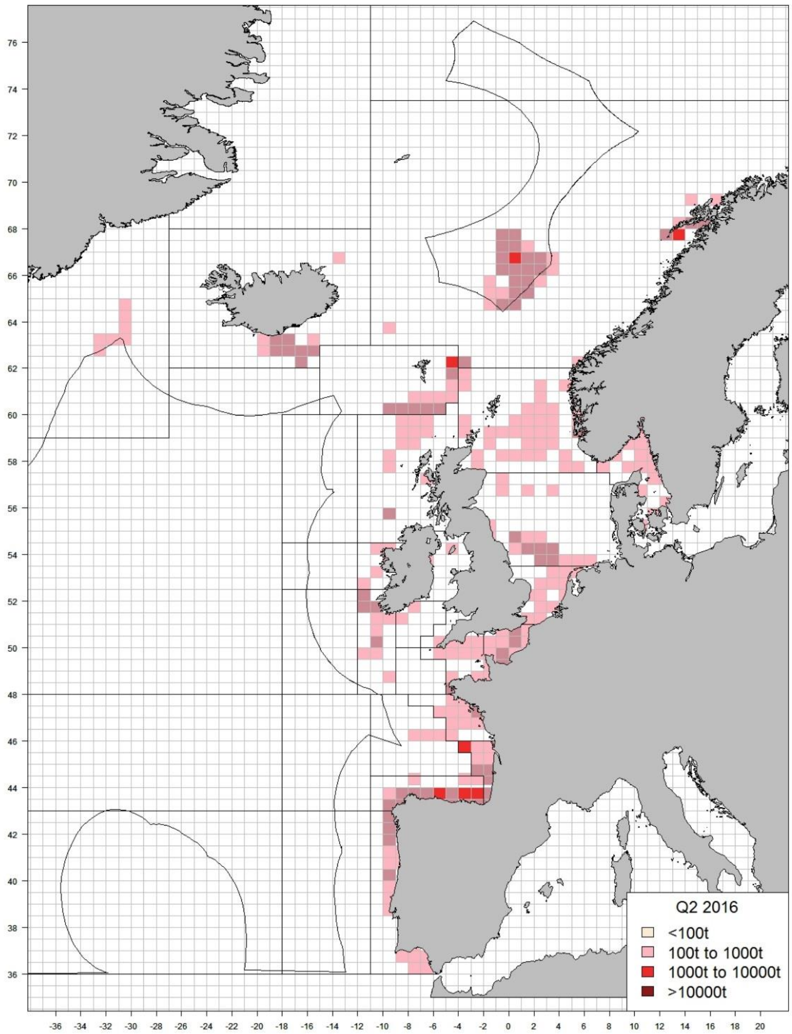


**Figure 8.4.2.2. NE Atlantic Mackerel. Commercial catches in 2016, quarter 2.**

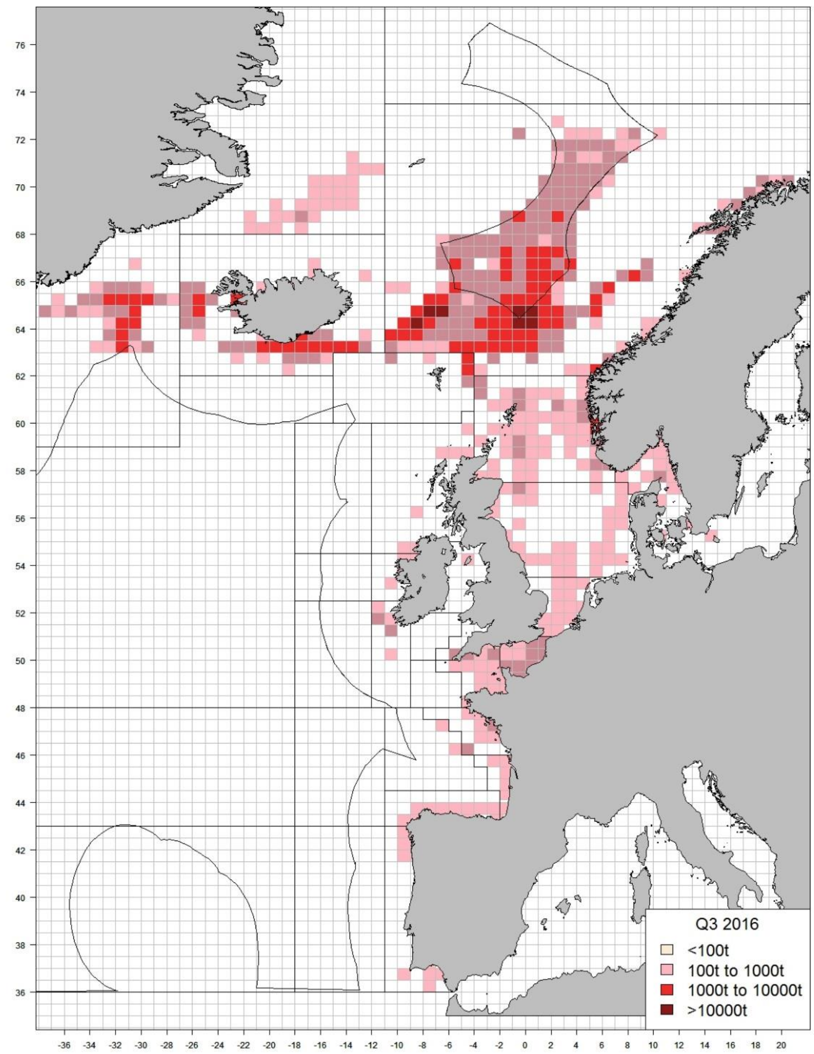


**Figure 8.4.2.3. NE Atlantic Mackerel. Commercial catches in 2016, quarter 3.**

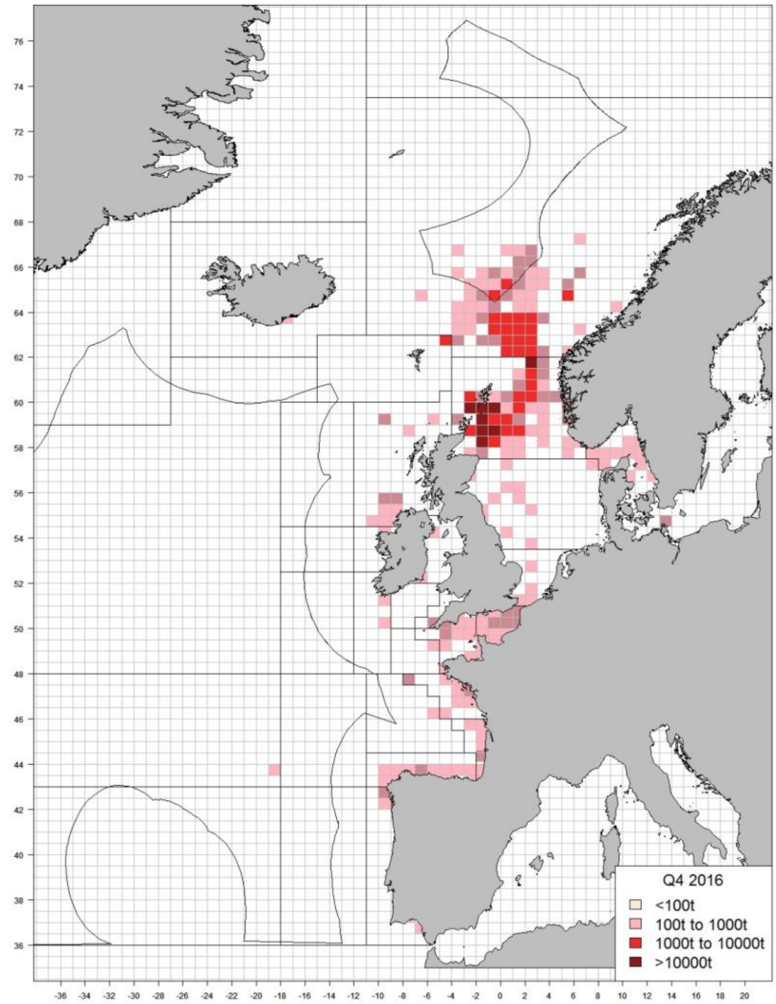


**Figure 8.4.2.4. NE Atlantic Mackerel. Commercial catches in 2016, quarter 4.**

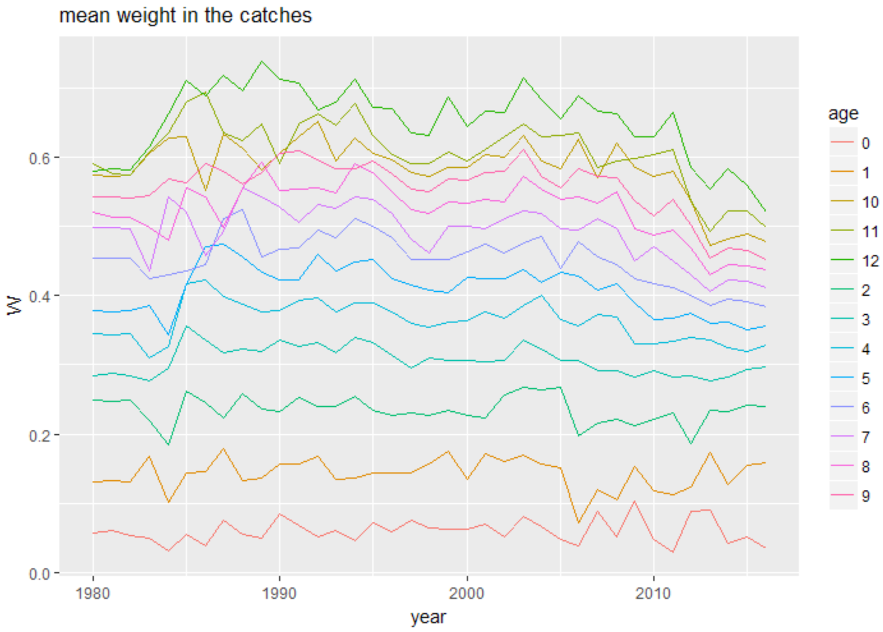


**Figure 8.5.2.1. NE Atlantic mackerel. Weights-at-age in the catch.**

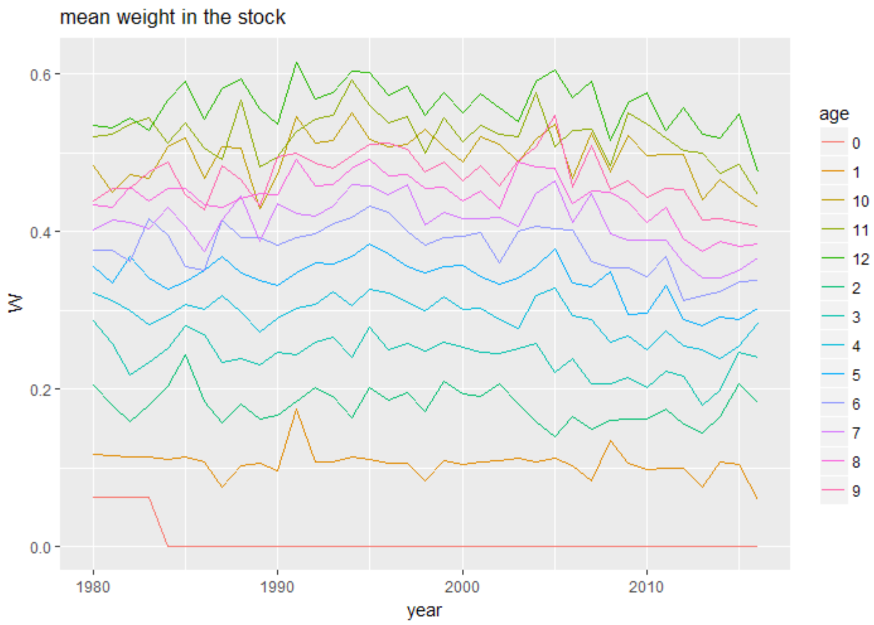


**Figure 8.5.2.2. NE Atlantic mackerel. Weights-at-age in the stock.**

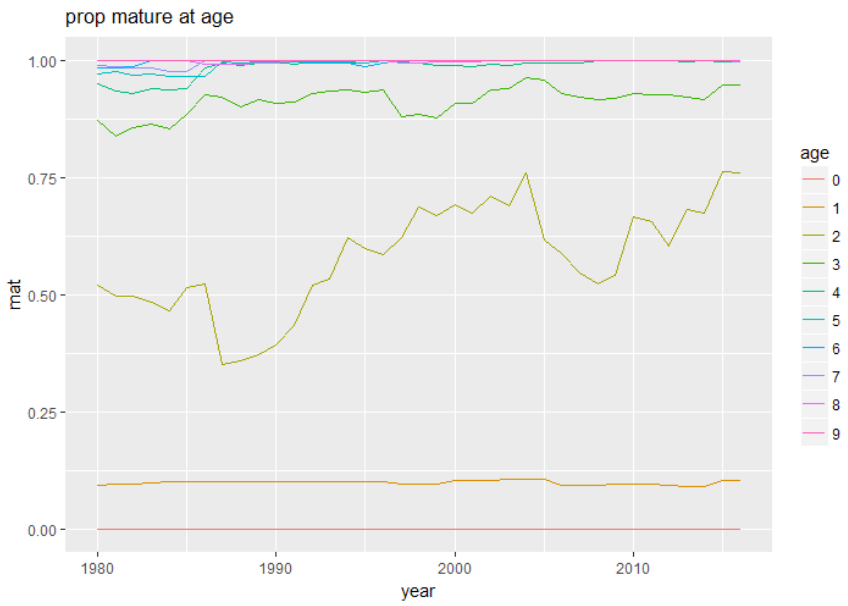


**Figure 8.5.3.1. NE Atlantic mackerel. Proportion of mature fish at age.**

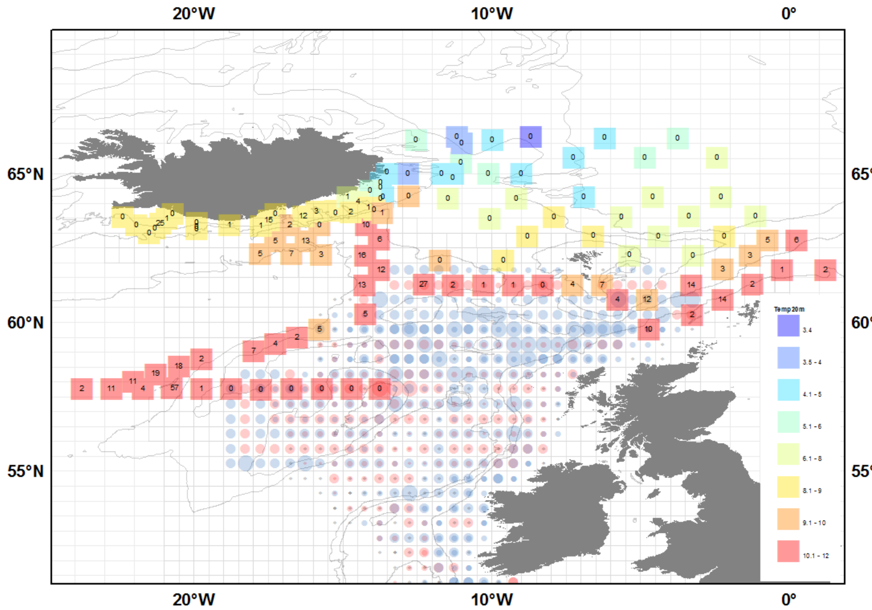


**Fig. 8.6.1.3.1. Mackerel stage 1 egg counts per m2 per day (coloured squares). The coloured squares represent the temperature at 20m depth recorded during the plankton tows. 200, 1000 and 2000m isobaths are included for reference. Abundance bubble plots from 2016 MEGS survey periods 5 and 6 are underlain for reference as well.**

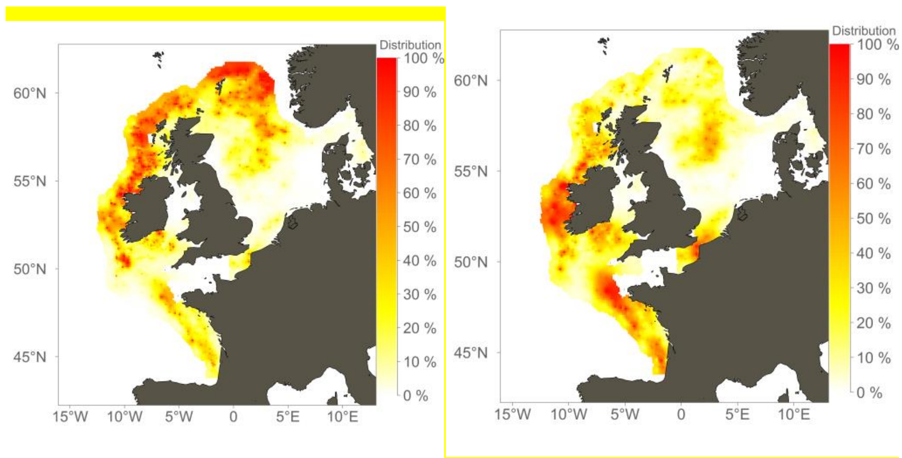


**Figure 8.6.2.1. Distributions of modelled squared catch rates of mackerel at approximately 3-9 months of age in first and fourth quarter demersal trawl surveys. Left) average rates for cohorts from 1998-2015; and Right) 2015 cohort. See Jansen *et al.* (2015) for details.**

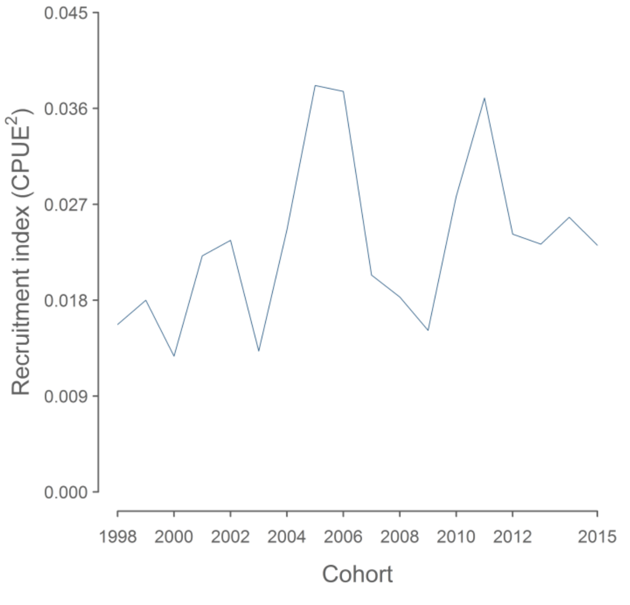


**Figure 8.6.2.2. IBTS recruitment index derived from square root transformed CPUE. See Jansen *et al.* (2015) for details.**

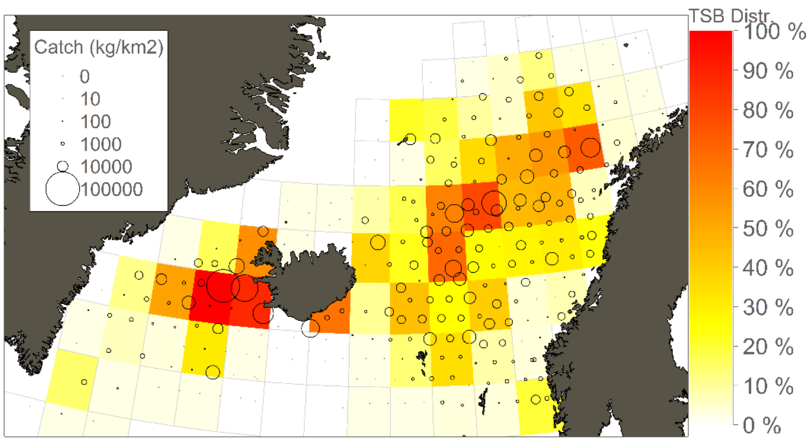


**Figure 8.6.3.1. Mackerel catch rates from surface trawl hauls (circle size represents catch rate in kg/km²) overlaid on mean catch rate per rectangle (1° lat. x 2° lon.) from the IESSNS survey in 2017. White rectangles indicate zero-observations and yellow-red colour scale represent the biomass distribution (illustrated as cumulative fractions, e.g. the sum of all areas with the colour corresponding up to 40% represents 40% of the total biomass in the entire survey).**

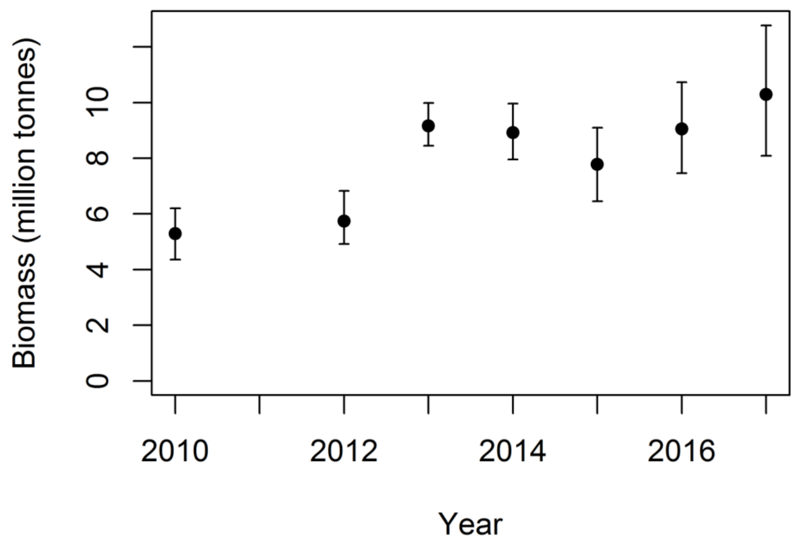


**Figure 8.6.3.2. Estimated mackerel total stock biomass, with 95 % CI, from the IESSNS for the years included in the assessment.**

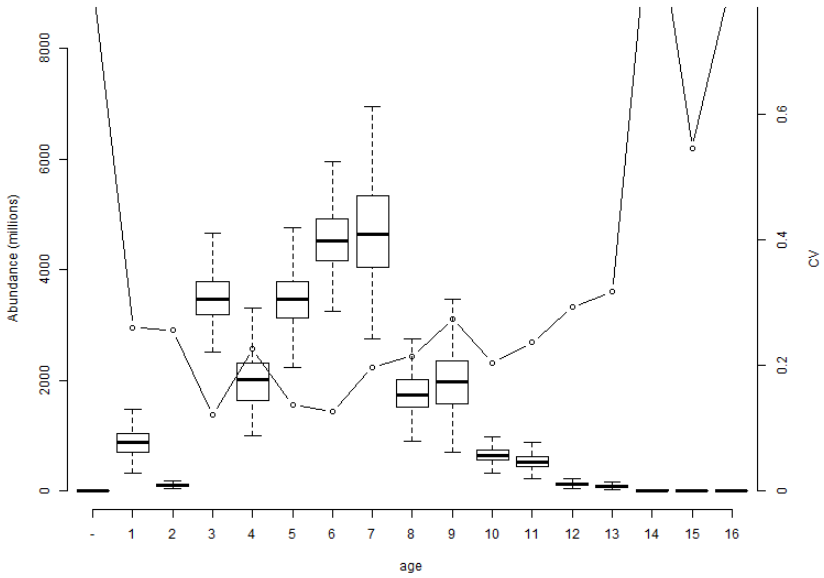


**Figure 8.6.3.3. Mackerel numbers by age from the IESSNS survey in 2017. Boxplot of abundance and relative standard error (CV) obtained by bootstrapping with 500 replicates using the StoX software.**

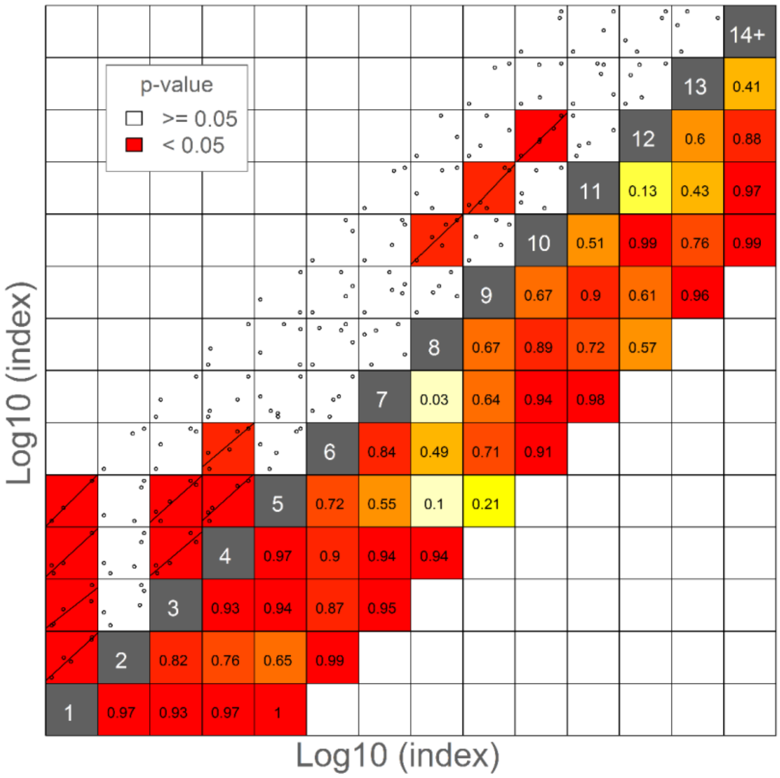


**Figure 8.6.3.4. Internal consistency of the mackerel abundance index from the IESSNS surveys including data in 2010 and from 2012 to 2017. Ages indicated by white numbers in grey diagonal cells. Statistically significant positive correlations (*p<0.05*) are indicated by regression lines and red cells in upper left half. Corelation coefficients (r) are given in the lower right half.**

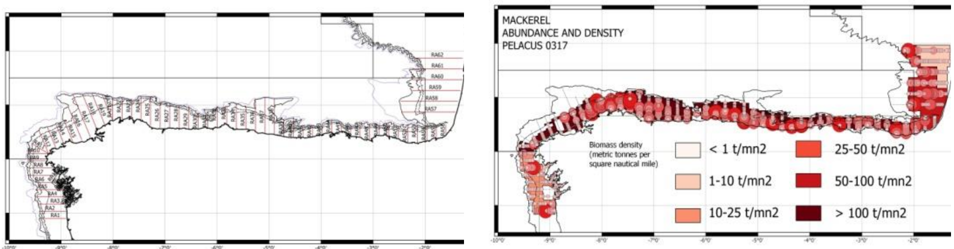


**Figure 8.6.5.2.1. PELACUS 0317 survey track (right panel) and mackerel density distribution(left panel). Polygons are drawn to encompass the backscattering energy, and polygon colour indicates the mean density expressed as tonnes per squared nautical mile (<1; 1-10; 10-25; 25-50; 50-100; and >100).**

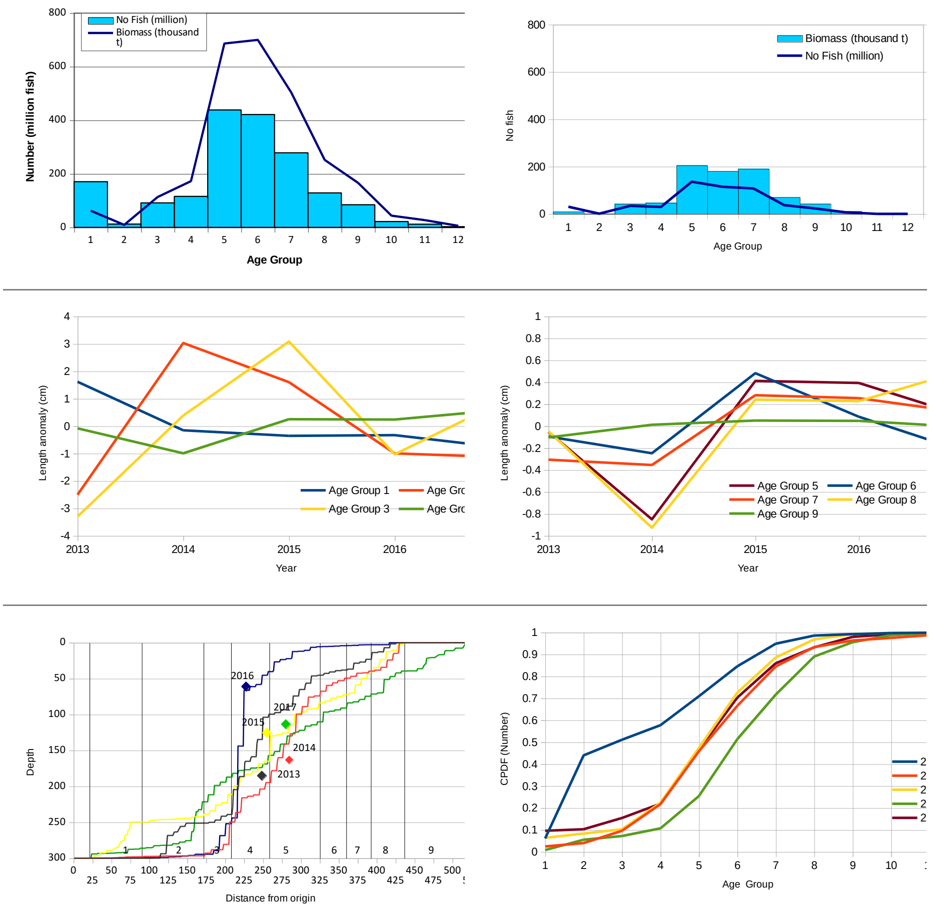


**Figure 8.6.5.2.2: Mackerel stock descriptors.from PELACUS Upper pannels, 2017 abundance and bioamms estimates by age group in 8c+9a (left panel) and 8b (right panel). Medium panels, trend in mean length at age by year (2013-17) expressed as anomaly around the ovearl mean length at age; left panel age groups 1-4, right panel age groups 5-9. Lower panel, left, centre of gravity (CoG) of mackerel distribution (weighting factor NASC) along the surveyed area (from south to north); right panel, cumulated abundance estimates by age group 2013-17age.**

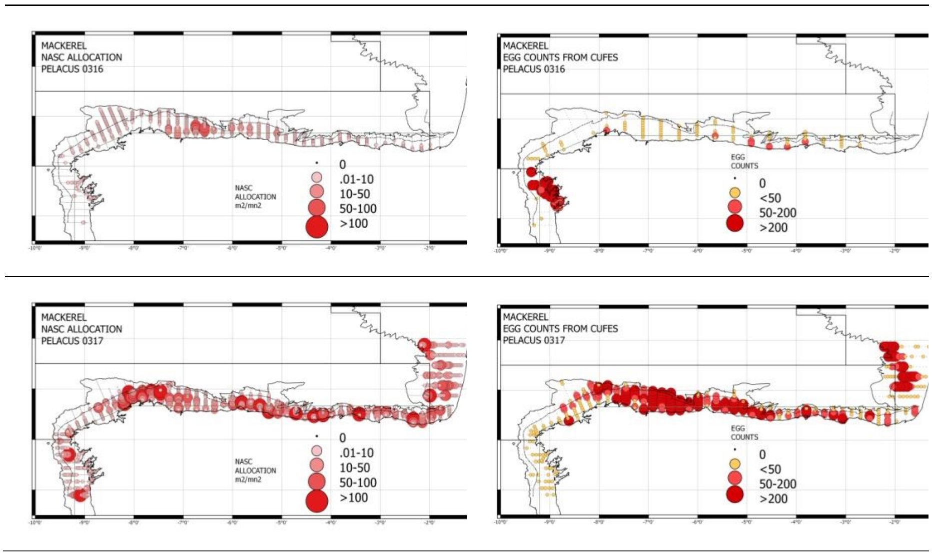


**Figure 8.6.5.2.3: Mackerel NASC and egg counts from CUFES distribution in 2016 and 2017 surveys.**

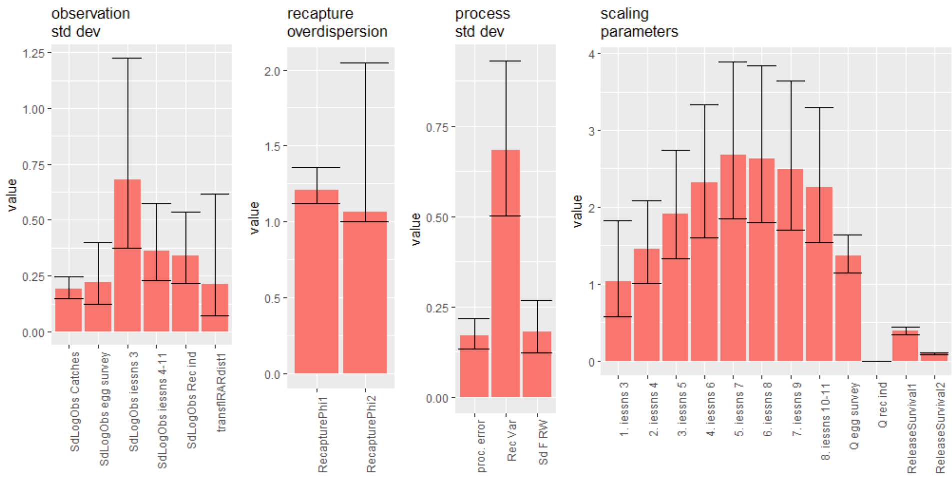


**Figure 8.6.2.1. NE Atlantic mackerel. Parameter estimates from the SAM model (and associated confidence intervals) for the WGWIDE 2017 update assessment.**

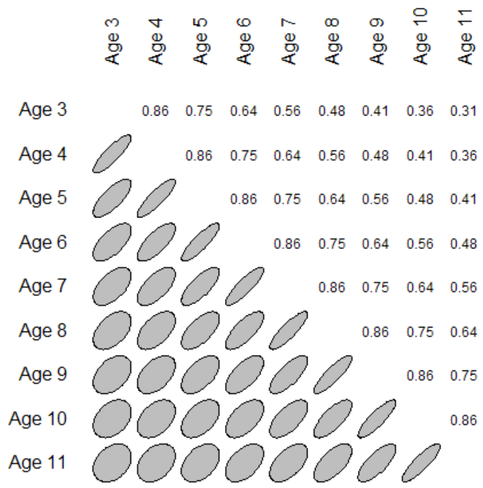


**Figure 8.6.2.2. NE Atlantic mackerel. Estimated AR1 error correlation structure for the observations from the IESSNS survey age 3 to 11.**

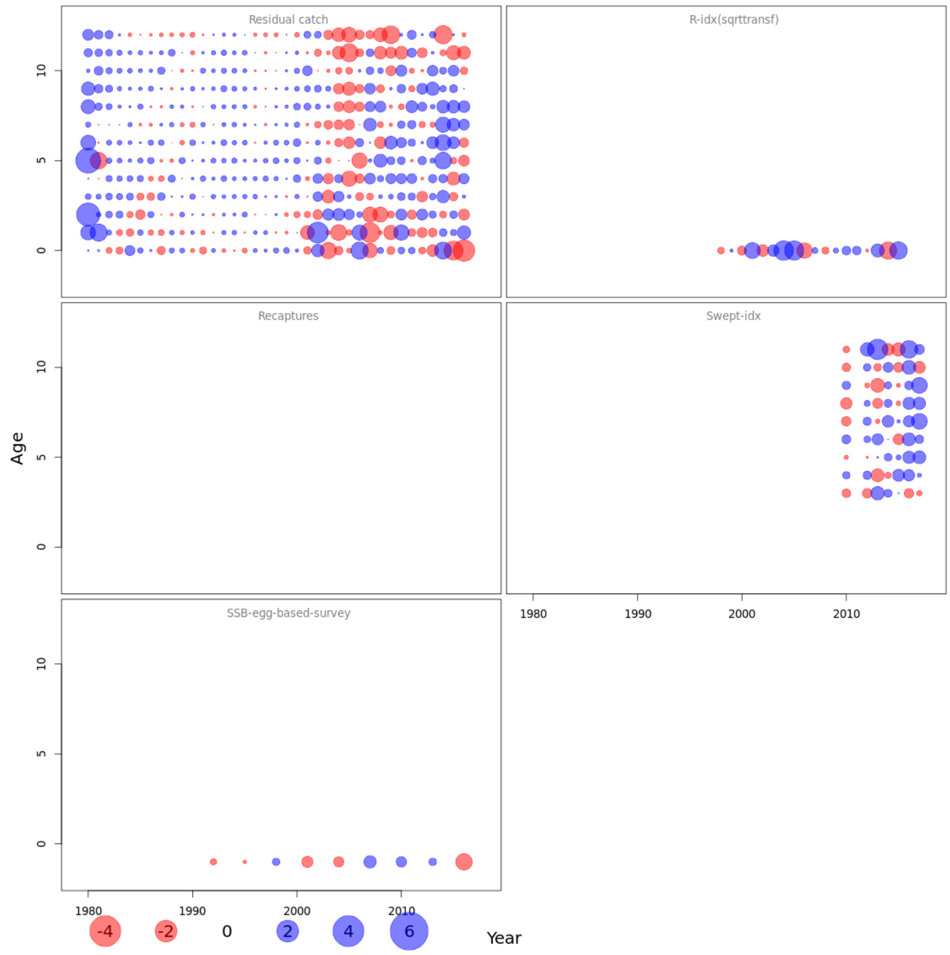


**Figure 8.6.2.3. NE Atlantic mackerel. One Step Ahead Normalized residuals for the fit to the catch data (catch data prior to 2000 were not used to fit the model). Blue circles indicate positive residuals (observation larger than predicted) and filled red circles indicate negative residuals.**

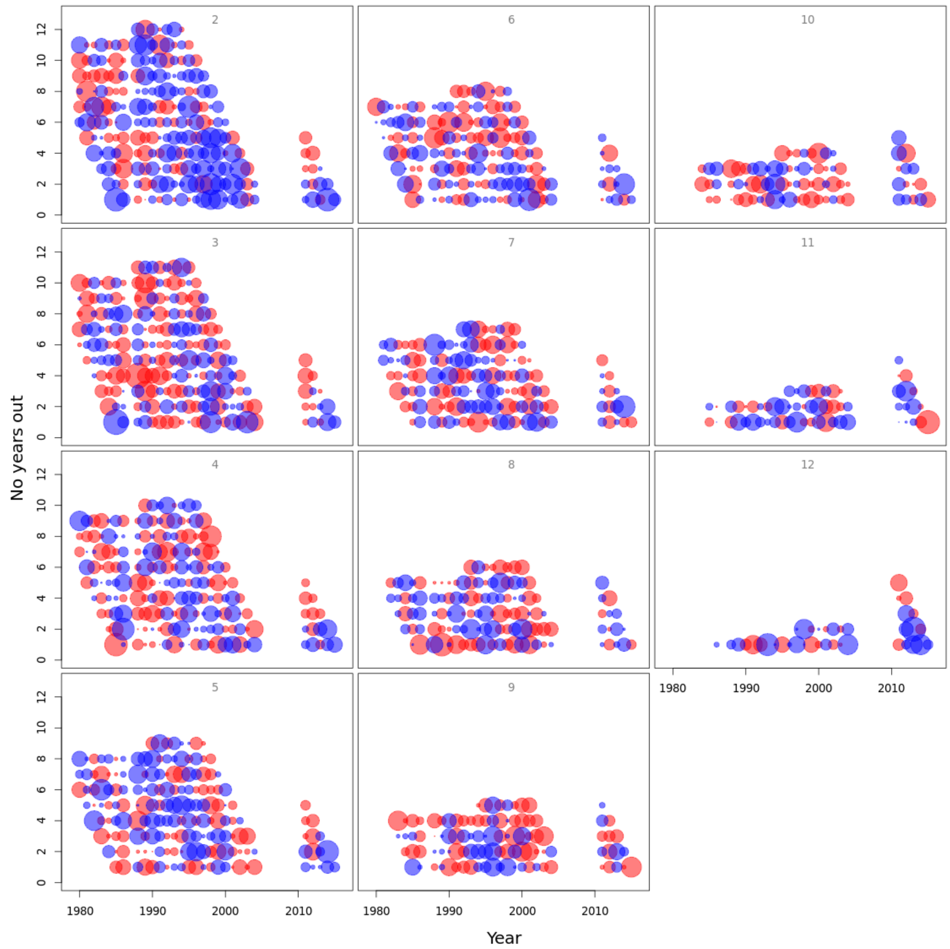


**Figure8.6.3.4. NE Atlantic mackerel. One step ahead residuals for the fit to the recaptures of tags in the final assessment. The x-axis represents the release year, and the y-axis is the number of years between tagging and recapture. Each panel correspond to a given age at release. Blue circles indicate positive residuals (observation larger than predicted) and filled red circles indicate negative residuals.**

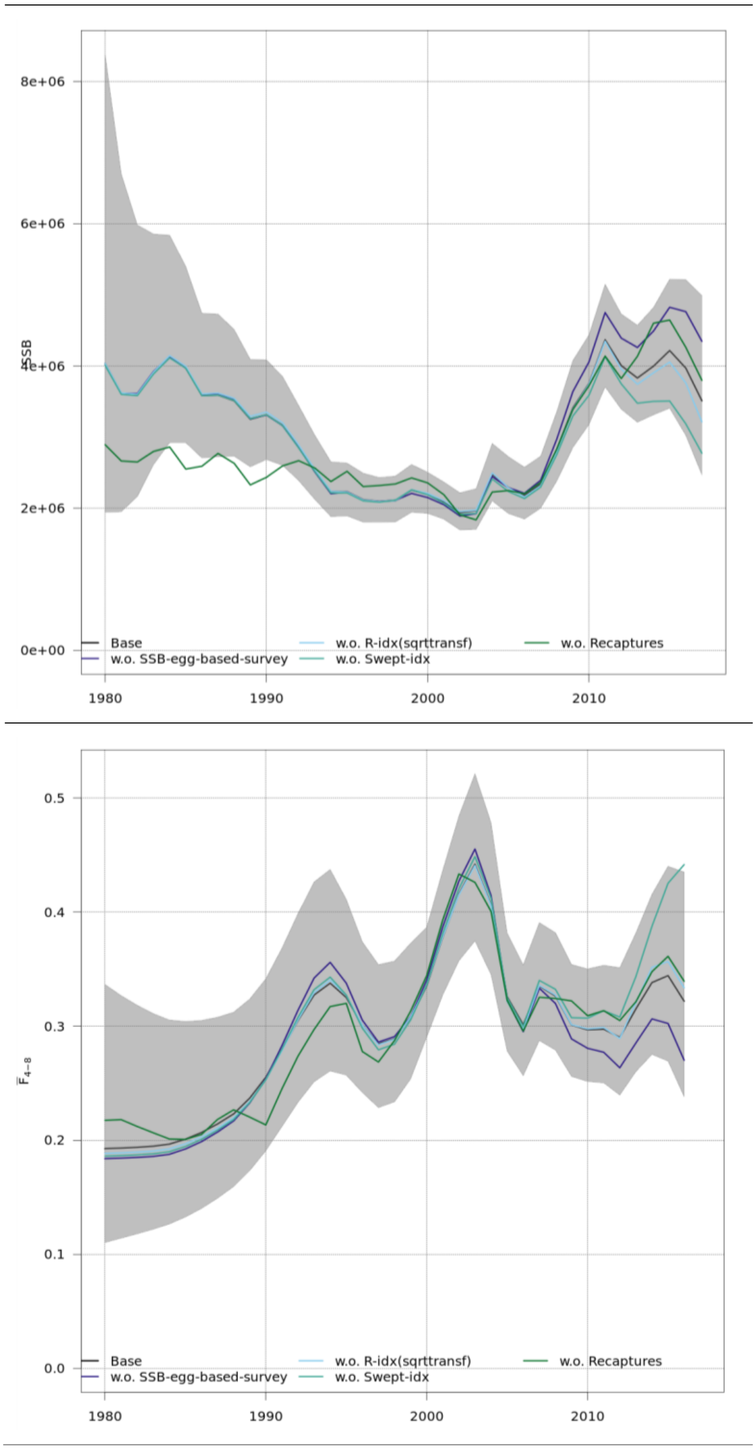


**Figure8.6.3.5. NE Atlantic mackerel. Leave one out assessment runs. SAM estimates of SSB and Fbar, for assessments runs leaving out one of the observation data sets.**

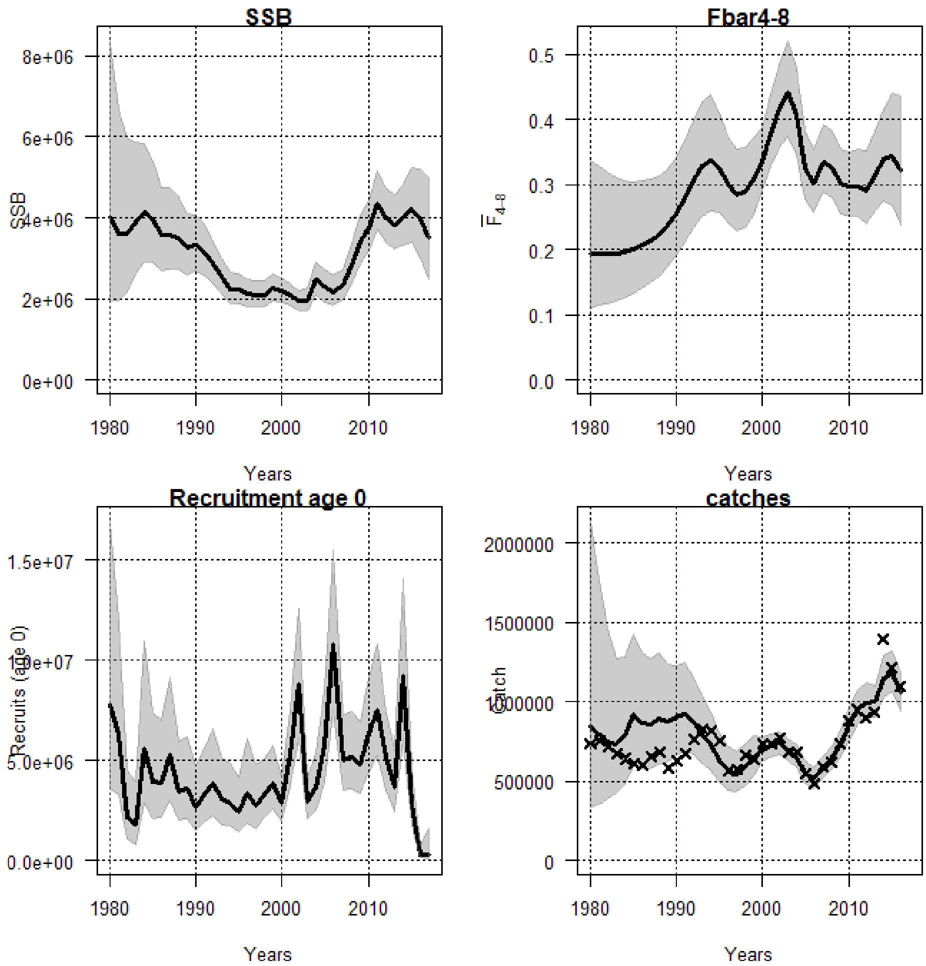


**Figure 8.6.3.1. NE Atlantic mackerel. Perception of the NEA mackerel stock, showing the SSB, $F_{bar}$4-8 and recruitment (with 95% confidence intervals) from the SAM assessment.**

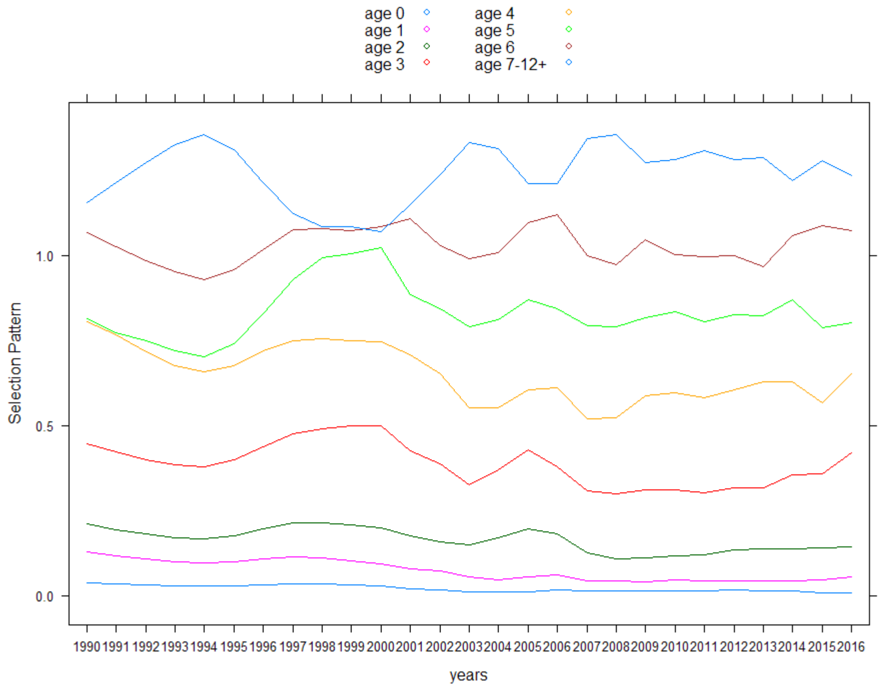


**Figure 8.6.3.2. NE Atlantic mackerel. Estimated selectivity for the period 1990 to 2016, calculated as the ratio of the estimated fishing mortality-at-age and the Fbar4-8 value in the corresponding year.**

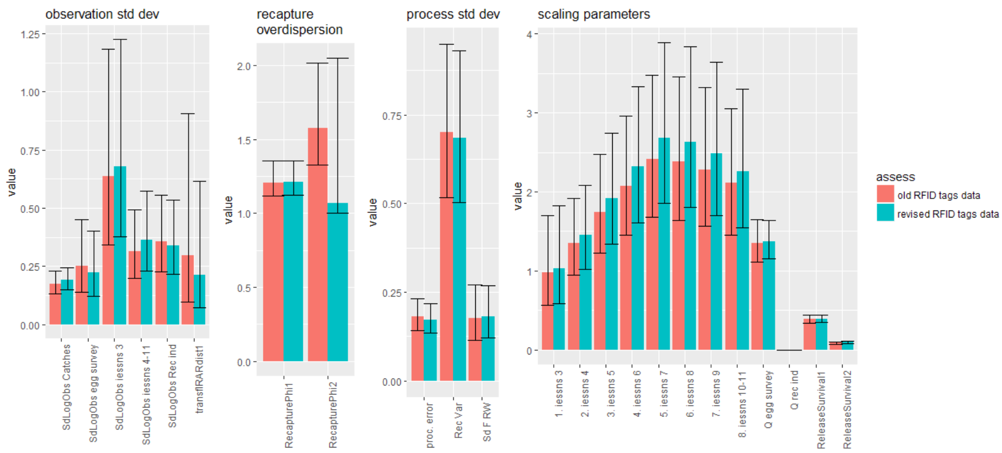


**Figure 8.6.4.1. NE Atlantic mackerel. Comparison of the parameter estimates from the SAM model (and associated confidence intervals) for the WGWIDE 2017 update assessment (using the new RFID tagging data), and the same assessment using the old RFID tagging RFID.**

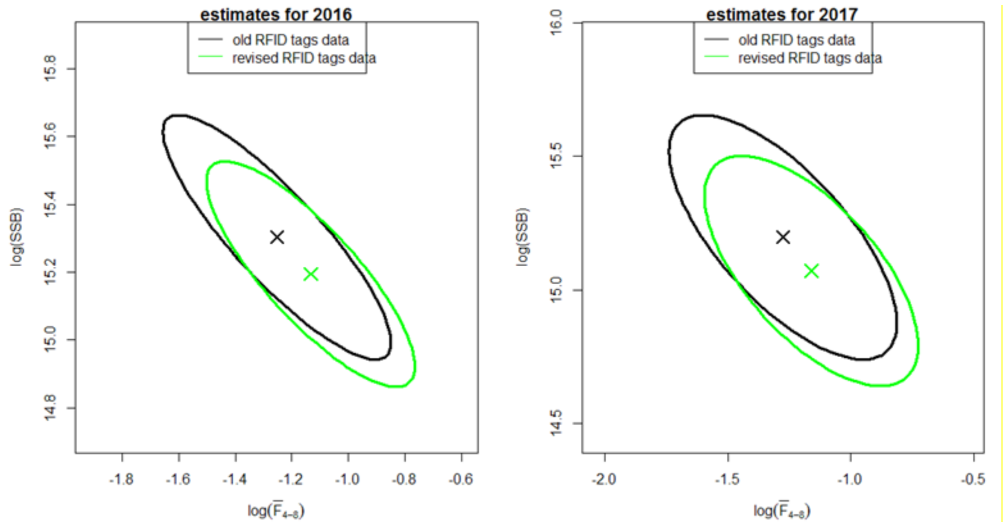


**Figure 8.6.4.2. NE Atlantic mackerel. Comparison of the joint uncertainty on recent estimates of SSB and Fbar for the WGWIDE 2017 update assessment (using the new RFID tagging data), and the same assessment using the old RFID tagging RFID.**

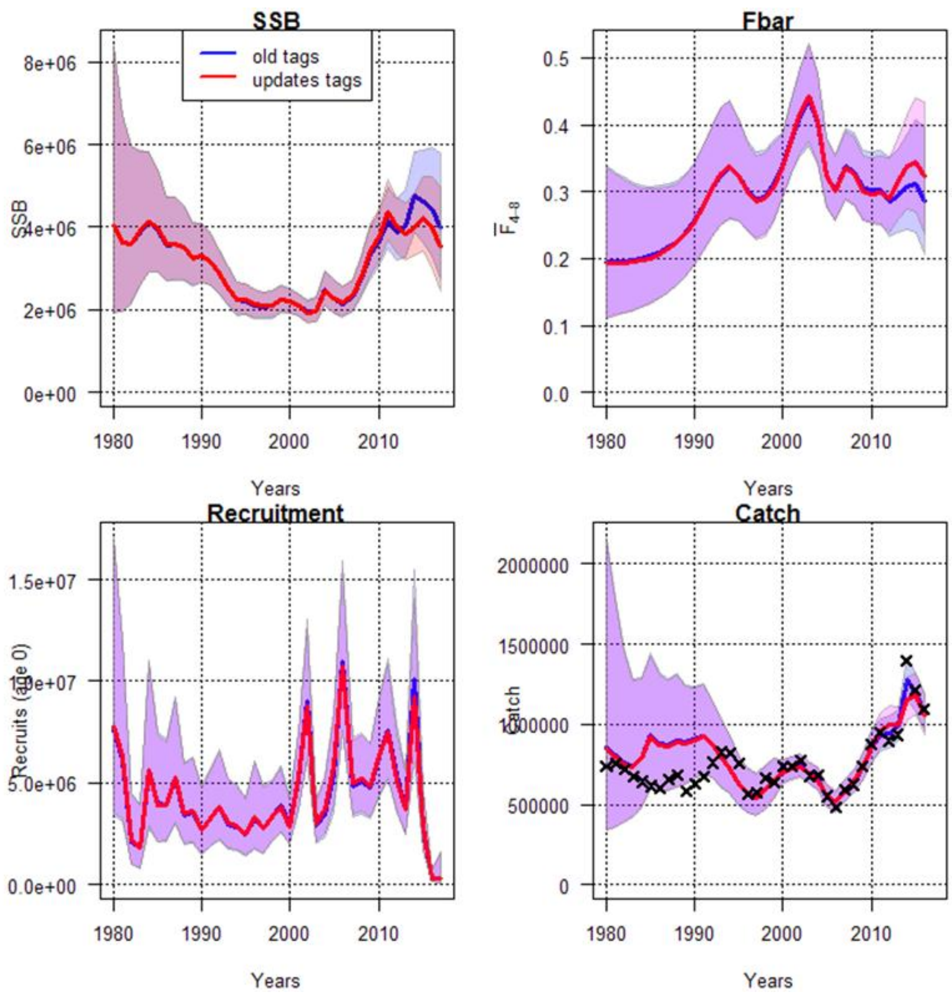


**Figure 8.6.4.3. NE Atlantic mackerel. Comparison of the stock summary for the WGWIDE 2017 update assessment (using the new RFID tagging data), and the same assessment using the old RFID tagging RFID.**

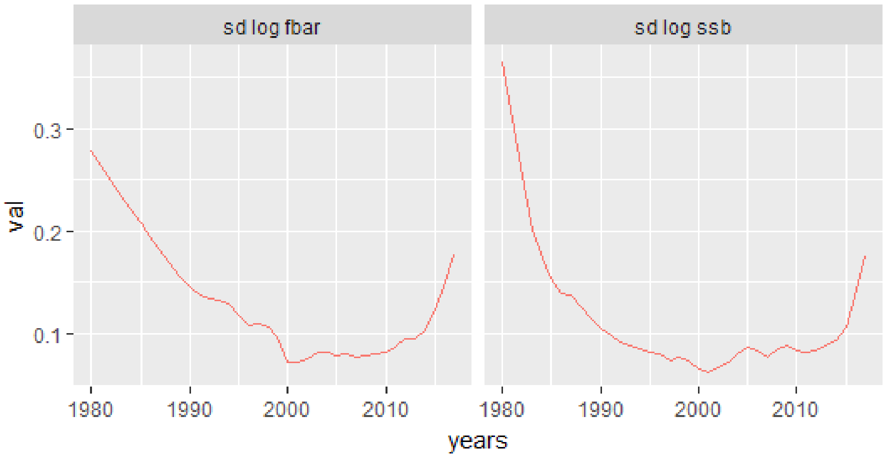


**Figure 8.6.5.1. NE Atlantic mackerel. Uncertainty (standard deviation of the log values) of the estimates of SSB and Fbar from the SAM for the 2017 WGWIDE assessment.**

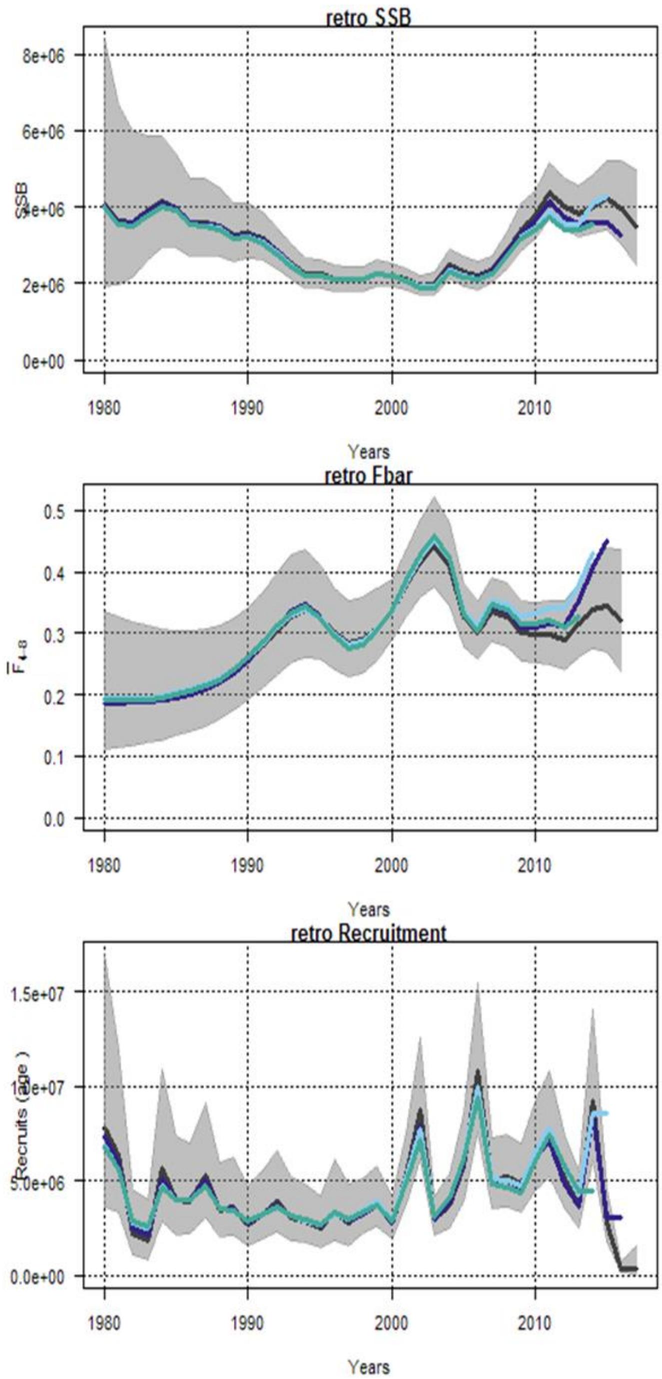


**Figure 8.6.5.2. NE Atlantic mackerel. Analytical retrospective patterns (2014 to 2011) of SSB, $F_{bar}$4-8 and recruitment from the benchmarked SAM assessment.**

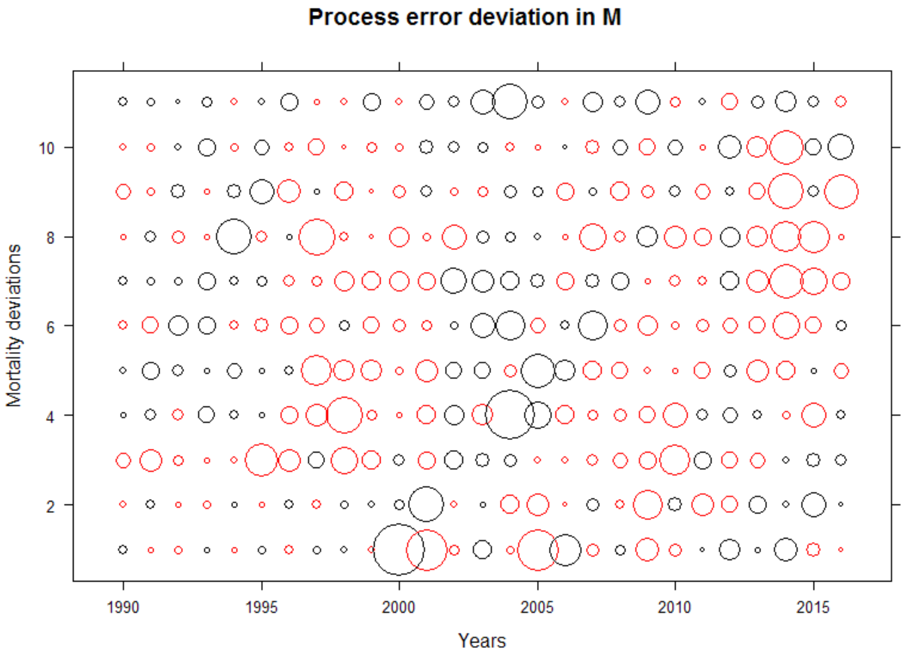


**Figure 8.6.4.2. NE Atlantic mackerel. Model process error expressed as deviations in mortality. Black circles represent positive deviations in the mortality, red circle represent negative deviations.**


**Figure 8.6.4.3. NE Atlantic mackerel. Model process error express in biomass cumulated across age-group and historical catches in tonnes.**

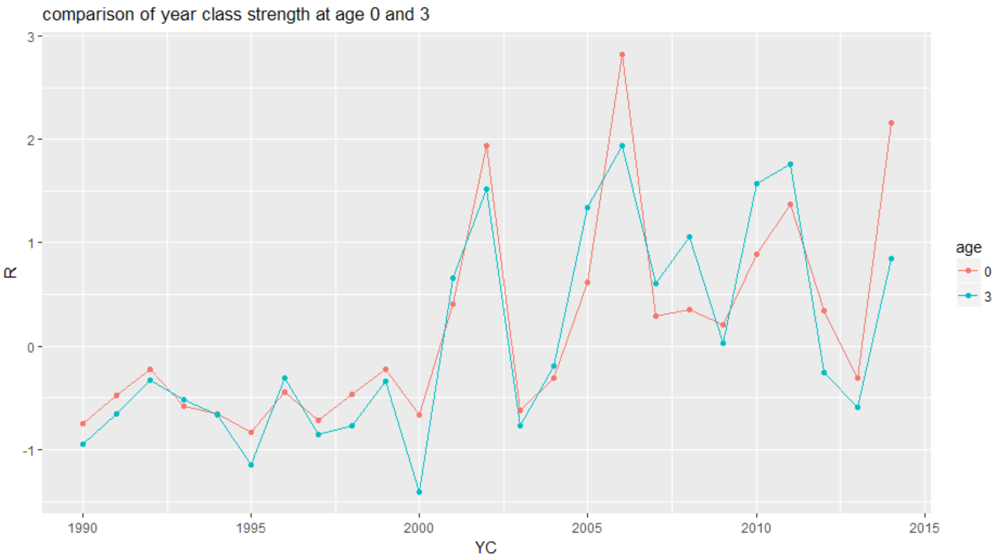


**Figure 8.6.4.4. NE Atlantic mackerel. Comparison of the perception of the strength of a cohort at age 0 and at age 3. The x axis represents the year of birth of the cohort and the y axis corresponds to the (standardised) SAM estimates of each cohort at age 0 and age3.**

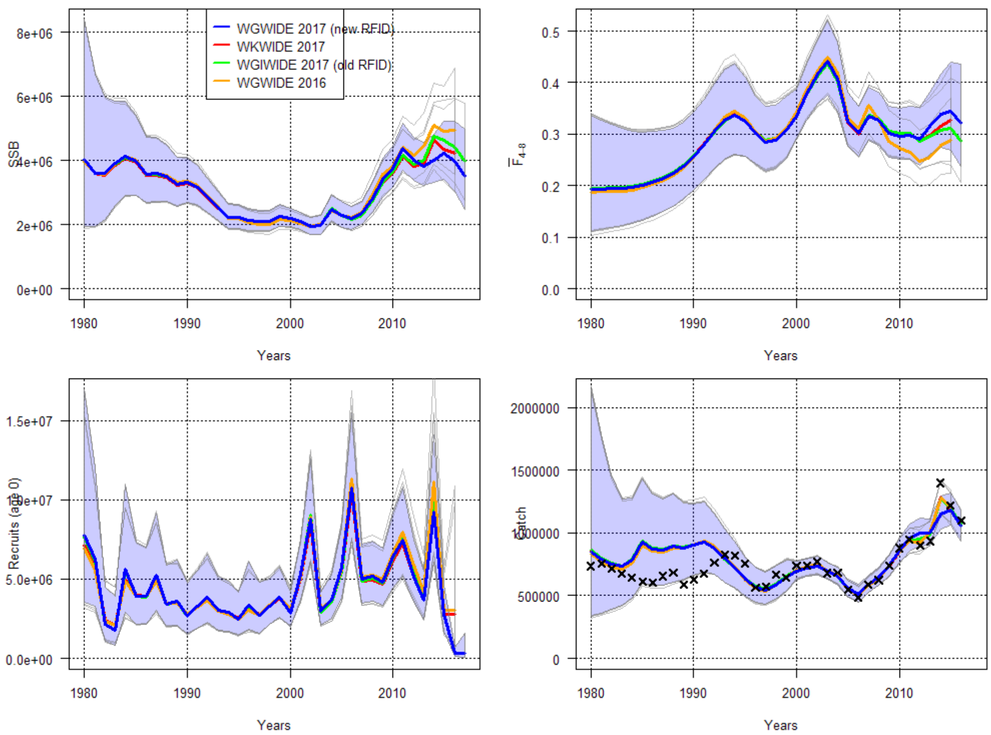


**Figure 8.9.1. NE Atlantic mackerel. Comparison of the stock trajectories between the 2017 WGWIDE assessment, the 2016 WGWIDE assessment, and the 2017 WKWIDE benchmark assessment.**

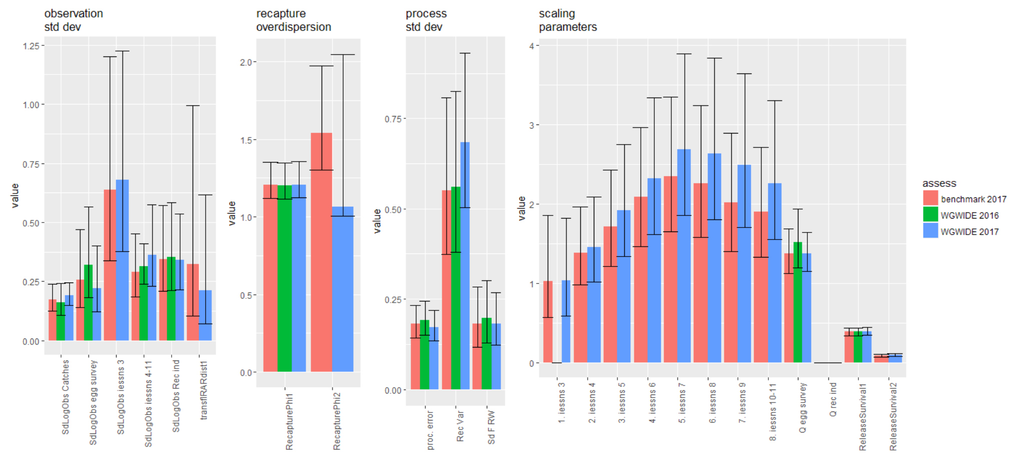


**Figure 8.9.2. NE Atlantic mackerel. Comparison of model parameters and their uncertainty for the 2017 WGWIDE, the 2017 benchmark and the 2016 WGWIDE assessments.**

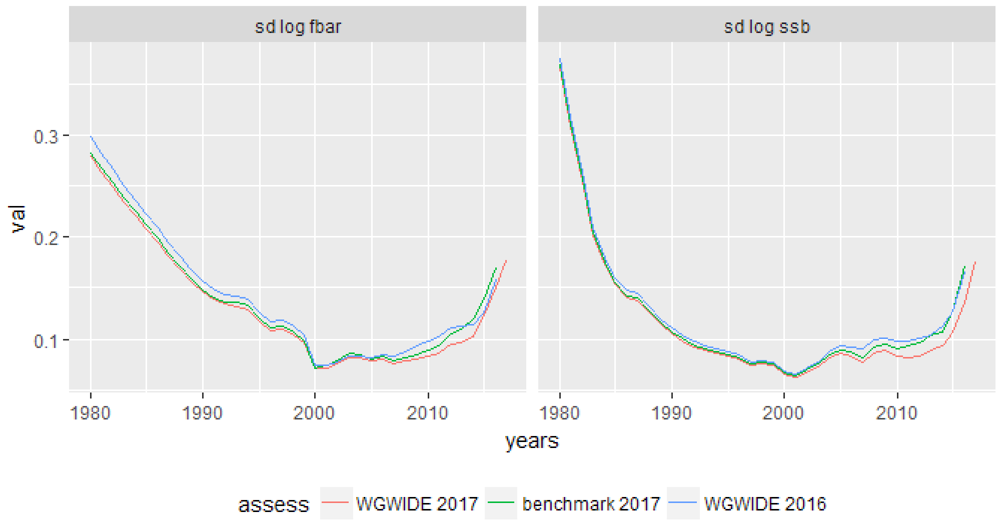


**Figure 8.9.3. NE Atlantic mackerel. Comparison of the uncertainties on the SSB and Fbar (standard deviation of the log values) between the 2016 and 2017 WGWIDE assessments and the 2017 assessment.**