

## 7 Western Horse Mackerel –in Subarea 8 and divisions 2.a, 3.a (Western Part), 4.a, 5.b, 6.a, 7.a–c and 7.e–k

### 7.1 ICES advice applicable to 2019 and 2020

Since 2011, the TACs cover areas in line with the distribution areas of the stock.

For 2019 the TAC set in EU waters (EU 2019/124) was the following:

Areas in EU waters	TAC 2019	Stocks fished in this area
2.a, 4.a, 5.b, 6, 7.a-c, 7.e-k, 8.abde, 12, 14	119 118 t	Western stock & North Sea stock in 4.a 1-2 quarters
4.b,c, 7.d	15 179 t	North Sea stocks
Division 8.c	18 858 t	Western stock

For 2020 the TAC set in EU waters (EU 2020/123) was the following:

Areas in EU waters	TAC 2020	Stocks fished in this area
2.a, 4.a, 5.b, 6, 7.a-c, 7.e-k, 8.abde, 12, 14	70 617	Western stock & North Sea stock in 4.a 1-2 quarters
4.b,c, 7.d	13 763	North Sea stocks
Division 8.c	11 179	Western stock

The TAC for the western stock should apply to the distribution area of western horse mackerel as follows:

All Quarters: 2.a, 5.b, 6.a, 7.a-c, 7.e-k, 8.a-e

Quarters 3&4: 3.a (west), 4.a

The TAC for the North Sea stock should apply to the distribution area of North Sea horse mackerel as follows:

All Quarters: 3.a (east), 4.b-c, 7.d

Quarters 1&2: 3.a (west), 4.a

In 2019 ICES advised on the basis of MSY approach that Western horse mackerel catches in 2020 should be no more than 83 954 tonnes. The Western horse mackerel TAC for 2020 is 81 796 tonnes, the TAC for EU waters only is 80 196 tonnes. The TAC should apply to the total distribution area of this stock. The EU horse mackerel catches in Division 3.a are taken outside the horse mackerel TACs.

#### 7.1.1 The fishery in 2019

Information on the development of the fisheries by quarter and division is shown in Tables 5.1.1 and 5.1.2 and in Figures 5.1.1.a–d. The total catch allocated to Western horse mackerel in 2019

was 124 947 t which is 23 265 t more than in 2018 and 20 290 t less than ICES advice. The catches of horse mackerel by country and area are shown in Tables 7.1.1.1-5 while the catches by quarter since 2000 are shown in Figure 7.1.1.1

## 7.1.2 Estimates of discards

Discard data are available since 2000 for few countries. Until 2013, the estimates available are considered an underestimation of the overall amount (Figure 7.1.2.1).

In 2019, most countries have submitted discard information. Countries that reported discard estimates for horse mackerel were Denmark, France, Ireland, Spain, Sweden and UK (England and Wales) and UK (Scotland). 2019 discard estimates for Germany, the Netherlands and Norway are considered to be equal to zero. Total discards for western horse mackerel were 3 141 tonnes, equal to 2.5 % in weight of the total catches, a decrease in comparison to last year.

Discard data are included in the assessment as part of the total catches.

Length frequency distributions of discards were provided by Spain, France and UK but are not included in the assessment length-frequency input data.

## 7.1.3 Stock description and management units

The Western horse mackerel stock spawns in the Bay of Biscay, and in UK and Irish waters. After spawning, parts of the stock migrate northwards into the Norwegian Sea and the North Sea, where they are fished in the third and fourth quarter (for area 4.a, only catches taken in quarters 3 and 4 are considered to be from the western stock). The stock is distributed in divisions 2.a, 5.b, 3.a, 4.a, 6.a, 7.a-c, 7.e-k and 8.a-e. The geographical catch distribution is described in Section 5.3 (Figure 7.1.3.1). The western stock is considered a management unit and advised accordingly. At present there are no international agreed management measures. The EU regulates the fishery by TAC. This TAC is now set in accordance with the distribution of the stock although catches in division 3.a are taken outside the TAC.

## 7.2 Scientific data

### 7.2.1 Egg survey estimates

In 2019, the triennial mackerel and horse mackerel egg survey was carried out in the western and southern spawning areas. A working document with preliminary results of the survey was presented to WG WIDE members in 2019 (O’Hea *et al.* 2019). On finalisation, results were revised slightly by WGMEGS in April 2020.

An overview of the spawning distribution of each survey period for the Western horse mackerel stock is presented in Figure 7.2.1.1.

The mean daily stage I egg production estimates (DEP) for each survey period are plotted in figures 7.2.1.2 and 7.2.1.3. with the results from previous surveys included for comparison. The period number and duration are the same as those used to estimate the egg production for the western component NEA mackerel, as are the dates defining the start and end of spawning.

Total Annual Egg Production (TAEP) in 2019 was estimated at  $1.78 \times 10^{14}$ . This is a decrease of almost 54% compared to the value observed in 2016 and the lowest production in the historic time-series (Figure 7.2.1.4 and Table 7.2.1.1).

The daily egg production curve revealed a spawning maximum in the last survey period and the shape of the egg production curve (Figure 7.2.1.2) and trend of bar plot (Figure 7.2.1.3) suggest that some spawning may have continued after the survey ended and therefore the entire temporal extent of horse mackerel spawning may not have been covered during the survey period.

### **Fecundity investigations**

WGMEGS had planned to collect samples of 1300 female horse mackerel in periods 6 and 7 of the 2019 egg survey, for batch fecundity and POF analyses. In total, 625 horse mackerel were caught in these periods combined and very few female samples showed the necessary oocyte development for batch fecundity estimation. Only 4 female samples were in the spent stage with the majority of the females sampled in an early oocyte development stage, even in period 7. This would indicate that the peak spawning was not reached in period 7.

## **7.2.2 Other surveys for western horse mackerel**

### *Bottom-trawl surveys*

An updated bottom-trawl survey index for recruitment was available for 2019: the index is based on IBTS surveys conducted by Ireland, France and Scotland covering the main distribution of the stock (Bay of Biscay, Celtic Sea, West of Ireland and West of Scotland) from 2003 to 2019, and uses a Bayesian Delta-GLMM for the calculation of an index of juvenile abundance based on catch rates (ICES 2017b). The updated index is shown in Figure 7.2.2.1 (middle panel) and data for 2017-2019 indices given in Table 7.2.2.1. The 2017 data point was highly uncertain due to very limited coverage of the French survey: the French research vessel had technical issue and could therefore only cover less than 1/3 of the stations usually sampled. Despite this high uncertainty, the 2017 data point suggested a very strong recruitment to be expected the following year. This perception was confirmed by the presence of numerous small fish in the 2017 and 2018 catch data. The overall trend suggests an increase in recruitment from 2013 to 2017 and a decrease back down to 2015 levels in 2018 and subsequent decrease in 2019.

### *Acoustic surveys*

In the Bay of Biscay two coordinated acoustic surveys are taking place in spring, PELGAS (Ifremer-France) and PELACUS (IEO-Spain).

The 2020 Spanish survey (PELACUS0320), normally carried out on the RV “Miguel Oliver” and covering ICES division 8c, was cancelled due to the coronavirus (COVID-19) pandemic, a few days before its planned start in March, as was the 2020 French PELGAS survey.

## **7.2.3 Effort and catch per unit effort**

No new information was presented on effort and catch per unit effort. Further information can be found in the stock annex.

## **7.2.4 Catch in numbers**

In 2019, the Netherlands (6.a, 7.behj), Ireland (6.a, 7.b), Norway (4.a), Germany (6.a) and Spain (8.bc) provided catch in numbers-at-age (Figure 7.2.4.1). The catch sampled for age readings in 2019 covered 72%, in 2018 covered 69% and in 2017 covered 68%. Catch in number-at-length were available from the Netherlands (6.a, 7.behj), Ireland (6.a, 7.b), Norway (4.a), Germany (6.a) and Spain (8.bc) as well as from France (7.e, 8.ab), England (7.eg) and Scotland (4.a, 6.a).

The total annual and quarterly catches in number for western horse mackerel in 2019 are shown in Table 7.2.4.1. The sampling intensity is discussed in Section 5.9.

The catch-at-age matrix is given in Table 7.2.4.2 and illustrated in Figures 7.2.4.2 and 7.2.4.3. The latter shows the dominance of the 1982-year class in the catches since 1984 until it entered the plus group in 1997. Since 2002, the 2001-year class, which entered the plus group in 2016, has been caught in considerable numbers. The 2008-year class can be followed in the catch data suggesting it was stronger than other year classes subsequent to the 2001.

Germany, Spain, Ireland, the Netherlands and UK (England) also provided the age length keys (ALK) which were used in 2019.

## 7.2.5 Length and age data

### *Mean length-at-age and mean weight-at-age in the catches*

The mean weight- and mean length-at-age in the catches by area, and by quarter in 2019 are shown in Tables 7.2.5.1 and 7.2.5.2. Weight-at-age time-series is shown in Figure 7.2.5.1.

### *Mean weight at age in the stock*

Prior to 2017, estimates of mean weight-at-age in the stock for the assessment were based on catch weight-at-age from Q1 and Q2, (Table 7.2.5.3). At present, the stock weight-at-age used in the forecast is an output of the assessment (presented in Table 7.4.1). Further information can be found in the stock annex.

## 7.2.6 Maturity ogive

Maturity-at-age is presented in Table 7.2.6.1. In the assessment model a constant logistic function was used (Figure 7.2.6.1). Further information can be found in the stock annex.

## 7.2.7 Natural mortality

A fixed natural mortality of 0.15 year<sup>-1</sup> is assumed for all ages and years in the assessment. Further information can be found in the stock annex.

## 7.2.8 Fecundity data

Potential fecundity data (10<sup>6</sup> eggs) per kg spawning females are available for the years 1987, 1992, 1995, 1998, 2000, 2001: the data are presented in Table 7.2.8.1 but were not used in the assessment model. In the assessment the fecundity is modelled as linear eggs/kg on body weight. Further information can be found in the stock annex.

## 7.2.9 Information from stakeholders

The EU fishing industry, partly in conjunction with the Pelagic Advisory Council (PELAC), has been working on a number of research projects relevant to Western horse mackerel that are briefly reported here. More details can be found in section 1.5.5 of this report.

In 2018, the results of a large-scale genetic analysis of horse mackerel were published (Farrell *et al.* 2018) which concluded that the spawners of North Sea and Western horse mackerel can be genetically identified as two distinct stocks. However, at that stage it was not yet possible to separate the two stocks when they occur in mixed samples. Therefore, a follow-up project was initiated to carry out a full genome sequencing of horse mackerel in order to increase the genetic

resolution. Results have been published in 2020 (Farrell *et al.* 2020) and confirm the separation between North Sea and Western horse mackerel. In addition, the samples from the Western stock, west of Ireland and the northern Spanish shelf, and the northern part of the Southern stock, northern Portugal, appear to form a genetically close group. There was significant genetic differentiation between the northern Portuguese samples and those collected in Southern Portuguese waters, with those in the south representing a separate population. The North African and Alboran Sea samples were distinct from each other and from all other samples. Based on the full genome sequencing, it is expected that mixed samples of horse mackerel can now be investigated on the contributing stock components. This work is foreseen for the end of 2020 in the Channel area and in the Northern North Sea.

Working Document 08 to this report summarizes the status of the industry-science collaboration aimed at improving the knowledge on gonad development of mackerel and horse mackerel. The work is based on samples taken by the fishing industry (PFA) on targeted or by-catches of mackerel and/or horse mackerel. For horse mackerel, the aim is to investigate when western horse mackerel spawning occurred in 2020. To date, 1365 mackerel have been sampled and 197 horse mackerel (horse mackerel only started in 2020). Final results for mackerel are expected in October 2020 and for horse mackerel in the first half of 2021.

The Pelagic Freezer-trawler Association (PFA) provided an annual report on the self-sampling programme that started in 2015. The horse mackerel fishery takes place from October through to March of the subsequent year. Overall, the self-sampling activities for the horse mackerel fisheries during the years 2015 – 2020 (up to August) covered 457 fishing trips with 3,454 hauls, a total catch of 140,633 tonnes and 125,000 individual length measurements. The main fishing areas are ICES division 27.6.a (between 21% and 40% of the catch), division 27.7.b (7%-22%) and division 27.7.d (19%-34%, note that this is considered as the North Sea horse mackerel stock). Horse mackerel have a wide range in the length distributions in the catch. Median lengths have fluctuated between 22.8 and 30.0 cm. In 2019 and 2020 there are some indications of a stronger year class being available to the fishery, with a narrower length distribution.

### 7.2.10 Data exploration

The length frequency distributions of the catches for the whole fleet included in the model are shown in Figures 7.2.10.1-2. The length distributions available for 2015-2018 show a considerable amount of very small fish, mostly from Spanish catches. Length frequency distribution from discards was analysed alongside the length frequency distribution from the landings during the 2018 assessment. The large number of small individuals from the discard estimates had a significant impact on the overall LFD of the catches. These data were not available at the benchmark (2017) and to include those in the assessment model would require substantial changes in the modelling structure. For this reason these data were only used in the explorative analysis in 2018. Such large numbers of discards were not seen in the 2018 and 2019 lengths data.

Within-cohort consistency of the catch-at-age matrix is investigated in Figure 7.2.10.3: this shows that the catch-at-age data contains information on year-class strength that could form the basis for an age-structured model.

The numbers at age in the catch by decade show a slight trend towards younger individuals when moving from the beginning of the time-series towards the end (Figure 7.2.10.4).

The indices of abundance used in the assessment cover different areas and therefore represent different parts of the stock. Negative correlations between indices that should represent the same portion of the population may lead to problems in the fitting of the model. The correlation between time-series was therefore estimated and is presented in Figure 7.2.10.5. There was no strong correlation between the IBTS recruitment index and the other two surveys with a weakly

positive correlation between IBTS and PELACUS, and a negative but highly uncertain correlation between IBTS and the egg survey. The egg survey index, which aims to represent the adult portion of the stock was strongly positively correlated with the PELACUS acoustic survey biomass estimate.

### 7.2.11 Assessment model, diagnostics

A one fleet, one sex, one area stock synthesis model (SS; Stock Synthesis v3.30) is used for the assessment of western horse mackerel stock in the Northeast Atlantic. A description of the model can be found in the stock annex. The assessment is presented as an update to the 2019 assessment and sees the inclusion of the 2019 estimates for the IBTS recruitment index, PELACUS biomass estimate and egg surveys index used, the 2019 length frequency distribution from the landings component of the catches and of the PELACUS survey and the 2019 total catch and conditional ALKs.

Fits to the available data are given in Figure 7.2.11.1, and model estimates with associated precision in Figure 7.2.11.2. Model estimates and residual patterns are similar to those presented in the benchmark (ICES, 2017b) and remain unchanged from last year's assessment for almost all variables, except for some patterns noted in the 2018 ALK that is no longer evident in 2019. Recruitment estimates were unchanged from last year's assessment. The model fitting to the most recent length frequency distributions and the conditional ALKs remains sub-optimal, and there may be an increase in smaller fish in recent years.

Retrospective plots are shown for 5 years with the associated Mohn's rho values (Figure 7.2.11.3). Major rescaling of the estimates was observed in correspondence of the availability of a new egg survey data points (available every three years) in previous assessments of this stock. The current 2020 assessment shows strong retrospective patterns, with a couple of peels falling just outside the confidence intervals in the latest years of SSB and recruitment estimates. The Mohn's rho values are on the limit of the tolerance threshold with 0.22 for SSB and -0.155 for F.

## 7.3 State of the Stock

### 7.3.1 Stock assessment

The SS model with new length and age data from the commercial fleet, and the 2019 information from the 3 surveys available, is presented as the final assessment model. Stock numbers-at-age and fishing mortality-at-age are given in Tables 7.3.1.1 and 7.3.1.2, and a stock-summary is provided in Table 7.3.1.3, and illustrated in Figure 7.2.11.2. SSB peaked in 1988 following the recruitment of the exceptionally strong 1982 year-class. Subsequently, SSB slowly declined until 2003 and then recovered again following the moderate-to-strong year-class of 2001 (a third of the size of the 1982 year-class). Year classes following 2001 have been weak: 2009-2011, and 2013 recruitments in particular have been estimated as the lowest values in the time-series together with that in 1983. The 2008 year-class has been estimated to be fairly strong. Recruitment estimates for 2014-2018 are the highest observed since 2008 and are higher than the geometric mean estimated over the years 1983-2019. 2019 appears to be low again. SSB in 2017 is estimated as the lowest in the time-series. Fishing mortality increased after 2007 as a result of increasing catches and decreasing biomass as the 2001 year-class was reduced. Between 2013 and 2017 fishing mortality then decreased, due to lower catches and a reduced proportion of the adult population in the exploited stock. Since 2017 it has increased again and appears above  $F_{MSY}$  in the current assessment.

## 7.4 Short-term forecast

A deterministic short-term forecast was conducted using the 'fwd()' method in FLR (Flash R add-on package).

### *Input*

Table 7.4.1. lists the input data for the short-term predictions. Weight at age in the stock and weight at age in the catch are equal to the year invariant weight at age function used in the stock synthesis model. Exploitation pattern is based on estimated fishing mortality in 2019 and is the average of ages 1 to 10. Natural mortality is assumed to be 0.15 across all ages. The proportion mature for this stock has a logistic form with fully mature individuals at age 4 as used in the assessment model. In 2019 the expected landings for the intermediate year were set at 80% of the total TAC, to reflect the catch uptake of the past 3 years. Similarly, this year it was set at 85% of the total TAC to reflect the increasing uptake of 2017-2019. Note that -despite the plus group in the catch being equal to 15+ the true population in SS model is set to arrive up to age 20 (as from literature) and is therefore estimated accordingly.

### *Output*

A range of predicted catch and SSB options from the short-term forecast are presented in Table 7.4.2.

## 7.5 Uncertainties in the assessment and forecast

Despite the increased amount of data used and information available to the stock assessment, the model still suffers from a retrospective pattern whenever a new year of data is included. This year rescaling is relatively significant with a pattern over the past 5 years (rescaling biomass down and vice-versa for  $F_{1-10}$ ).

The fitting to the fishery independent indices remains good for two of the three surveys used: a degradation of the fitting to the IBTS recruitment index was observed the past couple of years, but the estimates remained within the confidence intervals provided. The fit to the acoustic index remains poor.

The change in selectivity, which is detected from both the length and the age composition of the catch data, is not entirely picked up from the model. In general, the model tends to overestimate the mean age of the last decade. The selectivity issue should be further investigated and somehow addressed: for example, it is not clear whether the high presence of small specimen in the landings data is due to the inclusion of BMS individuals in the overall catch instead of having it as discard (the discard ban was implemented in 2015 for pelagic species) or if this is due to an effective change in selectivity (i.e. catchability of the gear and availability of the stock).

The 2020 assessment model suffered from being sensitive to variance adjustment factors which led to gradient and hessian inversion issues. The final model had the lowest likelihood and was tuned with the Francis reweighting approach, rather than using the McAllister and Ianelli approach which did not perform well here. At the benchmark, both methods performed equally and McAllister and Ianelli weights had been used since. The final model outputs showed similar trends to the outputs of another framework, SAM, which was tested for comparison and did not rely on any lengths data.

The model fixes the realised fecundity with a constant number of eggs/kg independently of the individual weight. However, western horse mackerel is known to be an indeterminate spawner, which implies this relationship being not appropriate when it comes to the use of an egg survey

as index of spawning biomass. During the benchmark it was attempted to estimate the parameters relative to fecundity, but the information provided was not sufficient. The inclusion of this feature, whenever appropriate data become available, would help to improve the reliability of the assessment.

The assumed value for  $M$  should be investigated. However, there is no data available (such as tagging) that could assist in estimating  $M$  more accurately. Nevertheless, total mortality appears to be low, given the persistence of the 1982-year class in the catch data.

The assessment, as was developed at the benchmark, has an increased amount of information for providing more robust estimates of recruitment, which is also informed by the strong, occasional year classes observed in the catch. On the contrary, the SSB is informed only by the triennial egg survey and by the acoustic survey (which only covers a small part of the stock distribution and size ranges, has a really low weight in the model and is really noisy): a new index for the spawning biomass would therefore be beneficial for the future stability of this assessment. The development of a SSB index from the IBTS survey as well as merging the information available from the PELACUS and the PELGAS acoustic survey in the Bay of Biscay should be pursued.

## 7.6 Comparison with previous assessment and forecast

A comparison of the update assessment with the historic ones (previous 4 years) is shown in Figure 7.2.11.4: the new information created a downward rescaling of the assessment biomass and upward revision of  $F$ . Recruitment, on the other hand, remains fairly stable until 2015 but a downward revision is estimated from then on.

## 7.7 Management Options

### 7.7.1 MSY approach

In 2017 stochastic equilibrium analyses were carried out using the *EqSim* software (WKWIDE 2017) to provide an estimate for  $F_{MSY}$  and other biological reference points. During WGWIDE 2017 further investigations were carried out and summarised in a Working Document attached to WGWIDE 2017 report (ICES, 2017a).

Reference points were subsequently revised during an inter-benchmark workshop carried out in July-August 2019 as those derived during the 2017 benchmark were deemed no longer appropriate in light of the retrospective pattern observed in the model. More robust reference points were therefore put forward after a number of alternatives were examined, following ICES guidelines, and based on the 2018 assessment. The detailed rationale can be found in the inter-benchmark report (ICES, 2019).

SSB in 2003 was adopted as a proxy for  $B_{pa}$  on the basis that fishing mortality had been relatively low for the data period ( $F_{bar}$  mean  $\sim 0.11$ , natural mortality = 0.15), and there was no indication of impaired recruitment below the associated  $B_{lim}$ , despite a continuing decline in SSB.  $F_{MSY}$  was derived from stochastic simulations as before and evaluated at 0.074. These updated reference points were used to set the 2020 advised catch.



### **7.7.2 Management plans and evaluations**

An overview of earlier management plans and management plan evaluations was presented at WGWIDE 2017. To date, no agreed management plan is available for this stock despite several attempts to develop such management plans.

The Pelagic Advisory Council (PELAC), together with several researchers have carried out an evaluation of potential harvest control rules for western horse mackerel. The HCR analyses represented two different assessment methods (SS3 and SAM) and two different HCR evaluation tools (EqSim and SAM HCR). Both HCR evaluation tools are of the 'short-cut' type with appropriate conditioning of the uncertainties in the assessment based on historical CV and autocorrelation in line with the recommendations from ICES workshops WKMSYREF3 and WKMSYREF4. The evaluations followed the guidelines from WKG MSE2 (ICES, 2019c) and WKREBUILD (ICES, 2020). Overall, the results of the different HCR tools and the different assessment inputs gave comparable results, although there were some differences in the absolute levels. Given that the EqSim with SS3 evaluation is closest to the ICES advisory practice, this was used as the basis for the suggested rebuilding plan by the PELAC. The proposed rebuilding plan and the scientific evaluation that underpins it (see Working Document 02), have been submitted to the European Commission with the request to commission a scientific review by ICES.

## **7.8 Management considerations**

The 2001 year-class has now entered the plus group and there are indications of 2014 being of comparable size, but no other detectable very strong year-classes entering the fishery, even though a higher amount of age 1-2 fish have been observed in the catches in the past 4-5 years.

The downward rescaling of the assessment combined with the lower catches estimated for the interim year (2020) lead to an advice for 2021 that is very similar to 2020 advice last year.

A TAC has only been agreed for parts of the distribution and fishing areas (EU waters). The Working Group advises that the TAC should apply to all areas where western horse mackerel are caught. Note that subarea 8.c is included in the ICES advice for Western horse mackerel.

## **7.9 Ecosystem considerations**

Knowledge about the distribution of the western horse mackerel stock is mostly gained from the egg surveys and the seasonal changes in the fishery. Based on these observations it is not possible to infer a similar changing trend in the distribution of western horse mackerel as for NEA mackerel. However, from catch data it appears that the stock is concentrated in the southern areas and it is mostly characterized by small individuals.

## **7.10 Regulations and their effects**

There are no horse mackerel management agreements between EU and non EU countries. The TAC set by EU therefore only apply to EU waters and the EU fleet in international waters. The minimum landing size of horse mackerel by the EU fleet is 15 cm (10% undersized allowed in the catches). In Norwegian waters there is no quota for horse mackerel but existing regulations on bycatch proportions as well as a general discard prohibition (for all species) apply to horse mackerel.

An overview of the scientific advice, the TACs (or sum of unilateral quota) and the catches is shown in figure 7.10.1. From 2001 onwards, TACs and catches have fluctuated around the scientific advice, where in some years the TACs were set higher and in other years lower than the scientific advice.

The stock allocations were changed in 2005 following the results of the HOMSIR project (Abaunza *et al.* 2003) and 8.c is considered to be the western stock. Landings from 7.d are now allocated to the North Sea horse mackerel. Results of a recent genetic research project on stock structure of horse mackerel has been reported in sections 1.5.5 and 7.2.9 of this report.

## 7.11 Changes in fishing technology and fishing patterns

The description of the fishery is given in Section 5.1 and no large changes in fishing areas or patterns have taken place.

## 7.12 Changes in the environment

Migrations are closely associated with the slope current, and horse mackerel migrations are known to be modulated by temperature. Continued warming of the slope current is likely to affect the timing and spatial extent of this migration.

After the strong 1982 year-class of the western stock started to appear in the North Sea in 1987 a good correspondence between the modelled influx of Atlantic water to the North Sea in the first quarter and the horse mackerel catches taken by Norwegian purse-seiners in the Norwegian EEZ (NEZ) later (October-November) the same year (Iversen *et al.* 2002, Iversen WD presented in ICES 2007/ACFM:31) was noted in most years.

## 7.13 References

- Abaunza, P., Gordo, L., Karlou-Riga, C., Murta, A., Eltink, A. T. G. W., García Santamaría, M. T., Zimmermann, C., Hammer, C., Lucio, P., Iversen, S. A., Molloy J., and Gallo, E. 2003. Growth and reproduction of horse mackerel, *Trachurus* (carangidae). Reviews in Fish Biology and Fisheries, 13: 27–61.
- Farrell, E. D., A. P. Fuentes-Pardo, M. Pettersson, C. G. Sprehn and L. Andersson (2020). Population structure of the Atlantic horse mackerel (*Trachurus trachurus*) revealed by whole-genome sequencing, EDF, December 2020.
- ICES 2017a. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 30 August–5 September 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017/ACOM:23.
- ICES 2017b. Report of the Benchmark Workshop on Widely Distributed Stocks (WKWIDE), 30 January–3 February 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017/ACOM:36. 196 pp.
- ICES. 2019. Interbenchmark Protocol on Reference points for Western horse mackerel (*Trachurus trachurus*) in subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a-c-e-k (the Northeast Atlantic) (IBPWHM). ICES Scientific Reports. 84 pp.
- ICES. 2020. Workshop on guidelines and methods for the evaluation of rebuilding plans (WKREBUILD). ICES Scientific Reports. 2:55. 79 pp. <http://doi.org/10.17895/ices.pub.6085>
- Iversen, S., A., Skogen, M., D., and Svendsen, E. 2002. Availability of horse mackerel (*Trachurus trachurus*) in the northeastern North Sea, predicted by the transport of Atlantic water. Fish. Oceanogr., 11(4): 245–250.
- O’Hea, B., Burns, F., Costas, G., Korta, M., Thorsen, A. 2019. 2019 Mackerel and Horse Mackerel Egg Survey – Preliminary Results. Working Document to ICES WGWIDE, 28 Aug. - 3 Sept. 2019, No. 08

## 7.14 Tables

**Table 7.1.1.1. Western horse mackerel. Catches (t) in Subarea 2 by country (Data as submitted by Working Group members).**

Country	1980	1981	1982	1983	1984	1985	1986	1987
Denmark	-	-	-	-	-	-	-	39
France	-	-	-	-	1	1	- <sup>2</sup>	- <sup>2</sup>
Germany, Fed.Rep	-	+	-	-	-	-	-	-
Norway	-	-	-	412	22	78	214	3,272
USSR	-	-	-	-	-	-	-	-
Total	-	+	-	412	23	79	214	3,311

	1988	1989	1990	1991	1992	1993	1994	1995
Faroe Islands	-	-	9643	1,115	9,157 <sup>3</sup>	1,068	-	950
Denmark	-	-	-	-	-	-	-	200
France	- <sup>2</sup>	-	-	-	-	-	55	-
Germany, Fed. Rep.	64	12	+	-	-	-	-	-
Norway	6,285	4,770	9,135	3,200	4,300	2,100	4	11,300
USSR / Russia (1992 -)	469	27	1,298	172	-	-	700	1,633
UK (England + Wales)	-	-	17		-	-	-	-
Total	6,818	4,809	11,414	4,487	13,457	3,168	759	14,083

	1996	1997	1998	1999	2000	2001	2002	2003
Faroe Islands	1,598	799 <sup>3</sup>	188 <sup>3</sup>	132 <sup>3</sup>		-	-	-
Denmark	-	-	1,755 <sup>3</sup>	-		-	-	-
France	-	-	-	-		-	-	-
Germany	-	-	-	-		-	-	-
Norway	887	1,170	234	2,304	841	44	1,321	22
Russia	881	554	345	121	78	16	3	2
UK (England + Wales)	-	-	-	-	-	-	-	-
Estonia	-	78	22	-	-	-	-	-
Total	3,366	2,601	2,544	2557	919	60	1,324	24

	2004	2005	2006	2007	2008	2009	2010	2011
Faroe Islands	-	-	3	-	-	-	222	224
Denmark	-	-	-	-	-	-	-	-
France	-	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	-	-	1
Norway	42	176	27	-	572	1,847	1,364	298
Russia	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-
Total	42	176	27	0	572	1,847	1,586	-

	2012	2013	2014	2015	2016	2017	2018	2019 <sup>1</sup>
Faroe Islands	-	-	-	-	-	-	-	-
Denmark	-	-	-	-	-	-	-	-
France	+	-	-	-	-	-	-	-
Germany	-	-	-	-	-	-	-	-
Ireland	-	-	-	-	-	-	-	-
Netherlands	-	-	107	-	-	-	-	-
Norway	66	30	302	10	45	5	718	867
Russia	-	-	-	-	-	-	-	-
UK (England + Wales)	-	-	-	-	-	-	-	-
Estonia	-	-	-	-	-	-	-	-
Total	66	30	409	10	45	5	718	867

<sup>1</sup>Preliminary<sup>2</sup>Included in 4.<sup>3</sup>Includes catches in Div. 5.b.<sup>4</sup>Taken in Div. 5.b.

**Table 7.1.1.2. Western horse mackerel. Catches (t) in North Sea Subarea 4 and Skagerrak Division 3.a by country (Data submitted by Working Group members). Catches partly concern the North Sea horse mackerel.**

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	8	34	7	55	20	13	13	9	10
Denmark	199	3,576	1,612	1,590	23,730	22,495	18,652	7,290	20,323
Faroe Islands	260	-	-	-	-	-	-	-	-
France	292	421	567	366	827	298	2312	1891	7841
Germany, Fed.Rep.	+	139	30	52	+	+	-	3	153
Ireland	1,161	412	-	-	-	-	-	-	-
Netherlands	101	355	559	2,0292	824	1602	6002	8503	1,0603
Norway2	119	2,292	7	322	2	203	776	11,7283	34,4253
Poland	-	-	-	2	94	-	-	-	-
Sweden	-	-	-	-	-	-	2	-	-
UK (Engl. + Wales)	11	15	6	4	-	71	3	339	373
UK (Scotland)	-	-	-	-	3	998	531	487	5,749
USSR	-	-	-	-	489	-	-	-	-
Total	2,151	7,253	2,788	4,420	25,987	24,238	20,808	20,895	62,877

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Belgium	10	13	-	+	74	57	51	28	-
Denmark	23,329	20,605	6,982	7,755	6,120	3,921	2,432	1,433	976
Estonia	-	-	-	293	-	-	17	-	-
Faroe Islands	-	942	340	-	360	275	-	-	296
France	248	220	174	162	302	-	-	-	-
Germany, Fed.Rep.	506	2,469 <sup>4</sup>	5,995	2,801	1,570	1,014	1,600	7	37
Ireland	-	687	2,657	2,600	4,086	415	220	1,100	8,152
Netherlands	14,172	1,970	3,852	3,000	2,470	1,329	5,285	6,205	52
Norway	84,161	117,903	50,000	96,000	126,800	94,000	84,747	14,639	43,888
Poland	-	-	-	-	-	-	-	-	-
Sweden	-	102	953	800	697	2,087	-	95	1761
UK (Engl. + Wales)	10	10	132	4	115	389	478	40	10
UK (N. Ireland)	-	-	350	-	-	-	-	-	-
UK (Scotland)	2,093	458	7,309	996	1,059	7,582	3,650	2,442	10,511
USSR / Russia (1992 -)	-	-	-	-	-	-	-	-	-
Unallocated+discards	12,482 <sup>3</sup>	-317 <sup>3</sup>	-750 <sup>3</sup>	-278 <sup>5</sup>	-3,270	1,511	-28	136	-31,615 <sup>6</sup>
Total	112,047	145,062	77,904	114,133	140,383	112,580	98,452	26,125	34,068

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006
Belgium	19	21	-	-	-	-	-	-	-
Denmark	2,048	2,026	7	98	53	841	48	216	60
Estonia	-	-	-	-	-	-	-	-	-
Faroe Islands	28	908	24	0	671	5	76	35	0
France	379	60	49	-	-	255	-	1	-
Germany	4,620	4,072	0	0	4	534	0	44	1
Ireland	-	404	32	332	11	93	378	-	-
Lithuania	-	-	-	-	-	-	-	-	-
Netherlands	4,548	3,285	10	1	0	36	0	0	0
Norway	13,129	44,344	1,141	7,912	34,843	20,349	10,687	24,733	27,087
Russia	-	-	2	-	-	-	-	-	-
Sweden	1,761	1,957	1,009	68	561	1,002	567	216	0
UK (Engl. + Wales)	1	12	-	-	-	-	0	-	-
UK (Scotland)	3,041	1,658	3,054	3,161	252	0	0	22	61
Unallocated+discards	737	-325	10	0	0	-36	0	0	0
Total	30,311	58,422	5,338	11,572	36,395	23,079	11,756	25,267	27,210

<sup>1</sup> Includes Division 2.a. <sup>2</sup> Estimated from biological sampling. <sup>3</sup> Assumed to be misreported. <sup>4</sup> Includes 13 t from the German Democratic Republic. <sup>5</sup> Includes a negative unallocated catch of -4,000 t. <sup>6</sup> Negative values when there were overestimations of catch when comparing scientific with official data

Country	2007	2008	2009	2010	2011	2012	2013	2014
Denmark	74	2	207	61	19	9	0	23
Faroe Islands	3	55	0	8	0	0	0	53
France	-	1	-	-	268	-	-	17
Germany, Fed.Rep.	6	93	0	4	0	0	20	0
Ireland	651	298	342	14	755	25	7	-
Netherlands	-	-	-	-	-	-	-	-
Lithuania	22	0	7	339	81	92	0	310
Norway	4180	11631	57890	10556	13409	3183	6566	14051
Sweden	76	9	258	2	90	0	1	0
UK (Engl. + Wales)	31	-	-	-	-	-	16	203
UK (Scotland)	7	20	51	546	101	12	102	11
Unallocated +discards	0	0	0	0	0	0	0	30
Total	5050	12110	58755	11531	14723	3320	6712	14699

Country	2015	2016	2017	2018	2019 <sup>1</sup>
Denmark	37	7	21	289	183
Faroe Islands	0	0	67	0	6
France	12	4	1	2	98
Germany, Fed.Rep.	6	28	1	1	5
Ireland	8	-	-	-	-
Netherlands	-	0	14	7	72
Lithuania	12	130	-	-	
Norway	8,887	8,765	9,880	8,601	8,154
Sweden	10	0	41	23	323
UK (Engl. + Wales)	134	13	4	0	
UK (Scotland)	36	14	-	-	50
Unallocated +discards	32	97	87	162**	339
Total	9,175	9,057	10,117	9,085	9144

<sup>1</sup>Preliminary    \*\* 3t landings from UK (Northern Ireland incl.)

**Table 7.1.1.3 Western horse mackerel. Catches (t) in Subarea 6 by country (Data submitted by Working Group members).**

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	734	341	2,785	7	-	-	-	769	1,655
Faroe Islands	-	-	1,248	-	-	4,014	1,992	4,450 <sup>2</sup>	4,000 <sup>2</sup>
France	45	454	4	10	14	13	12	20	10
Germany, Fed. Rep.	5,550	10,212	2,113	4,146	130	191	354	174	615
Ireland	-	-	-	15,086	13,858	27,102	28,125	29,743	27,872
Netherlands	2,385	100	50	94	17,500	18,450	3,450	5,750	3,340
Norway	-	5	-	-	-		83	75	41
Spain	-	-	-	-	-		1	1	1
UK (Engl. + Wales)	9	5	+	38	+	996	198	404	475
UK (N. Ireland)						-	-	-	-
UK (Scotland)	1	17	83	-	214	1,427	138	1,027	7,834
USSR.	-	-	-	-	-	-	-	-	-
Unallocated + disc						-19,168	-13,897	-7,255	-
Total	8,724	11,134	6,283	19,381	31,716	33,025	20,455	35,157	45,842

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	973	615	-	42	-	294	106	114	780
Faroe Islands	3,059	628	255	-	820	80	-	-	-
France	2	17	4	3	+	-	-	-	53
Germany, Fed. Rep.	1,162	2,474	2,500	6,281	10,023	1,430	1,368	943	229
Ireland	19,493	15,911	24,766	32,994	44,802	65,564	120,124	87,872	22,474
Netherlands	1,907	660	3,369	2,150	590	341	2,326	572	1335
Norway	-	-	-	-	-	-	-	-	-
Spain	1	1	1	3	-	-	-	-	-
UK (Engl. + Wales)	44	145	1,229	577	144	109	208	612	56
UK (N.Ireland)	-	-	1,970	273	-	-	-	-	767
UK (Scotland)	1,737	267	1,640	86	4,523	1,760	789	2,669	14,452
USSR/Russia (1992-)	-	44	-	-	-	-	-	-	-
Unallocated + disc.	6,493	143	-1,278	-1,940	-6,960 <sup>3</sup>	-51	-41,326	-11,523	837



Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Total	34,870	20,904	34,456	40,469	53,942	69,527	83,595	81,259	40,983

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark		79							
Faroe Islands	-	-							
France	221			428	55	209	172	41	411
Germany	414	1031	209	265	149	1337	1413	1958	1025
Ireland	21951	31736	15843	20162	12341	20903	15702	12395	9780
Lithuania									2822
Netherlands	983	2646	686	600	450	847	3702	6039	1892
Spain	-	-						0	0
UK (Engl.+Wales)	227	344	41	91		46	5	52	
UK (N.Ireland)	1132	-	79	272	654	530	249	210	82
UK (Scotland)	10147	4544	1839	3111	1192	453	377	62	43
Unallocated+disc.	98	1507	0	0	0	0	0	0	0
Total	34815	41887	18697	24929	14840	24325	21619	20757	16055

<sup>1</sup>Included in Subarea 7. <sup>2</sup>Includes Divisions 3.a, 4.a, b and 6.b. <sup>3</sup>Includes a negative unallocated catch of -7000 t.

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015
Denmark					58	1,131	433	856	3,045
Faroe Islands		573		66					
France		73			246			195	65
Germany	1,835	5,097	635	773	6,508	671	8,616	4,194	1,980
Ireland	20,010	18,751	16,596	19,985	23,556	29,282	19,979	15,745	10,894
Lithuania	80	641							
Netherlands	2,177	3,904	2,332	1,684	6,353	12,653	11,078	8,580	6,211
Norway	2	20	27	18	48	2			
Spain	0								
UK (Engl. + Wales)	332			463			451	18	58
UK (N.Ireland)				59	198		2,325	1,579	1,204
UK (Scotland)	38	588	243	89	2,528	1,231	385	1,277	696
Unallocated+disc.	0	0	0	0	230	2	-	123	
Total	24,474	29,648	19,833	23,136	39,726	44,973	43,266	32,567	24,153

Country	2016	2017	2018	2019 <sup>1</sup>
Denmark		3,462	4,982	6,467
Faroe Islands		113		20
France	23	1,025	197	550
Germany	4,069	2,884	2,779	1,418
Ireland	15,381	15,123	17,959	21,109
Lithuania	2,510			
Netherlands	9,246	5,497	11,921	14,421
Norway				
Spain				
UK (Engl. + Wales)		66	32	830
UK (N.Ireland)	0		1,026	1,907
UK (Scotland)	956			627

Country	2016	2017	2018	2019 <sup>1</sup>
Unallocated+disc.		116	55	129
Total	32,186	28,286	38,950	47,480

<sup>1</sup>Preliminary.**Table 7.1.1.4. Western horse mackerel. Catches (t) in Subarea 7 by country (Data submitted by the Working Group members).**

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Belgium	-	1	1	-	-	+	+	2	-
Denmark	5,045	3,099	877	993	732	1477	30408	27,368	33,202
France	1,983	2,800	2,314	1,834	2,387	1,881	3,801	2,197	1,523
Germany, Fed.Rep.	2,289	1,079	12	1,977	228	-	5	374	4,705
Ireland	-	16	-	-	65	100	703	15	481
Netherlands	23,002	25,000	27500	34,350	38,700	33,550	40,750	69,400	43,560
Norway	394	-	-	-	-	-	-	-	-
Spain	50	234	104	142	560	275	137	148	150
UK (Engl. + Wales)	12,933	2,520	2,670	1,230	279	1,630	1,824	1,228	3,759
UK (Scotland)	1	-	-	-	1	1	+	2	2,873
USSR	-	-	-	-	-	120	-	-	-
Total	45,697	34,749	33,478	40,526	42,952	39,034	77,628	100,734	90,253

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Faroe Islands	-	28	-	-	-	-	-	-	-
Belgium	-	+	-	-	-	1	-	-	18
Denmark	34,474	30,594	28,888	18,984	16,978	41,605	28,300	43,330	60,412
France	4,576	2,538	1,230	1,198	1,001	-	-	-	30,571
Germany, Fed.Rep.	7,743	8,109	12,919	12,951	15,684	14,828	17,436	15,949	28,267
Ireland	12,645	17,887	19,074	15,568	16,363	15,281	58,011	38,455	43,624
Netherlands	43,582	111,900	104,107	109,197	157,110	92,903	116,126	114,692	131,701
Norway	-	-	-	-	-	-	-	-	-
Spain	14	16	113	106	54	29	25	33	6
UK (Engl. + Wales)	4,488	13,371	6,436	7,870	6,090	12,418	31,641	28,605	17,464

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
UK (N.Ireland)	-	-	2,026	1,690	587	119	-	-	1,093
UK (Scotland)	+	139	1,992	5,008	3,123	9,015	10,522	11,241	7,902
Unallocated + discards	28,368	7,614	24,541	15,563	4,010	14,057	68,644	26,795	58,718
Total	135,890	192,196	201,326	188,135	221,000	200,256	330,705	279,100	379,776

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006
Faroe Islands	-	-		550	-	-	3,750	3,660	
Belgium	-	-	-	-		-			
Denmark	25,492	19,166	13,794	20,574	10,094	10,499	11,619	9,939	6,838
France	22,095	25,007	20,401	9,401	5,220	5,010	5,726	7,108	6,680
Germany	24,012	13,392	9,045	7,583	10,212	13,319	16,259	9,582	6,511
Ireland	48,860	25,816	32,869	29,897	23,366	13,533	8,469	20,405	16,841
Lithuania	-	-							3,606
Netherlands	95,753	63,091	44,806	37,733	32,123	38,808	32,130	26,424	29,165
Spain	-	58	50	7	11	1	27	12	3
UK (Engl. + Wales)	11,925	7,249	4,391	5,913	4,393	3,411	4,097	2,670	2,754
UK (N.Ireland)	27	-	546	868	475	384	209		21
UK (Scotland)	5,095	4,994	5,142	1,757	1,461	268	1,146	59	365
Unallocated+discards	12,706	31,239	-9,515	2,888	434	17,146	16,553	11,875	4,679
Total	245,965	190,012	121,530	117,170	87,788	102,379	99,985	91,733	77,463

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015
Faroe Islands	475	212		-	-	-	0		
Belgium				19	2		14		
Denmark	4856	1970	2710	5247	5831	2281	6373	5066	1474
France	2007	9703		260	7431	579	744	940	1552
Germany	3943	5693	14205	16847	14545	16391	15781	12948	7382
Ireland	8039	16282	23816	24491	14154	15893	15805	16922	10751
Lithuania	5387	4907				-	0		
Netherlands	32654	28077	23263	65865	49207	53644	41562	15529	18100
Norway	-	-	-	40		-	0		
Spain	11	11	6	3		10	0		
UK (Engl. + Wales)	5119	3245	6257	12139	11688	12122	3388	4576	1798
UK (Scotland)		469	1119	1713	299	91	17	101	6
Unallocated+discards	6012	-4624	-10891	6511	1	3038	4399	974	1929
Total	68504	65946	60487	133136	103157	104049	88083	57055	42992

Country	2016	2017	2018	2019 <sup>1</sup>
Denmark	314	1057	1,031	690
France	551	595	1,067	907
Germany	7313	4077	1,401	7,673
Ireland	12193	7857	7,169	7,753
Lithuania	86			
Netherlands	14415	8445	14,009	15,159
Poland				127
Spain	0		0	1
UK (Engl. + Wales)	820	478	2,410	2,862
UK (Scotland)				
UK (Northern Ireland)			52	0
Unallocated+discards	1692	830	548	918
Total	37384	23340	27,687	36,062

<sup>1</sup>Preliminary. <sup>2</sup>French catches landed in the Netherlands

**Table 7.1.1.5. Western horse mackerel. Catches (t) in Subarea 8 by country (Data submitted by Working Group members).**

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988
Denmark	-	-	-	-	-	-	446	3,283	2,793
France	3,361	3,711	3,073	2,643	2,489	4,305	3,534	3,983	4,502
Netherlands	-	-	-	-	- <sup>2</sup>	- <sup>2</sup>	- <sup>2</sup>	- <sup>2</sup>	-
Spain	34,134	36,362	19,610	25,580	23,119	23,292	40,334	30,098	26,629
UK (Engl.+Wales)	-	+	1	-	1	143	392	339	253
USSR	-	-	-	-	20	-	656	-	-
Total	37,495	40,073	22,684	28,223	25,629	27,740	45,362	37,703	34,177

Country	1989	1990	1991	1992	1993	1994	1995	1996	1997
Denmark	6,729	5,726	1,349	5,778	1,955	-	340	140	729
France	4,719	5,082	6,164	6,220	4,010	28	-	7	8,564
Germany, Fed. Rep.	-	-	80	62	-	-	-	-	-
Netherlands	-	6,000	12,437	9,339	19,000	7,272	-	14,187	-
Spain	27,170	25,182	23,733	27,688	27,921	25,409	28,349	29,428	31,082
UK (Engl.+Wales)	68	6	70	88	123	753	20	924	430
Unallocated+discards	-	1,500	2,563	5,011	700	2,038	-	3,583	-2,944
Total	38,686	43,496	46,396	54,186	53,709	35,500	28,709	48,269	37,861

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006
Denmark	1,728	4,769	2,584	582					1,513
France	1,844	74	7	5,316	13,676	4,908	2,161	3,540	3,944
Germany	3,268	3,197	3,760	3,645	2,293	504	72	4,776	3,326
Ireland	-	-	6,485	1,483	704	1,314	1,882	1,808	158
Lithuania	-	-							401
Netherlands	8,123	13,821	11,769	35,106	12,538	6,620	1,047	6,372	6,073
Spain	23,599	24,461	24,154	23,531	24,752	24,598	16,245	16,624	13,874
UK (Engl. + Wales)	9	28	121	1,092	1,578	982	516	838	821
UK (Scotland)	-	-	249						
Unallocated+discards	1,884	-8658	5,093	4,365	1,705	2,785	2,202	7,302	4,013

Country	1998	1999	2000	2001	2002	2003	2004	2005	2006
Total	40,455	37,692	54,222	75,120	57,246	41,711	24,125	41,260	34,122

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Denmark	2,687	3,289	3,109	632	200	581	14			
France	10,741	2,848			326	1,218	2,849	2,277	1,618	2,219
Germany		918	281	64	61		417	19	49	4
Ireland	694					39			0	32
Netherlands	211	6,269	1,848	98	49	7	1,057	526	635	1
Spain	14,265	19,840	21,071	38,742	34,581	13,502	22,542	19,443	13,072	14,235
UK (Engl. + Wales)		120	224	112	28		104	35	72	9
Unallocated+discards		67	913	7,412	417	431	2,055	182	9,314	6,643
Total	28,598	33,352	27,447	47,060	35,662	15,777	29,039	22,483	24,760	23,143

Country	2017	2018	2019 <sup>1</sup>
Denmark	1		422
France	2,303	2,176	2,914
Germany	210	554	144
Ireland	580	219	36
Netherlands	313	6	3
Spain	14,901	20,362	25,775
UK (Engl. + Wales)		2	344
Unallocated+discards	2,907	1,921	1,755
Total	21,213	25,240	31,396

<sup>1</sup>Preliminary. <sup>2</sup>Included in Subarea 7. <sup>3</sup>French catches landed in the Netherlands

**Table 7.2.1.1. Western horse mackerel. The time series of Total Annual Egg Production (TAEP) estimates ( $10^{12}$  eggs).**

Year	TAEP	CV
1992	2094	0.14
1995	1344	0.76
1998	1242	0.46
2001	864	0.32
2004	884	0.32
2007	1486	0.61
2010	1033	0.37
2013	366	0.34
2016	331	0.36
2019	178	0.48

**Table 7.2.2.1. Western horse mackerel. The time series of recruitment estimates from the IBTS Survey 2017-2019.**

Year	2020	2020 CV	2019	2018
2003	724708	0.3001	684217	649889
2004	2439512	0.3064	2295299	2232665
2005	2148828	0.3229	2027050	1947555
2006	1482969	0.3267	1397314	1344055
2007	3088715	0.2840	2886675	2791339
2008	7272792	0.2946	6888222	6725228
2009	1135301	0.2735	1061126	1010931
2010	860652	0.2912	808159	773303
2011	180361	0.3475	169028	162735
2012	4356450	0.3091	4102691	3947958
2013	1092849	0.2367	1034260	979157
2014	2922237	0.2381	2688011	2636896
2015	4030569	0.2698	3789317	3650668
2016	5216531	0.2942	4913923	4742525
2017	9450737	0.4633	8855563	8446544
2018	4000271	0.2982	3750158	



Year	2020	2020 CV	2019	2018
2019	1636554	0.2851		

**Table 7.2.2.2. Western horse mackerel. The time series of biomass for the PELACUS acoustic survey (in tonnes).**

Year	Biomass	CV
1992	57188	0.32
1993	25028	0.32
1995	93825	0.32
1997	74364	0.32
1998	139395	0.32
1999	71744	0.32
2000	26192	0.32
2001	40864	0.32
2002	41788	0.32
2003	26647	0.32
2004	23992	0.32
2005	40082	0.32
2006	13934	0.32
2007	28173	0.32
2008	33614	0.32
2009	24020	0.32
2010	53417	0.32
2011	7687	0.32
2012	15479	0.32
2013	5532	0.32
2014	30454	0.32
2015	67068	0.32
2016	32581	0.32
2017	13845	0.32
2018	9270	0.32
2019	13075	0.32

Year	Biomass	CV
2020	NA	NA



**Table 7.2.4.1. Western Horse Mackerel stock. Catch in numbers (thousands) at age by quarter and area in 2019 (15 = 15+ group)**

Q1 Age	27.2.a	27.6.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.d.2	Total
0														0	0		0		0		0
1			2	0	1	8	0	0	3	0	1	0	0	4623	10753	1	116	4	26	5	15543
2	17	557	378	4	192	3136	1	1	766	37	248	1	15	4808	3097	29	194	414	28	19	13943
3	4	185	439	5	224	6022	2	1	2122	44	290	1	18	4121	375	6	422	1557	24	6	15866
4	47	3233	866	3	140	2954	1	1	993	27	181	1	11	1740	112	2	289	1314	10	1	11923
5	1364	127357	15751	22	1065	11530	8	5	3951	208	1377	5	85	1043	85	0	230	1154	6	0	165245
6	131	11706	1687	2	83	801	1	0	296	16	108	0	7	852	90	1	243	879	5	0	16907
7	139	12805	3090	3	142	1363	1	1	504	237	183	1	11	418	38	1	128	506	2	0	19573
8	31	2659	802	1	34	324	0	0	120	33	44	0	3	423	30	1	132	564	2		5201
9	19	1742	339	0	15	146	0	0	54	55	20	0	1	430	26	0	115	614	3		3579
10	43	3691	949	1	36	345	0	0	128	85	46	0	3	462	27	0	144	590	3		6554
11	114	10080	3718	3	151	1451	1	1	536	212	195	1	12	407	19		79	457	2		17440
12	20	1572	761	1	31	297	0	0	110	32	40	0	2	392	17		50	424	2		3753
13	10	612	256	0	11	104	0	0	39	54	14	0	1	191	6		10	142	1		1451
14	8	459	55	0	3	26	0	0	10	1	4	0	0	220	9		14	166	1		976
15	103	7775	2326	2	89	860	1	0	318	44	116	0	7	392	12		14	243	2		12302
sum	2050	184432	31419	46	2217	29369	16	10	9948	1085	2867	10	176	20520	14696	40	2179	9027	120	31	310256

Q2 Age	27.2.a	27.6.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.h	27.7.j	27.7.j.2	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.e	Total
0												0	0	0	0	0	0	0	1
1			3	0	0	1	0	1	2	14	0	506	485	1	11856	4627	4	0	17503
2	3	1	37	0	0	16	0	16	30	176	0	560	674	79	6817	10442	5	0	18857
3	2	1	165	0	0	69	0	70	135	786	0	510	502	93	797	12537	4	0	15672
4	29	12	339	0	0	142	1	144	276	1610	0	274	425	83	741	3993	2	0	8072
5	1308	523	670	0	0	281	1	284	783	3182	0	206	418	84	995	1601	1	0	10338
6	122	49	105	0	0	44	0	45	119	499	0	210	506	78	1337	1014	1	0	4129
7	133	53	111	0	0	47	0	47	113	528	0	119	231	20	599	614	1	0	2615
8	34	13	27	0	0	11	0	11	32	129	0	133	170	7	353	921	1	0	1842
9	24	10	18	0	0	8	0	8	16	87	0	123	128	5	225	934	1	0	1585
10	51	20	71	0	0	30	0	30	60	335	0	117	116	2	282	537	1	0	1651
11	114	46	140	0	0	59	0	60	125	667	0	77	80	1	204	298	0	0	1870
12	25	10	35	0	0	15	0	15	32	168	0	61	97	0	265	239	0	0	963
13	13	5	11	0	0	4	0	4	11	50	0	20	24	0	66	90	0	0	299
14	9	4	4	0	0	1	0	1	5	17	0	29	89	1	212	95	0	0	467
15	132	53	88	0	0	37	0	37	81	416	0	31	74	0	261	178	0	0	1388
sum	2000	800	1825	0	1	765	3	773	1819	8663	1	2978	4018	454	25010	38119	22	1	87252

**Table 7.2.4.1 cont. Western Horse Mackerel stock. Catch in numbers (thousands) at age by quarter and area in 2019 (15 = 15+ group)**

Q3 Age	27.2.a	27.3.a	27.4.a	27.6.a	27.7.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	Total
0					0	25	0	1	1	1	0	0	128	24	0	0	4	102		26	0	0	132
1					0	682	3	23	24	16	7	2	401	655	0	1	986	702	0	609	6758	0	9234
2	1	11	8	58	0	324	1	11	11	8	4	1	1178	311	0	1	1062	143	0	632	8297	0	12027
3	0	3	2	37	0	1997	8	66	69	48	22	6	11155	1920	0	3	895	109	0	905	7737	0	11537
4	2	18	12	158	0	4168	17	138	144	101	46	12	12108	4007	0	7	425	62	0	598	5100	0	21671
5	32	252	383	7267	1	557	2	18	19	13	6	2	2698	535	0	1	286	55	0	371	4356	0	33750
6	4	30	528	461	0	340	1	11	12	8	4	1	1310	327	0	1	306	74	0	310	5347	0	10913
7	4	28	473	455	0	68	0	2	2	2	1	0	281	66	0	0	183	54	0	183	3430	0	6825
8	2	12	707	68	0	67	0	2	2	2	1	0	364	64	0	0	194	60	0	229	3657	0	5351
9	1	9	386	303	0	305	1	10	11	7	3	1	1858	293	0	1	174	53	0	227	3116	0	4772
10	3	21	1366	111	0	373	2	12	13	9	4	1	1850	358	0	1	160	44	0	316	2670	0	7180
11	4	34	1460	200	0	126	1	4	4	3	1	0	668	121	0	0	118	38	0	385	1573	0	6436
12	2	13	879	67	0	20	0	1	1	0	0	0	117	19	0	0	85	30	0	364	723	0	3090
13	1	10	671	50	0	19	0	1	1	0	0	0	91	18	0	0	43	19	0	230	265	0	1445
14	1	7	473	43	0	235	1	8	8	6	3	1	1224	226	0	0	46	15	0	215	275	0	1206
15	10	74	4920	630	0	8	8	6	3	1	1	0	84	20	0	0	84	20	0	425	440	0	8314
sum	67	524	12270	9906	2	9304	38	307	321	225	102	27	35432	8944	0	16	5050	1580	0	6026	53742	0	143883

Q4 Age	27.2.a	27.3.a	27.4.a	27.6.a	27.7.b	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	Total
0					22	4	16	14	0	0	1	190	7283	37	0	0	7510
1					3756	171	594	543	0	4	26	480	7512	44	236	2435	10764
2	3	25	1	1528	798	232	808	738	0	5	35	377	715	4	357	6311	14415
3	1	7	0	344	798	232	808	738	0	5	35	406	169		388	3930	7862
4	9	70	4	2529	1029	455	1584	1448	1	10	69	282	133		348	3001	10971
5	255	2078	229	39063	13082	1259	4381	4003	3	27	191	236	126		393	3241	68568
6	25	203	310	3995	666	152	527	482	0	3	23	269	165		515	3480	10815
7	26	213	279	3878	742	162	564	515	0	4	25	172	125		363	1693	8763
8	7	56	416	762	127	38	131	119	0	1	6	190	150		473	1357	3832
9	5	38	227	468	44	24	84	77	0	1	4	171	153		463	1013	2772
10	10	84	804	926	0	88	305	278	0	2	13	160	184		544	692	4089
11	23	189	859	3126	414	188	654	597	0	4	29	118	200		591	342	7333
12	5	43	517	482	95	47	164	150	0	1	7	82	182		574	214	2563
13	3	25	394	279	0	13	45	41	0	0	2	41	137		380	105	1466
14	2	19	277	267	22	5	18	16	0	0	1	40	115		388	102	1270
15	28	229	2892	2444	200	115	401	366	0	3	17	73	220		866	97	7951
sum	403	3279	7211	60090	20999	2953	10276	9388	6	64	448	3286	17568	84	6879	28011	170944

**Table 7.2.4.1 cont. Western Horse Mackerel stock. Catch in numbers (thousands) at age by quarter and area in 2019 (15 = 15+ group)**

all Q Age	27.2.a	27.3.a	27.4.a	27.6.a	27.7.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.d.2	27.8.e	Total
0																	194	7385	37	26	0	0	0	0	7643
1					0	51	0	2	14	16	15	4	131	40	0	0	6595	19452	46	12818	13824	31	5	0	53043
2	25	36	11	2171	0	4853	7	215	3346	612	551	784	473	1105	1	16	6807	4630	112	8000	25464	33	19	0	59271
3	7	9	3	574	0	1726	6	235	6335	817	742	2193	1362	1422	1	18	5932	1155	99	2512	25761	28	6	0	50945
4	88	87	21	6007	0	4231	11	206	3620	1634	1470	1143	11469	3779	1	15	2721	732	84	1976	13408	12	1	0	52717
5	2959	2331	771	176441	1	33671	39	1204	13214	4491	4053	4250	13126	8757	5	92	1771	684	84	1989	10352	8	0	0	280292
6	282	233	853	16428	0	3016	4	102	1016	542	488	342	2837	1165	0	8	1637	834	78	2404	10720	6	0	0	42996
7	301	242	769	17420	0	4283	4	153	1584	573	520	552	1663	1063	1	12	893	448	21	1273	6242	3	0	0	38021
8	73	68	1127	3562	0	1025	1	36	375	133	120	131	346	244	0	3	941	410	7	1187	6499	3		0	16292
9	50	47	616	2564	0	468	1	17	180	86	78	62	435	175	0	1	897	360	5	1030	5676	3		0	12752
10	107	105	2175	4838	0	1325	2	46	473	313	282	159	2005	688	0	3	899	371	2	1286	4489	3		0	19572
11	256	223	2334	13653	0	4646	5	163	1711	664	602	597	2192	1249	1	13	719	336	1	1259	2670	3		0	33296
12	52	56	1400	2177	0	1017	1	35	363	167	151	125	733	336	0	3	619	326	0	1253	1600	3		0	10418
13	27	35	1068	972	0	286	0	11	122	46	42	43	182	85	0	1	294	186	0	686	602	1		0	4690
14	21	26	751	792	0	100	0	3	34	18	16	11	96	39	0	0	335	228	1	829	637	1		0	3940
15	273	304	7830	11148	0	2849	3	97	1020	407	369	356	1351	775	0	8	579	325	0	1567	956	2		0	30219
sum	4520	3803	19730	258747	2	63546	84	2526	33408	10520	9499	10754	38400	20922	10	193	31834	37862	578	40094	128899	142	31	1	716105

**Table 7.2.4.2. Western horse mackerel. Catch-at-age (thousands).**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1982	0	3713	21072	134743	11515	13197	11741	8848	1651	414	1651	6582	18483	28679	19432	8210
1983	0	7903	2269	32900	53508	15345	44539	52673	17923	3291	5505	3386	17017	23902	38352	46482
1984	0	0	241360	4439	36294	149798	22350	38244	34020	14756	4101	0	639	1757	5080	50895
1985	0	1633	4901	602992	4463	41822	100376	12644	16172	6200	9224	339	850	3723	1250	34814
1986	0	0	0	1548	676208	8727	65147	109747	25712	21179	15271	3116	1031	855	292	51531
1987	0	99	493	0	2950	891660	2061	41564	90814	11740	9549	19363	8917	1398	200	32899
1988	876	27369	6112	2099	4402	18968	941725	12115	39913	67869	9739	16326	17304	5179	4892	32396
1989	0	0	0	20766	18282	5308	14500	1276730	12046	59357	83125	13905	24196	13731	8987	18132
1990	0	20406	45036	138929	61442	33298	10549	20607	1384850	37011	70512	101945	14987	34687	18077	56598
1991	20176	24021	56066	17977	159643	97147	49515	21713	17148	1028420	20309	12161	43665	8141	7053	25553
1992	14888	229694	36332	80550	56280	255874	126816	48711	18992	23447	1099780	13409	23002	65250	11967	33246
1993	46	131108	109807	16738	62342	105760	325674	141148	68418	55289	30689	1075610	11373	24018	68137	32140
1994	3686	60759	911713	115729	53056	44520	38769	221863	106390	40988	43083	22380	918512	10143	14599	36635
1995	2702	233030	646753	526053	269658	74592	114649	36076	228687	113304	96624	59874	63187	951901	39278	148243
1996	10729	19774	659641	864188	189273	87562	52050	55914	53835	57361	56962	91690	67114	56012	349086	165611
1997	4860	110451	471611	732959	408648	256563	141168	143166	143769	123044	133166	96058	176730	98196	51674	283110
1998	744	91505	184443	488661	359590	217571	153136	119309	77494	67072	50108	58791	30535	65839	57583	141362

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1999	14822	97561	83715	176919	265820	254516	212217	187196	147271	77622	35582	22909	34440	29743	41830	122176
2000	565	66210	130897	64801	119297	232346	202175	165745	109218	54365	14594	17509	18642	18585	10031	73174
2001	60561	93125	204360	166641	113659	120410	141419	259974	218002	110319	38576	22749	17102	14092	18857	64868
2002	14044	505717	122603	158114	123258	66640	68890	95052	132743	87285	46167	29692	25333	11305	12753	72682
2003	1913	323194	509889	141442	148989	89122	59047	48582	52305	102089	57089	31748	27158	8832	7683	40641
2004	22237	159011	116055	486195	81099	98855	69441	48969	32589	51953	54542	33298	12581	13407	4305	21278
2005	1305	74538	171420	310767	540649	69957	74746	61889	44443	22726	27019	42746	23677	6849	7491	18626
2006	1905	53322	58091	75505	91274	482229	57377	37222	41970	16865	11828	17073	32025	12877	7464	24645
2007	5121	32399	38598	40530	61938	112724	347284	48160	29112	21504	8728	7015	8462	14021	7618	18335
2008	30155	78121	24456	53525	57125	84358	54701	297879	49889	36692	25172	14466	12787	9269	13194	24124
2009	47421	86053	31431	56816	40104	36174	62700	57683	273217	68318	42063	30583	21230	8266	6811	39752
2010	4331	68198	122386	69381	29371	30496	51312	110033	73973	285281	70041	34486	24421	14887	14942	44201
2011	1136	17035	61864	106032	51259	35380	38626	59428	59031	61017	239472	88764	29187	17731	9783	35379
2012	5350	48100	42653	64221	171284	56012	37917	28132	25608	45490	41255	162118	50523	24043	11621	30567
2013	94165	138663	34651	34171	76847	248958	67370	25070	18447	20746	31217	20836	106242	21316	16279	24536
2014	19215	26080	83034	34591	28200	62102	152650	56679	21786	16441	23876	23654	24509	57284	25197	23878
2015	85629	108174	25416	51631	31604	24613	46201	118679	27331	12698	10883	12584	11794	7272	48586	15935
2016	133936	168323	97368	18662	31033	18762	14519	22754	80818	19004	10531	10298	14703	16212	18451	62769



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2017	104771	135690	26426	132175	34464	49849	23046	14115	22170	52786	12603	6491	6110	6919	7284	33718
2018	25736	107004	42957	54376	257565	43887	39837	14438	8809	19014	44833	10875	8065	4589	3645	35529
2019	7643	53043	59271	50945	52717	280292	42996	38021	16292	12752	19572	33296	10418	4690	3940	30219

Table 7.2.4.3. Western horse mackerel. Marginal age-distribution.

year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Timing	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Fleet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
catch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample size	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	4.5	7.5	6.1	4.8	6.3	7.5	6.2	5.1	2.8	3.2	3.6
0	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.013	0.007	0.000	0.001	0.001	0.004	0.001	0.000	0.008	0.000	0.036	0.009
1	0.013	0.022	0.000	0.002	0.000	0.000	0.023	0.000	0.010	0.015	0.107	0.058	0.023	0.065	0.007	0.033	0.042	0.054	0.051	0.056	0.322
2	0.073	0.006	0.400	0.006	0.000	0.000	0.005	0.000	0.022	0.035	0.017	0.049	0.345	0.179	0.233	0.140	0.085	0.046	0.101	0.123	0.078
3	0.465	0.090	0.007	0.717	0.002	0.000	0.002	0.013	0.068	0.011	0.038	0.007	0.044	0.146	0.305	0.217	0.226	0.098	0.050	0.100	0.101
4	0.040	0.147	0.060	0.005	0.690	0.003	0.004	0.012	0.030	0.099	0.026	0.028	0.020	0.075	0.067	0.121	0.166	0.147	0.092	0.068	0.078
5	0.046	0.042	0.248	0.050	0.009	0.801	0.016	0.003	0.016	0.060	0.120	0.047	0.017	0.021	0.031	0.076	0.101	0.141	0.179	0.072	0.042
6	0.040	0.122	0.037	0.119	0.066	0.002	0.780	0.009	0.005	0.031	0.059	0.144	0.015	0.032	0.018	0.042	0.071	0.118	0.156	0.085	0.044
7	0.031	0.144	0.063	0.015	0.112	0.037	0.010	0.814	0.010	0.013	0.023	0.063	0.084	0.010	0.020	0.042	0.055	0.104	0.128	0.156	0.060

year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
8	0.006	0.049	0.056	0.019	0.026	0.082	0.033	0.008	0.676	0.011	0.009	0.030	0.040	0.063	0.019	0.043	0.036	0.082	0.084	0.131	0.084
9	0.001	0.009	0.024	0.007	0.022	0.011	0.056	0.038	0.018	0.639	0.011	0.024	0.016	0.031	0.020	0.036	0.031	0.043	0.042	0.066	0.056
10	0.006	0.015	0.007	0.011	0.016	0.009	0.008	0.053	0.034	0.013	0.514	0.014	0.016	0.027	0.020	0.039	0.023	0.020	0.011	0.023	0.029
11	0.023	0.009	0.000	0.000	0.003	0.017	0.014	0.009	0.050	0.008	0.006	0.476	0.008	0.017	0.032	0.028	0.027	0.013	0.013	0.014	0.019
12	0.064	0.047	0.001	0.001	0.001	0.008	0.014	0.015	0.007	0.027	0.011	0.005	0.348	0.018	0.024	0.052	0.014	0.019	0.014	0.010	0.016
13	0.099	0.065	0.003	0.004	0.001	0.001	0.004	0.009	0.017	0.005	0.031	0.011	0.004	0.264	0.020	0.029	0.030	0.016	0.014	0.008	0.007
14	0.067	0.105	0.008	0.001	0.000	0.000	0.004	0.006	0.009	0.004	0.006	0.030	0.006	0.011	0.123	0.015	0.027	0.023	0.008	0.011	0.008
15	0.028	0.127	0.084	0.041	0.053	0.030	0.027	0.012	0.028	0.016	0.016	0.014	0.014	0.041	0.058	0.084	0.065	0.068	0.056	0.039	0.046

year	2003*	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Timing	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Fleet	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Sex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
catch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample size	7.9	6.8	7.8	7.2	6.2	7.7	8.7	7.8	6.2	6.8	7.7	8.1	6.4	8.2	6.8	6.9	6.6
0	0.001	0.017	0.001	0.002	0.006	0.035	0.052	0.004	0.001	0.006	0.096	0.028	0.134	0.181	0.157	0.036	0.011
1	0.196	0.122	0.050	0.052	0.040	0.090	0.095	0.065	0.019	0.057	0.142	0.038	0.169	0.228	0.203	0.148	0.074
2	0.309	0.089	0.114	0.057	0.048	0.028	0.035	0.117	0.068	0.050	0.035	0.122	0.040	0.132	0.040	0.060	0.083

year	2003*	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
3	0.086	0.372	0.207	0.074	0.051	0.062	0.063	0.066	0.116	0.076	0.035	0.051	0.081	0.025	0.198	0.075	0.071
4	0.090	0.062	0.361	0.089	0.077	0.066	0.044	0.028	0.056	0.203	0.078	0.042	0.049	0.042	0.052	0.357	0.074
5	0.054	0.076	0.047	0.472	0.141	0.097	0.040	0.029	0.039	0.066	0.254	0.091	0.039	0.025	0.075	0.061	0.391
6	0.036	0.053	0.050	0.056	0.433	0.063	0.069	0.049	0.042	0.045	0.069	0.225	0.072	0.020	0.034	0.055	0.060
7	0.029	0.038	0.041	0.036	0.060	0.344	0.063	0.105	0.065	0.033	0.026	0.083	0.186	0.031	0.021	0.020	0.053
8	0.032	0.025	0.030	0.041	0.036	0.058	0.301	0.071	0.065	0.030	0.019	0.032	0.043	0.109	0.033	0.012	0.023
9	0.062	0.040	0.015	0.017	0.027	0.042	0.075	0.272	0.067	0.054	0.021	0.024	0.020	0.026	0.079	0.026	0.018
10	0.035	0.042	0.018	0.012	0.011	0.029	0.046	0.067	0.263	0.049	0.032	0.035	0.017	0.014	0.019	0.062	0.027
11	0.019	0.025	0.029	0.017	0.009	0.017	0.034	0.033	0.097	0.192	0.021	0.035	0.020	0.014	0.010	0.015	0.046
12	0.016	0.010	0.016	0.031	0.011	0.015	0.023	0.023	0.032	0.060	0.108	0.036	0.018	0.020	0.009	0.011	0.015
13	0.005	0.010	0.005	0.013	0.017	0.011	0.009	0.014	0.019	0.028	0.022	0.084	0.011	0.022	0.010	0.006	0.007
14	0.005	0.003	0.005	0.007	0.010	0.015	0.007	0.014	0.011	0.014	0.017	0.037	0.076	0.025	0.011	0.005	0.006
15	0.025	0.016	0.012	0.024	0.023	0.028	0.044	0.042	0.039	0.036	0.025	0.035	0.025	0.085	0.050	0.049	0.042

\*From 2003 the marginal age composition is replaced by the age-length key in the assessment.

Table 7.2.4.4. Western horse mackerel. Conditional age-length key.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2003	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	2	11	1	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	3	18	9	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	13	15	3	1	0	0	0	0	0	0	0	0	0	0
2003	0	1	24	63	32	7	2	2	0	1	1	0	0	0	0	0
2003	0	0	8	72	88	22	8	2	1	4	5	0	0	0	0	0
2003	0	0	2	41	111	57	11	14	18	12	1	0	0	0	1	0
2003	0	0	0	9	72	81	33	29	29	32	5	1	1	0	0	0
2003	0	0	0	1	34	54	43	33	25	47	11	3	1	1	1	3
2003	0	0	0	0	14	30	28	29	49	50	23	11	3	2	0	3
2003	0	0	0	0	1	8	22	23	33	52	19	5	7	2	2	5
2003	0	0	0	0	1	3	4	4	15	29	29	13	2	3	2	17
2003	0	0	0	0	0	2	3	2	7	15	10	8	6	2	3	5
2003	0	0	0	0	0	0	0	1	0	7	8	5	7	2	2	8
2003	0	0	0	0	0	1	0	2	1	3	6	2	2	0	4	4

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2003	0	0	0	0	0	0	0	0	1	0	3	3	1	2	2	5
2003	0	0	0	0	0	0	0	0	1	1	1	2	1	0	0	8
2003	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	10
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2003	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3
2004	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	17	18	0	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	52	126	2	1	0	0	0	0	0	0	0	0	0	0
2004	0	0	51	186	14	5	0	0	0	0	0	0	0	0	0	0
2004	0	0	29	164	44	27	6	3	2	2	2	0	0	0	0	0
2004	0	0	4	95	71	64	21	5	2	13	3	4	1	0	0	1
2004	0	0	2	28	65	108	35	9	6	10	11	4	0	0	0	1
2004	0	0	1	2	36	73	50	9	9	21	5	7	0	1	0	2
2004	0	0	0	1	10	32	20	7	13	16	4	6	2	0	0	1
2004	0	0	0	0	2	4	11	5	8	8	12	3	4	0	1	2
2004	0	0	0	0	0	2	2	0	3	4	3	3	2	0	0	3
2004	0	0	0	0	0	1	1	0	3	1	1	3	1	1	1	6

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2004	0	0	0	0	0	0	1	0	0	3	0	2	0	1	0	3
2004	0	0	0	0	0	0	0	0	0	3	1	1	2	1	0	7
2004	0	0	0	0	0	0	0	1	0	3	1	2	1	0	2	3
2004	0	0	0	0	0	0	0	0	1	0	3	0	2	1	1	5
2004	0	0	0	0	0	0	0	0	0	0	1	1	3	0	0	3
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
2004	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2005	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	1	42	54	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	75	151	2	2	0	0	0	0	0	0	0	0	0
2005	0	0	0	61	230	4	4	2	0	0	0	0	0	0	0	0
2005	0	0	0	30	248	22	17	7	4	3	2	3	0	0	0	0

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2005	0	0	0	18	160	40	35	7	8	7	7	6	2	0	2	1
2005	0	0	0	3	37	45	51	18	8	12	9	6	2	1	0	0
2005	0	0	0	0	3	21	39	26	8	19	20	10	3	0	0	3
2005	0	0	0	0	1	4	22	24	11	15	19	13	7	0	1	2
2005	0	0	0	0	0	1	10	12	6	6	15	14	2	0	2	3
2005	0	0	0	0	0	2	13	11	7	8	8	8	3	2	0	4
2005	0	0	0	0	0	1	0	3	0	2	9	5	3	2	0	9
2005	0	0	0	0	0	0	1	2	3	3	3	8	6	2	3	7
2005	0	0	0	0	0	0	0	1	2	0	1	5	6	5	1	11
2005	0	0	0	0	0	0	0	0	1	0	4	2	5	4	2	16
2005	0	0	0	0	0	0	0	1	0	1	1	2	3	0	1	15
2005	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	14
2005	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	3
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2006	0	0	0	3	4	18	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	4	20	201	3	2	0	0	0	0	0	0	0	0





	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2007	0	0	0	0	27	9	234	2	0	0	0	0	0	0	0	0
2007	0	0	0	0	7	7	334	9	2	0	0	0	1	0	0	0
2007	0	0	0	0	1	3	360	7	5	3	1	1	0	0	0	0
2007	0	0	0	0	0	0	280	25	23	9	0	3	3	4	1	1
2007	0	0	0	0	0	2	213	27	27	19	10	2	1	9	4	2
2007	0	0	0	0	0	1	126	32	43	34	7	5	11	9	7	7
2007	0	0	0	0	0	0	54	22	34	28	15	13	9	16	6	14
2007	0	0	0	0	0	0	22	9	18	25	9	7	6	6	8	15
2007	0	0	0	0	0	0	8	7	8	17	2	3	1	8	6	24
2007	0	0	0	0	0	0	1	1	9	10	6	2	3	11	5	19
2007	0	0	0	0	0	0	0	0	6	2	2	5	4	5	5	18
2007	0	0	0	0	0	0	0	0	2	3	3	3	1	4	4	15
2007	0	0	0	0	0	0	0	0	0	1	4	0	0	3	6	11
2007	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	15
2007	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	14
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2008	0	0	0	0	2	1	0	4	0	0	0	0	0	0	0	0

[illegible]

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2009	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	5	4	6	1	0	3	0	0	0	0	0	0	0
2009	0	0	0	6	24	36	25	8	37	0	0	0	0	0	0	0
2009	0	0	0	0	23	64	67	26	167	5	2	3	0	0	0	0
2009	0	0	0	0	5	41	70	36	262	10	4	1	0	1	1	0
2009	0	0	0	0	1	12	45	22	314	22	8	2	2	0	0	5
2009	0	0	0	0	0	2	28	14	301	32	17	6	2	4	1	2
2009	0	0	0	0	0	1	11	5	229	38	17	17	6	1	2	9
2009	0	0	0	0	0	0	1	3	154	25	21	15	6	4	7	19
2009	0	0	0	0	0	0	0	4	87	21	19	12	9	1	8	27
2009	0	0	0	0	0	0	0	0	44	10	12	10	2	6	4	32
2009	0	0	0	0	0	0	0	0	17	4	10	15	3	4	3	26
2009	0	0	0	0	0	0	0	0	6	7	13	11	4	3	0	17
2009	0	0	0	0	0	0	0	0	2	2	7	8	3	3	1	18
2009	0	0	0	0	0	0	0	0	0	0	6	3	3	3	2	16
2009	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	20
2009	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	11

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2009	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2010	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0
2010	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	5	4	1	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	2	4	7	3	3	0	1	0	0	0	0	0	0
2010	0	0	0	0	13	17	27	19	5	25	1	1	0	0	0	0
2010	0	0	0	0	4	12	17	26	12	69	3	2	1	1	0	1
2010	0	0	0	0	0	2	13	31	11	103	3	0	4	0	0	1
2010	0	0	0	0	0	1	10	13	11	145	4	5	1	1	1	1
2010	0	0	0	0	0	2	3	12	6	149	9	6	3	1	1	5
2010	0	0	0	0	0	0	1	1	2	133	6	12	5	2	1	8
2010	0	0	0	0	0	0	1	1	2	86	10	9	4	4	3	15
2010	0	0	0	0	0	0	1	1	3	57	8	10	3	2	1	6
2010	0	0	0	0	0	0	0	0	1	30	9	7	6	3	2	11
2010	0	0	0	0	0	0	0	1	0	18	10	5	7	1	2	16
2010	0	0	0	0	0	0	0	0	1	14	8	7	8	3	3	15

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2010	0	0	0	0	0	0	0	0	0	12	2	7	4	3	3	13
2010	0	0	0	0	0	0	0	0	0	3	3	6	1	4	0	17
2010	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	17
2010	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	9
2010	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
2011	0	0	7	2	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	20	10	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	17	39	0	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	10	52	2	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	9	51	4	1	0	0	0	0	0	0	0	0	0	0
2011	0	0	8	33	17	4	2	1	2	0	2	0	0	0	0	0
2011	0	0	4	15	21	18	8	7	5	2	10	1	1	0	0	0
2011	0	0	0	2	18	23	15	17	14	5	28	2	0	0	0	2
2011	0	0	0	0	2	10	18	28	17	7	81	1	0	1	0	1
2011	0	0	0	0	0	3	6	27	19	7	120	3	2	1	0	2
2011	0	0	0	0	1	2	4	9	9	6	136	2	6	2	1	4
2011	0	0	0	0	0	1	1	2	6	4	132	6	7	4	1	10
2011	0	0	0	0	0	1	1	1	1	2	99	11	7	7	1	9

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2011	0	0	0	0	0	0	0	0	2	0	73	9	11	8	1	10
2011	0	0	0	0	0	0	0	0	0	0	44	15	8	3	3	10
2011	0	0	0	0	0	0	0	0	0	1	32	6	14	10	2	11
2011	0	0	0	0	0	0	0	0	0	0	27	4	6	9	2	18
2011	0	0	0	0	0	0	0	0	0	0	8	6	8	8	1	15
2011	0	0	0	0	0	0	0	0	0	0	4	5	4	2	2	8
2011	0	0	0	0	0	0	0	0	0	0	3	3	4	5	1	9
2011	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3
2011	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2012	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	1	21	22	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	20	51	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	10	92	6	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	4	107	14	1	1	0	0	0	0	0	0	0	0
2012	0	0	0	0	97	28	3	2	1	2	0	1	0	0	0	0
2012	0	0	0	2	74	27	16	2	6	5	0	15	1	0	1	0
2012	0	0	0	0	26	34	20	9	16	16	5	44	0	1	0	1

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	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2013	0	0	0	2	14	59	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	1	27	116	1	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	18	153	8	1	0	0	0	0	0	0	0	0
2013	0	0	0	0	9	141	33	5	2	1	1	0	1	0	0	0
2013	0	0	0	0	4	103	47	6	5	6	6	2	19	1	1	0
2013	0	0	0	0	2	44	38	14	6	19	16	4	56	4	2	0
2013	0	0	0	0	0	11	20	13	14	26	18	2	90	5	6	3
2013	0	0	0	0	0	3	10	13	10	15	13	7	119	4	2	3
2013	0	0	0	0	0	1	2	4	11	13	11	3	91	7	6	5
2013	0	0	0	0	0	0	2	4	0	0	9	3	68	5	7	3
2013	0	0	0	0	0	0	0	0	0	3	1	2	60	3	4	8
2013	0	0	0	0	0	0	0	0	2	2	2	0	49	6	3	9
2013	0	0	0	0	0	0	0	0	0	0	0	1	29	4	9	7
2013	0	0	0	0	0	0	0	0	0	0	1	0	23	3	2	12
2013	0	0	0	0	0	0	0	0	0	0	0	1	13	3	8	8
2013	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	7
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
2013	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5



[illegible]

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	3
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2015	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	8	2	2	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	22	5	4	2	0	0	0	0	0	0	0	0	0
2015	0	0	0	15	22	4	2	2	0	0	0	0	0	0	0	0
2015	0	0	0	8	12	13	11	16	0	0	0	0	0	0	0	0
2015	0	0	0	5	16	9	11	43	1	1	0	0	0	0	0	0
2015	0	0	0	3	4	3	18	82	3	1	1	0	0	0	1	0
2015	0	0	0	0	1	5	15	85	8	2	2	1	1	1	5	1
2015	0	0	0	0	0	0	12	75	11	3	0	0	4	4	15	5
2015	0	0	0	0	0	1	4	36	10	6	1	5	9	5	34	5



[illegible]

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2017	10	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	10	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	10	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	10	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	4	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	29	10	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	22	34	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	23	74	3	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	19	79	35	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	7	40	70	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	1	22	98	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	8	97	2	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	4	104	11	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	112	23	1	0	0	0	0	0	0	0	0	0	0
2017	0	0	1	105	53	11	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	69	112	44	13	0	0	0	0	0	0	0	0	0
2017	0	0	1	47	88	128	39	5	1	0	0	0	0	0	0	0
2017	0	0	0	27	50	145	83	12	0	0	0	0	0	0	0	0

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	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2018	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	13	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	14	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	3	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	2	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	18	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	18	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	11	83	8	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	54	42	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	56	31	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	66	24	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	55	61	19	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	42	102	41	5	0	0	0	0	0	0	0	0	0	0	0
2018	0	21	184	100	49	0	0	0	0	0	0	0	0	0	0	0
2018	0	10	112	104	167	1	0	0	0	0	0	0	0	0	0	0
2018	0	0	70	119	431	11	1	0	0	0	0	0	0	0	0	0
2018	0	0	15	113	584	52	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	52	531	79	27	3	3	2	0	0	0	0	0	0

[illegible]



[illegible]

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2019	0	29	33	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	17	47	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	23	52	1	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	26	52	1	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	25	80	23	1	0	0	0	0	0	0	0	0	0	0	0
2019	0	19	99	63	2	2	0	0	0	0	0	0	0	0	0	0
2019	0	3	92	101	17	2	0	0	0	0	0	0	0	0	0	0
2019	0	2	67	101	45	31	1	0	0	0	0	0	0	0	0	0
2019	0	0	30	107	77	145	1	0	0	0	0	0	0	0	0	0
2019	0	0	5	67	108	358	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	12	114	509	20	2	0	0	0	0	0	0	0	1
2019	0	0	0	1	83	526	80	18	0	0	1	1	0	0	0	3
2019	0	0	0	2	63	404	119	48	6	3	1	1	0	0	0	0
2019	0	0	0	2	28	219	103	88	22	4	6	5	0	0	0	0
2019	0	0	0	1	7	98	78	93	78	38	8	26	3	0	0	3
2019	0	0	0	0	2	40	42	110	33	75	49	61	7	0	0	3
2019	0	0	0	0	0	14	24	75	19	22	110	96	12	5	2	14
2019	0	0	0	0	0	2	8	53	17	11	54	136	29	3	2	38

[illegible]

Table 7.2.4.5. Western horse mackerel. Catch-at-length distribution from the commercial fleet.

year		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Timing		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Fleet		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sex		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
catch		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample number		34	42	50	40	47	53	57	37	46	87	68	49	48	66	63	82	101	108	104	96
Length bins (cm)	5	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	0.000	0.000	0.000	0.000	0.000	0.000
	6	0.000	0.002	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	0.000	0.000	0.000	0.000
	7	0.000	0.004	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	0.001	0.000	0.000	0.000	0.000
	8	0.000	0.003	0.003	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000
	9	0.000	0.001	0.006	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.001	0.000	0.000	0.000
	10	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	0.000	0.059	0.001	0.000	0.000	0.000
	11	0.000	0.009	0.007	0.000	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.001	0.000	0.000	0.000
	12	0.001	0.035	0.034	0.000	0.010	0.004	0.002	0.001	0.003	0.000	0.002	0.000	0.000	0.001	0.000	0.020	0.004	0.000	0.001	0.004
	13	0.018	0.014	0.055	0.001	0.018	0.003	0.002	0.002	0.003	0.002	0.005	0.000	0.000	0.004	0.000	0.016	0.007	0.002	0.007	0.011
	14	0.035	0.008	0.045	0.002	0.016	0.007	0.004	0.002	0.004	0.044	0.006	0.001	0.001	0.020	0.000	0.010	0.009	0.028	0.016	0.017
	15	0.034	0.016	0.039	0.007	0.022	0.017	0.007	0.001	0.033	0.054	0.010	0.003	0.002	0.048	0.001	0.012	0.014	0.017	0.026	0.016
	16	0.025	0.024	0.040	0.011	0.029	0.014	0.010	0.004	0.045	0.012	0.009	0.004	0.005	0.067	0.002	0.012	0.012	0.010	0.010	0.009

year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
17	0.019	0.042	0.049	0.011	0.020	0.006	0.014	0.008	0.021	0.008	0.009	0.010	0.009	0.052	0.002	0.008	0.018	0.010	0.003	0.008
18	0.016	0.044	0.054	0.016	0.025	0.007	0.013	0.012	0.020	0.014	0.009	0.017	0.009	0.043	0.003	0.011	0.019	0.022	0.008	0.005
19	0.053	0.044	0.037	0.021	0.035	0.012	0.012	0.012	0.008	0.024	0.010	0.017	0.022	0.026	0.006	0.024	0.028	0.027	0.013	0.011
20	0.070	0.052	0.030	0.031	0.042	0.018	0.012	0.024	0.009	0.036	0.026	0.016	0.034	0.022	0.015	0.024	0.047	0.029	0.029	0.018
21	0.022	0.061	0.033	0.027	0.091	0.054	0.023	0.036	0.014	0.019	0.057	0.030	0.046	0.022	0.025	0.021	0.055	0.043	0.051	0.030
22	0.023	0.072	0.031	0.027	0.109	0.120	0.039	0.076	0.044	0.024	0.062	0.041	0.035	0.022	0.028	0.019	0.041	0.060	0.069	0.038
23	0.031	0.098	0.034	0.032	0.117	0.120	0.086	0.123	0.065	0.032	0.044	0.048	0.039	0.026	0.024	0.026	0.023	0.072	0.121	0.038
24	0.054	0.112	0.054	0.026	0.092	0.113	0.161	0.102	0.067	0.031	0.034	0.059	0.049	0.026	0.026	0.031	0.016	0.065	0.135	0.053
25	0.086	0.087	0.077	0.029	0.088	0.084	0.139	0.109	0.081	0.037	0.033	0.051	0.072	0.045	0.030	0.032	0.022	0.058	0.109	0.097
26	0.106	0.069	0.063	0.040	0.069	0.071	0.086	0.114	0.101	0.049	0.041	0.041	0.076	0.075	0.036	0.031	0.026	0.039	0.077	0.126
27	0.105	0.059	0.044	0.071	0.063	0.058	0.068	0.099	0.110	0.084	0.067	0.050	0.066	0.087	0.060	0.038	0.033	0.042	0.048	0.132
28	0.086	0.043	0.032	0.094	0.042	0.048	0.049	0.069	0.097	0.105	0.092	0.055	0.052	0.076	0.102	0.060	0.037	0.050	0.033	0.103
29	0.065	0.027	0.026	0.106	0.031	0.038	0.034	0.048	0.072	0.098	0.119	0.083	0.064	0.058	0.118	0.075	0.060	0.056	0.032	0.067
30	0.041	0.021	0.025	0.107	0.019	0.028	0.024	0.030	0.053	0.066	0.106	0.117	0.087	0.050	0.112	0.093	0.083	0.069	0.032	0.050
31	0.025	0.014	0.021	0.111	0.014	0.024	0.017	0.020	0.041	0.043	0.078	0.101	0.094	0.054	0.109	0.095	0.092	0.074	0.039	0.042
32	0.024	0.012	0.023	0.098	0.008	0.019	0.022	0.016	0.033	0.035	0.062	0.072	0.073	0.046	0.096	0.063	0.098	0.066	0.039	0.034
33	0.017	0.009	0.025	0.047	0.009	0.021	0.028	0.013	0.023	0.033	0.041	0.052	0.055	0.035	0.077	0.063	0.088	0.057	0.032	0.032
34	0.016	0.008	0.029	0.027	0.010	0.024	0.031	0.014	0.016	0.032	0.026	0.043	0.036	0.025	0.047	0.029	0.069	0.045	0.028	0.025

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**Table 7.2.4.6. Western horse mackerel. Catch-at-length distribution from the PELACUS survey.**

year		1992	1993	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2013	2014	2015	2016	2017	2018	2019
Timing		5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08
Fleet		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Sex		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
catch		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample number		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Length bins (cm)	5	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	8	0.000	0.000	0.000	0.000	0.000	0.012	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000
	9	0.000	0.000	0.000	0.000	0.000	0.038	0.000	0.000	0.002	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.002	0.000
	10	0.000	0.000	0.000	0.000	0.000	0.055	0.000	0.000	0.207	0.000	0.004	0.148	0.000	0.000	0.004	0.000	0.049	0.000	0.047	0.017	0.003
	11	0.000	0.024	0.002	0.000	0.002	0.006	0.014	0.000	0.257	0.000	0.006	0.113	0.000	0.000	0.009	0.003	0.058	0.009	0.112	0.101	0.077
	12	0.000	0.128	0.043	0.017	0.009	0.002	0.046	0.000	0.092	0.000	0.001	0.025	0.000	0.000	0.024	0.015	0.108	0.014	0.097	0.068	0.144
	13	0.000	0.055	0.066	0.028	0.016	0.002	0.025	0.000	0.063	0.000	0.000	0.007	0.001	0.000	0.080	0.012	0.126	0.003	0.060	0.081	0.096
	14	0.000	0.016	0.047	0.084	0.013	0.000	0.006	0.000	0.038	0.000	0.000	0.009	0.000	0.001	0.083	0.003	0.095	0.009	0.034	0.087	0.038
	15	0.000	0.011	0.029	0.140	0.005	0.000	0.019	0.000	0.018	0.000	0.000	0.017	0.004	0.003	0.020	0.001	0.035	0.053	0.014	0.124	0.051
	16	0.000	0.020	0.018	0.123	0.000	0.000	0.025	0.000	0.005	0.000	0.001	0.034	0.020	0.004	0.027	0.011	0.007	0.165	0.017	0.184	0.068

year	1992	1993	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2013	2014	2015	2016	2017	2018	2019
17	0.000	0.081	0.079	0.089	0.001	0.000	0.018	0.000	0.002	0.017	0.000	0.020	0.018	0.001	0.023	0.039	0.012	0.144	0.106	0.130	0.081
18	0.000	0.015	0.148	0.045	0.005	0.000	0.003	0.000	0.004	0.024	0.000	0.012	0.019	0.003	0.021	0.066	0.020	0.059	0.120	0.039	0.091
19	0.004	0.009	0.163	0.073	0.005	0.000	0.001	0.000	0.002	0.019	0.001	0.001	0.017	0.012	0.020	0.081	0.022	0.059	0.076	0.029	0.072
20	0.026	0.000	0.083	0.008	0.005	0.000	0.007	0.000	0.005	0.016	0.018	0.002	0.009	0.057	0.024	0.195	0.036	0.057	0.043	0.036	0.039
21	0.089	0.002	0.032	0.031	0.007	0.002	0.012	0.000	0.013	0.018	0.126	0.002	0.047	0.117	0.013	0.235	0.053	0.059	0.034	0.032	0.050
22	0.298	0.000	0.012	0.017	0.003	0.007	0.007	0.002	0.010	0.030	0.123	0.008	0.087	0.171	0.011	0.089	0.059	0.052	0.031	0.028	0.032
23	0.337	0.003	0.014	0.026	0.007	0.035	0.023	0.004	0.004	0.056	0.129	0.026	0.073	0.142	0.022	0.039	0.083	0.073	0.035	0.024	0.019
24	0.159	0.003	0.028	0.032	0.011	0.066	0.064	0.025	0.008	0.073	0.078	0.035	0.072	0.070	0.026	0.009	0.100	0.061	0.031	0.012	0.027
25	0.055	0.003	0.042	0.053	0.003	0.076	0.125	0.109	0.047	0.098	0.083	0.063	0.071	0.064	0.024	0.034	0.068	0.053	0.021	0.001	0.024
26	0.013	0.023	0.042	0.040	0.008	0.039	0.123	0.244	0.083	0.179	0.136	0.087	0.090	0.086	0.038	0.028	0.026	0.045	0.028	0.000	0.020
27	0.011	0.077	0.025	0.042	0.029	0.029	0.109	0.293	0.074	0.134	0.141	0.091	0.136	0.083	0.048	0.027	0.011	0.039	0.027	0.000	0.013
28	0.004	0.183	0.023	0.030	0.099	0.044	0.084	0.141	0.037	0.098	0.058	0.088	0.103	0.076	0.077	0.016	0.007	0.017	0.022	0.001	0.013
29	0.000	0.168	0.031	0.044	0.212	0.146	0.094	0.089	0.015	0.097	0.037	0.069	0.077	0.051	0.127	0.027	0.007	0.009	0.013	0.001	0.009
30	0.001	0.080	0.029	0.047	0.275	0.179	0.100	0.062	0.008	0.061	0.029	0.059	0.056	0.039	0.134	0.021	0.003	0.002	0.007	0.001	0.012
31	0.001	0.045	0.017	0.016	0.166	0.120	0.067	0.021	0.001	0.041	0.022	0.033	0.042	0.014	0.080	0.013	0.006	0.000	0.002	0.000	0.012
32	0.000	0.019	0.009	0.017	0.078	0.062	0.016	0.008	0.001	0.028	0.005	0.017	0.040	0.004	0.047	0.016	0.005	0.003	0.003	0.000	0.005
33	0.000	0.002	0.005	0.000	0.024	0.029	0.010	0.002	0.000	0.006	0.003	0.009	0.014	0.002	0.014	0.008	0.003	0.002	0.004	0.000	0.001
34	0.000	0.012	0.004	0.000	0.009	0.021	0.003	0.000	0.000	0.002	0.000	0.002	0.003	0.000	0.006	0.009	0.001	0.001	0.002	0.003	0.001



[illegible]

**Table 7.2.5.1. Western horse mackerel stock. Mean weight (kg) in catch-at-age by quarter and area in 2019 (15 = 15+ group)**

Q1 weight	27.2.a	27.6.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.d.2	Total
0														0.021	0.021		0.021	0.021	0.021		0.021
1			0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.024	0.016	0.045	0.024	0.033	0.024	0.023	0.018
2	0.077	0.060	0.070	0.072	0.072	0.065	0.072	0.072	0.070	0.072	0.072	0.072	0.072	0.060	0.040	0.055	0.064	0.087	0.061	0.048	0.059
3	0.117	0.087	0.085	0.085	0.085	0.082	0.085	0.085	0.082	0.085	0.085	0.085	0.085	0.103	0.091	0.084	0.100	0.113	0.103	0.083	0.091
4	0.144	0.129	0.126	0.114	0.114	0.103	0.114	0.114	0.104	0.114	0.114	0.114	0.114	0.126	0.122	0.118	0.127	0.133	0.126	0.095	0.120
5	0.148	0.140	0.145	0.156	0.156	0.151	0.156	0.156	0.154	0.156	0.156	0.156	0.156	0.160	0.162	0.134	0.160	0.162	0.160	0.177	0.142
6	0.197	0.189	0.200	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.203	0.183	0.186	0.218	0.189	0.176	0.182	0.177	0.190
7	0.240	0.235	0.240	0.241	0.241	0.241	0.241	0.241	0.241	0.270	0.241	0.241	0.241	0.204	0.204	0.218	0.209	0.203	0.204	0.177	0.235
8	0.298	0.287	0.284	0.290	0.290	0.290	0.290	0.290	0.290	0.340	0.290	0.290	0.290	0.235	0.233	0.218	0.234	0.231	0.235		0.275
9	0.287	0.274	0.269	0.274	0.274	0.274	0.274	0.274	0.274	0.251	0.274	0.274	0.274	0.258	0.255	0.218	0.258	0.257	0.258		0.267
10	0.296	0.274	0.293	0.296	0.296	0.296	0.296	0.296	0.296	0.326	0.296	0.296	0.296	0.292	0.286	0.218	0.286	0.294	0.292		0.283
11	0.301	0.293	0.289	0.290	0.290	0.290	0.290	0.290	0.290	0.324	0.290	0.290	0.290	0.320	0.318		0.313	0.317	0.320		0.293
12	0.347	0.320	0.324	0.320	0.320	0.320	0.320	0.320	0.320	0.379	0.320	0.320	0.320	0.320	0.352		0.352	0.342	0.350		0.328
13	0.389	0.367	0.356	0.362	0.362	0.362	0.362	0.362	0.362	0.394	0.362	0.362	0.362	0.383	0.383		0.382	0.394	0.383		0.370
14	0.384	0.352	0.271	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.415	0.416		0.416	0.417	0.415		0.372
15	0.374	0.341	0.343	0.343	0.343	0.343	0.343	0.343	0.343	0.362	0.343	0.343	0.343	0.493	0.486		0.476	0.538	0.491		0.351

Q2 weight	27.2.a	27.6.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.h	27.7.j	27.7.j.2	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.e	Total
0												0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
1			0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.032	0.027	0.048	0.023	0.027	0.032	0.032	0.024
2	0.039	0.039	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.074	0.058	0.067	0.041	0.071	0.074	0.074	0.060
3	0.082	0.082	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.111	0.108	0.104	0.093	0.102	0.111	0.111	0.101
4	0.125	0.125	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.137	0.133	0.131	0.134	0.121	0.137	0.137	0.141
5	0.142	0.142	0.168	0.168	0.168	0.168	0.168	0.168	0.177	0.168	0.168	0.167	0.164	0.161	0.164	0.156	0.168	0.168	0.161
6	0.196	0.196	0.228	0.228	0.228	0.228	0.228	0.228	0.231	0.228	0.228	0.191	0.189	0.182	0.189	0.175	0.192	0.192	0.194
7	0.239	0.239	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.249	0.211	0.206	0.194	0.205	0.202	0.211	0.211	0.221
8	0.308	0.308	0.294	0.294	0.294	0.294	0.294	0.294	0.295	0.294	0.294	0.238	0.233	0.223	0.228	0.234	0.239	0.239	0.242
9	0.303	0.303	0.314	0.314	0.314	0.314	0.314	0.314	0.315	0.314	0.314	0.259	0.253	0.238	0.248	0.255	0.259	0.259	0.260
10	0.311	0.311	0.304	0.304	0.304	0.304	0.304	0.304	0.305	0.304	0.304	0.286	0.283	0.275	0.285	0.288	0.287	0.287	0.293
11	0.309	0.309	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.315	0.319	0.310	0.320	0.315	0.314	0.314	0.309
12	0.359	0.359	0.311	0.311	0.311	0.311	0.311	0.311	0.312	0.311	0.311	0.350	0.356	0.331	0.360	0.339	0.343	0.343	0.340
13	0.404	0.404	0.349	0.349	0.349	0.349	0.349	0.349	0.334	0.349	0.349	0.380	0.381	0.398	0.381	0.397	0.380	0.380	0.378
14	0.400	0.400	0.296	0.296	0.296	0.296	0.296	0.296	0.304	0.296	0.296	0.416	0.422	0.426	0.425	0.414	0.414	0.414	0.413
15	0.391	0.391	0.355	0.355	0.355	0.355	0.355	0.355	0.353	0.355	0.355	0.506	0.482	0.460	0.497	0.532	0.491	0.491	0.419

**Table 7.2.5.1 cont. Western horse mackerel stock. Mean weight (kg) in catch-at-age by quarter and area in 2019 (15 = 15+ group)**

Q3 weight	27.2.a	27.3.a	27.4.a	27.6.a	27.7.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	Total
0					0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.066	0.070	0.066	0.066	0.066	0.021	0.021	0.020	0.020	0.020	0.020	0.020
1					0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.074	0.073	0.074	0.093	0.103	0.074	0.096
2	0.084	0.084	0.084	0.084	0.152	0.152	0.152	0.152	0.152	0.152	0.152	0.152	0.175	0.152	0.152	0.152	0.111	0.113	0.111	0.124	0.127	0.111	0.132
3	0.138	0.138	0.138	0.153	0.195	0.195	0.195	0.195	0.195	0.195	0.195	0.195	0.199	0.195	0.195	0.195	0.138	0.141	0.138	0.145	0.151	0.138	0.184
4	0.169	0.169	0.169	0.172	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.245	0.238	0.238	0.238	0.195	0.196	0.195	0.194	0.199	0.195	0.223
5	0.193	0.193	0.270	0.194	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.317	0.316	0.316	0.316	0.240	0.240	0.240	0.243	0.241	0.240	0.267
6	0.248	0.248	0.349	0.228	0.366	0.366	0.366	0.366	0.366	0.366	0.366	0.366	0.368	0.366	0.366	0.366	0.260	0.257	0.260	0.262	0.260	0.260	0.288
7	0.277	0.277	0.364	0.252	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.286	0.287	0.286	0.293	0.284	0.286	0.317
8	0.358	0.358	0.380	0.355	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.316	0.317	0.316	0.323	0.311	0.316	0.343
9	0.363	0.363	0.392	0.349	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.347	0.345	0.347	0.352	0.334	0.347	0.352
10	0.389	0.389	0.404	0.384	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.427	0.379	0.373	0.379	0.381	0.371	0.379	0.398
11	0.362	0.362	0.414	0.352	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.412	0.408	0.412	0.410	0.409	0.412	0.413
12	0.418	0.418	0.425	0.418	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.489	0.469	0.489	0.496	0.479	0.489	0.447
13	0.427	0.427	0.434	0.427	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.489	0.469	0.489	0.496	0.479	0.489	0.447
14	0.432	0.432	0.443	0.416	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.489	0.469	0.489	0.496	0.479	0.489	0.447
15	0.456	0.456	0.469	0.400	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.432	0.489	0.469	0.489	0.496	0.479	0.489	0.447

Q4 weight	27.2.a	27.3.a	27.4.a	27.6.a	27.7.b	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	Total
0												0.010	0.011	0.015	0.020	0.020	0.011
1					0.046	0.066	0.066	0.066	0.066	0.066	0.066	0.045	0.037	0.040	0.048	0.076	0.046
2	0.077	0.077	0.077	0.083	0.079	0.072	0.072	0.072	0.072	0.072	0.072	0.100	0.071	0.069	0.093	0.096	0.087
3	0.119	0.119	0.119	0.134	0.119	0.099	0.099	0.099	0.099	0.099	0.099	0.124	0.122		0.124	0.126	0.119
4	0.145	0.145	0.145	0.164	0.147	0.176	0.176	0.176	0.176	0.176	0.176	0.146	0.146		0.150	0.153	0.162
5	0.150	0.150	0.251	0.174	0.175	0.170	0.170	0.170	0.170	0.170	0.170	0.173	0.175		0.178	0.177	0.173
6	0.204	0.204	0.351	0.212	0.209	0.225	0.225	0.225	0.225	0.225	0.225	0.196	0.196		0.199	0.193	0.210
7	0.244	0.244	0.366	0.249	0.238	0.247	0.247	0.247	0.247	0.247	0.247	0.213	0.214		0.216	0.208	0.241
8	0.315	0.315	0.383	0.300	0.314	0.296	0.296	0.296	0.296	0.296	0.296	0.240	0.241		0.243	0.239	0.275
9	0.310	0.310	0.395	0.299	0.347	0.316	0.316	0.316	0.316	0.316	0.316	0.260	0.259		0.261	0.258	0.283
10	0.323	0.323	0.406	0.306	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.287	0.292		0.291	0.280	0.318
11	0.314	0.314	0.416	0.302	0.276	0.302	0.302	0.302	0.302	0.302	0.302	0.316	0.320		0.323	0.313	0.317
12	0.371	0.371	0.427	0.364	0.273	0.308	0.308	0.308	0.308	0.308	0.308	0.345	0.348		0.354	0.345	0.360
13	0.408	0.408	0.436	0.385	0.349	0.349	0.349	0.349	0.349	0.349	0.349	0.379	0.374		0.382	0.378	0.394
14	0.407	0.407	0.445	0.388	0.395	0.310	0.310	0.310	0.310	0.310	0.310	0.411	0.409		0.412	0.404	0.410
15	0.405	0.405	0.471	0.388	0.348	0.355	0.355	0.355	0.355	0.355	0.355	0.487	0.474		0.491	0.488	0.430

**Table 7.2.5.1 cont. Western horse mackerel stock. Mean weight (kg) in catch-at-age by quarter and area in 2019 (15 = 15+ group)**

all Q weight	27.2.a	27.3.a	27.4.a	27.6.a	27.7.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.d.2	27.8.e	Total
0					0.066	0.057	0.063	0.056	0.056	0.066	0.066	0.054	0.070	0.067	0.048	0.054	0.027	0.011	0.011	0.015	0.020	0.020	0.020	0.020	0.011
1					0.066	0.057	0.063	0.056	0.056	0.066	0.066	0.054	0.070	0.067	0.048	0.054	0.027	0.011	0.011	0.015	0.020	0.020	0.020	0.020	0.011
2	0.073	0.079	0.082	0.077	0.079	0.078	0.075	0.073	0.065	0.072	0.072	0.069	0.077	0.073	0.072	0.073	0.066	0.048	0.064	0.048	0.048	0.062	0.048	0.074	0.073
3	0.111	0.125	0.132	0.119	0.152	0.114	0.100	0.088	0.083	0.099	0.099	0.083	0.164	0.106	0.086	0.087	0.106	0.105	0.103	0.110	0.114	0.104	0.083	0.111	0.108
4	0.139	0.150	0.159	0.145	0.195	0.168	0.174	0.140	0.117	0.177	0.177	0.114	0.198	0.184	0.117	0.133	0.131	0.134	0.131	0.139	0.141	0.128	0.095	0.137	0.158
5	0.146	0.155	0.240	0.150	0.191	0.163	0.171	0.160	0.153	0.170	0.170	0.155	0.205	0.176	0.157	0.159	0.164	0.167	0.161	0.167	0.172	0.162	0.177	0.168	0.157
6	0.198	0.210	0.347	0.196	0.238	0.210	0.223	0.209	0.208	0.225	0.225	0.207	0.244	0.230	0.204	0.208	0.188	0.191	0.182	0.192	0.193	0.185	0.177	0.192	0.204
7	0.240	0.248	0.362	0.239	0.256	0.241	0.246	0.242	0.242	0.248	0.247	0.242	0.266	0.250	0.241	0.242	0.209	0.209	0.195	0.210	0.211	0.206	0.177	0.211	0.237
8	0.306	0.323	0.381	0.292	0.316	0.290	0.298	0.292	0.291	0.296	0.296	0.291	0.317	0.299	0.291	0.291	0.237	0.237	0.223	0.238	0.238	0.236		0.239	0.269
9	0.299	0.320	0.393	0.288	0.366	0.292	0.317	0.286	0.283	0.317	0.317	0.280	0.351	0.329	0.276	0.282	0.259	0.256	0.237	0.258	0.258	0.258		0.259	0.278
10	0.308	0.336	0.405	0.284	0.308	0.297	0.304	0.299	0.298	0.304	0.304	0.298	0.309	0.305	0.296	0.298	0.289	0.288	0.272	0.290	0.285	0.291		0.287	0.304
11	0.307	0.322	0.414	0.296	0.320	0.291	0.300	0.292	0.292	0.302	0.302	0.291	0.328	0.306	0.290	0.291	0.318	0.319	0.310	0.322	0.313	0.319		0.314	0.309
12	0.358	0.382	0.425	0.334	0.290	0.314	0.307	0.317	0.318	0.308	0.308	0.319	0.297	0.304	0.320	0.318	0.349	0.350	0.331	0.355	0.338	0.349		0.343	0.344
13	0.400	0.414	0.435	0.376	0.313	0.352	0.349	0.359	0.360	0.349	0.349	0.360	0.339	0.343	0.361	0.360	0.382	0.375	0.398	0.382	0.382	0.383		0.380	0.387
14	0.396	0.414	0.444	0.369	0.330	0.310	0.320	0.311	0.307	0.310	0.310	0.305	0.315	0.313	0.307	0.309	0.414	0.414	0.426	0.415	0.411	0.415		0.414	0.402
15	0.389	0.417	0.470	0.356	0.375	0.346	0.354	0.346	0.345	0.355	0.355	0.345	0.378	0.359	0.344	0.345	0.493	0.476	0.460	0.493	0.505	0.491		0.491	0.402

**Table 7.2.5.2. Western horse mackerel stock. Mean length (cm) in catch-at-age by quarter and area in 2019 (15 = 15+ group)**

Q1 cm	27.2.a	27.6.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.d.2	Total
0														13.5	13.5		13.5	13.5	13.5		13.5
1			18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	14.1	12.0	17.4	14.2	15.5	14.1	13.6	12.7
2	21.4	19.7	21.1	21.3	21.3	20.6	21.3	21.3	21.0	21.3	21.3	21.3	21.3	18.9	16.7	18.5	19.3	21.6	18.9	17.7	19.2
3	24.4	22.3	22.6	22.6	22.6	22.4	22.6	22.6	22.5	22.6	22.6	22.6	22.6	22.9	22.0	21.4	22.7	23.7	22.9	21.4	22.7
4	26.5	25.8	25.6	24.8	24.8	24.1	24.8	24.8	24.3	24.8	24.8	24.8	24.8	24.5	24.2	24.0	24.6	25.0	24.5	22.3	24.9
5	27.0	26.7	27.0	27.4	27.4	27.1	27.4	27.4	27.2	27.4	27.4	27.4	27.4	26.6	26.7	25.1	26.6	26.7	26.6	27.5	26.7
6	29.4	29.2	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	29.9	27.8	27.9	29.5	28.1	27.5	27.8	27.5	29.2
7	31.3	31.2	31.4	31.4	31.4	31.4	31.4	31.4	31.4	32.4	31.4	31.4	31.4	28.8	28.8	29.5	29.1	28.8	28.8	27.5	31.1
8	33.0	32.8	32.9	33.0	33.0	33.0	33.0	33.0	33.0	34.2	33.0	33.0	33.0	30.2	30.1	29.5	30.2	30.0	30.2		32.2
9	32.9	32.6	32.6	32.7	32.7	32.7	32.7	32.7	32.7	31.6	32.7	32.7	32.7	31.2	31.0	29.5	31.2	31.1	31.2		32.1
10	33.1	32.7	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.8	33.9	33.9	33.9	32.5	32.3	29.5	32.2	32.5	32.5		33.0
11	33.5	33.4	33.3	33.3	33.3	33.3	33.3	33.3	33.3	34.2	33.3	33.3	33.3	33.5	33.4		33.2	33.4	33.5		33.4
12	34.6	34.1	34.4	34.2	34.2	34.2	34.2	34.2	34.2	34.4	34.2	34.2	34.2	34.5	34.6		34.6	34.2	34.5		34.2
13	35.7	35.5	35.5	35.6	35.6	35.6	35.6	35.6	35.6	36.0	35.6	35.6	35.6	35.6	35.5		35.5	35.9	35.6		35.6
14	35.7	35.2	32.6	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	36.5	36.5		36.6	36.6	36.5		35.6
15	35.5	34.9	35.2	35.2	35.2	35.2	35.2	35.2	35.2	34.2	35.2	35.2	35.2	38.6	38.4		38.2	39.7	38.6		35.2

Q2 cm	27.2.a	27.6.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.h	27.7.j	27.7.j.2	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.e	Total
0												13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4
1			20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5	15.3	14.3	17.7	13.9	14.7	15.3	15.3	14.1
2	17.7	17.7	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	20.2	18.6	19.8	16.8	20.1	20.2	20.2	18.8
3	21.8	21.8	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.5	23.2	23.0	22.1	22.8	23.5	23.5	22.9
4	25.6	25.6	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	25.2	24.9	24.9	25.0	24.2	25.2	25.2	25.3
5	26.7	26.7	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.8	27.5	27.5	27.0	26.8	26.6	26.8	26.3	27.0	27.1
6	29.4	29.4	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2	28.2	28.1	27.7	28.1	27.4	28.3	28.3	28.4
7	31.3	31.3	31.6	31.6	31.6	31.6	31.6	31.6	31.4	31.6	31.6	29.1	28.9	28.3	28.9	28.7	29.2	29.2	29.9
8	33.2	33.2	33.0	33.0	33.0	33.0	33.0	33.0	33.1	33.0	33.0	30.4	30.1	29.7	29.9	30.2	30.4	30.4	30.5
9	33.4	33.4	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	31.2	31.0	30.3	30.8	31.0	31.2	31.2	31.3
10	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5	32.3	32.1	31.8	32.2	32.3	32.3	32.3	32.7
11	33.7	33.7	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.3	33.4	33.1	33.5	33.3	33.3	33.3	33.5
12	34.8	34.8	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	34.5	34.7	33.9	34.8	34.1	34.3	34.3	34.3
13	36.0	36.0	35.3	35.3	35.3	35.3	35.3	35.3	34.8	35.3	35.3	35.5	35.5	36.0	35.5	36.0	35.4	35.4	35.6
14	35.9	35.9	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	36.5	36.7	36.8	36.8	36.5	36.5	36.5	36.5
15	35.9	35.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	38.8	38.3	37.8	38.7	39.6	38.6	38.6	36.6

**Table 7.2.5.2 cont. Western horse mackerel stock. Mean length (cm) in catch-at-age by quarter and area in 2019 (15 = 15+ group)**

Q3 cm	27.2.a	27.3.a	27.4.a	27.6.a	27.7.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	Total
0					20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.2	20.5	20.2	20.2	20.2	13.5	13.4	13.4	13.4	13.4	13.4	13.4
1					21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	20.2	20.1	20.2	16.8	18.1	15.3	17.5
2	22.0	22.0	22.0	22.0	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	27.5	26.4	26.4	26.4	23.5	23.6	23.5	24.4	24.6	23.5	24.9
3	25.8	25.8	25.8	26.1	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	28.0	27.9	27.9	27.9	25.3	25.4	25.3	25.7	26.1	25.3	27.4
4	27.6	27.6	27.6	27.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.4	28.7	28.4	28.4	28.4	27.1	27.4	27.1	27.0	27.5	27.1	28.3
5	28.6	28.6	30.9	28.0	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.2	30.3	30.2	30.2	30.2	28.4	28.5	28.4	28.4	28.6	28.4	29.4
6	30.7	30.7	33.4	29.4	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.9	31.5	31.5	31.5	29.2	29.3	29.2	29.2	29.3	29.2	30.5
7	31.9	31.9	33.9	31.1	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.6	33.5	33.6	33.6	33.6	30.4	30.4	30.4	30.6	30.5	30.4	31.3
8	34.1	34.1	34.5	34.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	31.2	31.1	31.2	31.3	31.2	31.2	32.2
9	34.7	34.7	34.9	35.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	32.3	32.3	32.3	32.5	32.2	32.3	33.2
10	35.0	35.0	35.3	34.8	33.7	33.7	33.7	33.7	33.7	33.7	33.7	33.7	34.0	33.7	33.7	33.7	33.3	33.4	33.3	33.6	33.2	33.3	34.1
11	34.5	34.5	35.7	34.2	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.8	32.7	32.7	32.7	34.4	34.3	34.4	34.6	34.0	34.4	34.3
12	35.9	35.9	36.0	35.9	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	35.4	35.2	35.4	35.5	35.2	35.4	35.7
13	36.2	36.2	36.3	36.2	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	36.4	36.3	36.4	36.4	36.3	36.4	36.4
14	36.5	36.5	36.6	36.0	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	34.4	38.5	38.0	38.5	38.7	38.3	38.5	36.8
15	37.2	37.2	37.4	36.5																			

Q4 cm	27.2.a	27.3.a	27.4.a	27.6.a	27.7.b	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	Total
0												10.5	10.6	12.2	13.4	13.4	10.6
1					18.5	20.2	20.2	20.2	20.2	20.2	20.2	17.2	16.2	16.6	17.7	20.7	17.3
2	21.4	21.4	21.4	21.9	21.9	21.3	21.3	21.3	21.3	21.3	21.3	22.6	20.2	20.1	22.1	22.4	22.0
3	24.5	24.5	24.5	25.6	24.9	23.4	23.4	23.4	23.4	23.4	23.4	24.4	24.3		24.4	24.5	24.3
4	26.5	26.5	26.5	27.4	26.7	27.2	27.2	27.2	27.2	27.2	27.2	25.8	25.8		26.0	26.2	26.8
5	27.0	27.0	30.2	28.0	28.1	27.7	27.7	27.7	27.7	27.7	27.7	27.3	27.4		27.5	27.5	27.9
6	29.6	29.6	33.5	29.8	29.8	30.1	30.1	30.1	30.1	30.1	30.1	28.4	28.5		28.6	28.3	29.3
7	31.4	31.4	34.0	31.4	30.9	31.5	31.5	31.5	31.5	31.5	31.5	29.3	29.3		29.4	29.0	30.8
8	33.3	33.3	34.6	33.0	33.8	33.1	33.1	33.1	33.1	33.1	33.1	30.4	30.5		30.5	30.4	31.8
9	33.5	33.5	35.0	33.1	35.0	33.7	33.7	33.7	33.7	33.7	33.7	31.2	31.2		31.3	31.2	32.1
10	33.7	33.7	35.4	33.2	33.5	33.5	33.5	33.5	33.5	33.5	33.5	32.3	32.5		32.4	32.0	33.3
11	33.7	33.7	35.7	33.3	32.4	33.5	33.5	33.5	33.5	33.5	33.5	33.3	33.5		33.6	33.2	33.6
12	35.0	35.0	36.1	35.0	32.3	33.6	33.6	33.6	33.6	33.6	33.6	34.3	34.4		34.6	34.3	34.7
13	36.0	36.0	36.4	35.5	35.3	35.3	35.3	35.3	35.3	35.3	35.3	35.4	35.3		35.5	35.4	35.7
14	36.1	36.1	36.7	35.8	36.5	34.7	34.7	34.7	34.7	34.7	34.7	36.4	36.3		36.4	36.2	36.3
15	36.2	36.2	37.5	35.8	35.0	34.9	34.9	34.9	34.9	34.9	34.9	38.5	38.1		38.6	38.5	36.7

**Table 7.2.5.2 cont. Western horse mackerel stock. Mean length (cm) in catch-at-age by quarter and area in 2019 (15 = 15+ group)**

all Q cm	27.2.a	27.3.a	27.4.a	27.6.a	27.7.a	27.7.b	27.7.c	27.7.c.2	27.7.e	27.7.f	27.7.g	27.7.h	27.7.j	27.7.j.2	27.7.k	27.7.k.2	27.8.a	27.8.b	27.8.c	27.8.c.e	27.8.c.w	27.8.d	27.8.d.2	27.8.e	Total
0					20.2	19.4	19.9	19.3	19.3	20.2	20.2	19.1	20.5	20.3	18.6	19.2	10.6	10.6	12.2	13.4	13.4	13.4	13.4	13.4	10.7
1					20.9	21.6	21.8	21.3	20.7	21.3	21.3	20.9	21.7	21.4	21.3	21.3	14.6	13.8	16.7	14.1	17.4	14.3	13.6	15.3	14.9
2	20.9	21.6	21.8	21.4	21.9	21.8	21.5	21.3	20.7	21.3	21.3	20.9	21.7	21.4	21.3	21.3	19.4	17.6	19.5	17.5	21.6	19.1	17.7	20.2	20.4
3	23.9	24.9	25.4	24.6	26.4	24.4	23.5	22.8	22.4	23.4	23.4	22.5	26.9	23.8	22.7	22.8	23.2	23.0	22.9	23.4	23.7	23.0	21.4	23.5	23.5
4	26.2	26.7	27.2	26.5	27.9	27.1	27.1	25.8	24.7	27.2	27.2	24.7	28.0	27.5	24.9	25.5	24.9	25.0	24.8	25.3	25.4	24.6	22.3	25.2	26.4
5	26.9	27.2	29.9	27.0	28.4	27.6	27.8	27.5	27.1	27.7	27.7	27.2	28.6	27.9	27.4	27.5	26.8	26.9	26.6	26.9	27.2	26.7	27.5	27.0	27.2
6	29.4	29.7	33.3	29.4	30.2	29.9	30.1	29.9	29.9	30.1	30.1	29.9	30.3	30.2	29.9	29.9	28.0	28.2	27.8	28.2	28.3	27.9	27.5	28.3	29.2
7	31.3	31.4	33.9	31.3	31.5	31.4	31.4	31.4	31.4	31.5	31.5	31.4	31.9	31.5	31.4	31.4	29.0	29.1	28.4	29.1	29.1	28.9	27.5	29.2	30.9
8	33.1	33.4	34.5	32.9	33.6	33.0	33.2	33.1	33.1	33.1	33.1	33.0	33.5	33.2	33.0	33.1	30.3	30.3	29.7	30.3	30.4	30.2		30.4	31.6
9	33.2	33.7	34.9	33.1	35.0	33.2	33.8	33.0	32.9	33.8	33.8	32.9	34.5	34.1	32.8	32.9	31.2	31.1	30.3	31.2	31.2	31.2		31.2	32.1
10	33.4	33.9	35.3	32.9	33.3	33.7	33.5	33.7	33.8	33.5	33.5	33.8	33.3	33.4	33.9	33.8	32.4	32.3	31.7	32.4	32.2	32.4		32.3	33.1
11	33.6	33.9	35.7	33.4	33.7	33.3	33.4	33.3	33.3	33.5	33.5	33.3	34.0	33.6	33.3	33.3	33.4	33.4	33.1	33.5	33.2	33.4		33.3	33.6
12	34.8	35.2	36.0	34.4	32.7	34.0	33.6	34.0	34.1	33.6	33.6	34.1	32.9	33.4	34.2	34.1	34.5	34.5	33.9	34.6	34.1	34.5		34.3	34.4
13	35.9	36.0	36.4	35.5	34.5	35.4	35.3	35.5	35.5	35.3	35.3	35.5	35.0	35.2	35.6	35.5	35.5	35.3	36.0	35.5	35.5	35.5		35.4	35.7
14	35.9	36.2	36.6	35.5	35.7	34.1	34.9	34.1	33.9	34.7	34.7	33.8	35.5	34.9	33.8	34.0	36.5	36.5	36.8	36.5	36.4	36.5		36.5	36.1
15	35.8	36.4	37.4	35.2	34.4	35.1	34.9	35.1	35.1	34.9	34.9	35.1	34.4	34.8	35.2	35.1	38.6	38.2	37.8	38.6	38.9	38.6		38.6	36.1

**Table 7.2.5.3. Western horse mackerel. Catch weights-at-age (kg), from Q1 and Q2 data.**

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1982	0.024	0.052	0.066	0.080	0.207	0.232	0.269	0.280	0.292	0.305	0.369	0.348	0.348	0.348	0.356	0.366
1983	0.024	0.052	0.066	0.080	0.171	0.227	0.257	0.276	0.270	0.243	0.390	0.348	0.348	0.348	0.356	0.366
1984	0.024	0.052	0.064	0.077	0.122	0.155	0.201	0.223	0.253	0.246	0.338	0.348	0.348	0.348	0.356	0.366
1985	0.024	0.052	0.066	0.081	0.148	0.140	0.193	0.236	0.242	0.289	0.247	0.241	0.251	0.314	0.346	0.321
1986	0.024	0.052	0.066	0.080	0.105	0.134	0.169	0.195	0.242	0.292	0.262	0.319	0.287	0.345	0.260	0.360
1987	0.024	0.052	0.066	0.080	0.105	0.126	0.150	0.171	0.218	0.254	0.281	0.336	0.244	0.328	0.245	0.373
1988	0.024	0.052	0.066	0.080	0.105	0.126	0.141	0.143	0.217	0.274	0.305	0.434	0.404	0.331	0.392	0.424
1989	0.024	0.052	0.066	0.080	0.105	0.103	0.131	0.159	0.127	0.210	0.252	0.381	0.400	0.421	0.448	0.516
1990	0.024	0.052	0.066	0.080	0.105	0.127	0.135	0.124	0.154	0.174	0.282	0.328	0.355	0.399	0.388	0.379
1991	0.024	0.052	0.066	0.080	0.121	0.137	0.143	0.144	0.150	0.182	0.189	0.303	0.323	0.354	0.365	0.330
1992	0.024	0.052	0.066	0.080	0.105	0.133	0.151	0.150	0.158	0.160	0.182	0.288	0.306	0.359	0.393	0.401

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1993	0.024	0.052	0.066	0.080	0.105	0.153	0.166	0.173	0.172	0.170	0.206	0.238	0.308	0.327	0.376	0.421
1994	0.024	0.052	0.066	0.080	0.105	0.147	0.185	0.169	0.191	0.191	0.190	0.275	0.240	0.326	0.342	0.383
1995	0.024	0.052	0.059	0.066	0.119	0.096	0.152	0.166	0.178	0.187	0.197	0.222	0.215	0.246	0.237	0.298
1996	0.024	0.052	0.073	0.095	0.118	0.129	0.148	0.172	0.183	0.185	0.202	0.224	0.233	0.229	0.280	0.332
1997	0.024	0.052	0.066	0.080	0.112	0.124	0.162	0.169	0.184	0.188	0.208	0.241	0.229	0.268	0.286	0.266
1998	0.024	0.052	0.071	0.090	0.108	0.129	0.142	0.151	0.162	0.174	0.191	0.220	0.229	0.268	0.286	0.271
1999	0.024	0.052	0.081	0.110	0.120	0.130	0.160	0.170	0.180	0.190	0.210	0.241	0.233	0.268	0.286	0.274
2000	0.024	0.052	0.102	0.115	0.128	0.158	0.169	0.181	0.208	0.224	0.225	0.227	0.247	0.247	0.272	0.378
2001	0.020	0.048	0.077	0.109	0.133	0.160	0.169	0.176	0.187	0.205	0.220	0.241	0.265	0.244	0.266	0.308
2002	0.020	0.039	0.067	0.133	0.152	0.164	0.175	0.194	0.202	0.222	0.242	0.275	0.299	0.307	0.306	0.329
2003	0.022	0.060	0.089	0.114	0.142	0.160	0.175	0.178	0.194	0.205	0.226	0.249	0.267	0.286	0.278	0.317
2004	0.036	0.064	0.100	0.120	0.148	0.168	0.186	0.201	0.219	0.209	0.221	0.233	0.262	0.260	0.322	0.303
2005	0.023	0.053	0.071	0.114	0.136	0.158	0.184	0.196	0.197	0.202	0.222	0.230	0.247	0.281	0.268	0.344
2006	0.019	0.038	0.078	0.114	0.141	0.154	0.180	0.199	0.212	0.222	0.235	0.229	0.235	0.248	0.253	0.304
2007	0.024	0.048	0.067	0.092	0.130	0.150	0.163	0.186	0.210	0.233	0.248	0.256	0.264	0.286	0.310	0.347
2008	0.031	0.051	0.082	0.116	0.144	0.164	0.176	0.190	0.240	0.251	0.251	0.281	0.279	0.289	0.293	0.352
2009	0.025	0.047	0.070	0.107	0.156	0.177	0.187	0.203	0.225	0.252	0.270	0.292	0.306	0.322	0.316	0.370
2010	0.026	0.048	0.087	0.118	0.151	0.178	0.201	0.212	0.229	0.248	0.274	0.305	0.312	0.335	0.329	0.376



Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2011	0.028	0.051	0.079	0.112	0.151	0.172	0.192	0.211	0.223	0.243	0.261	0.288	0.305	0.324	0.329	0.330
2012	0.044	0.060	0.087	0.118	0.151	0.175	0.198	0.213	0.232	0.256	0.266	0.286	0.312	0.307	0.347	0.357
2013	0.040	0.058	0.102	0.130	0.154	0.172	0.195	0.228	0.243	0.249	0.248	0.288	0.288	0.321	0.348	0.355
2014	0.032	0.053	0.094	0.127	0.143	0.180	0.201	0.224	0.247	0.259	0.273	0.278	0.289	0.311	0.304	0.353
2015	0.021	0.082	0.083	0.137	0.144	0.176	0.200	0.219	0.235	0.256	0.279	0.285	0.297	0.313	0.312	0.348
2016	0.016	0.055	0.096	0.133	0.164	0.192	0.200	0.225	0.249	0.254	0.306	0.295	0.310	0.335	0.337	0.339
2017	0.016	0.039	0.077	0.098	0.124	0.173	0.199	0.216	0.249	0.266	0.286	0.307	0.333	0.334	0.337	0.370
2018	0.013	0.028	0.074	0.092	0.113	0.161	0.207	0.236	0.231	0.270	0.282	0.295	0.336	0.339	0.327	0.358
2019	0.011	0.032	0.074	0.108	0.156	0.159	0.205	0.237	0.268	0.277	0.304	0.309	0.346	0.386	0.400	0.402

Table 7.2.6.1. Western horse mackerel. Maturity-at-age.

	0	1	2	3	4	5	6	7	8	9	10	11+
1982	0	0	0.4	0.8	1	1	1	1	1	1	1	1
1983	0	0	0.3	0.7	1	1	1	1	1	1	1	1
1984	0	0	0.1	0.6	0.85	1	1	1	1	1	1	1
1985	0	0	0.1	0.4	0.8	0.95	1	1	1	1	1	1
1986	0	0	0.1	0.4	0.6	0.9	1	1	1	1	1	1
1987	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1988	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1989	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1990	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1991	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1992	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1993	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1994	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1995	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1996	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1997	0	0	0.1	0.4	0.6	0.8	1	1	1	1	1	1
1998	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
1999	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2000	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2001	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2002	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2003	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2004	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2005	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2006	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2007	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2008	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2009	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2010	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2011	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2012	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2013	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2014	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2015	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2016	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2017	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2018	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1
2019	0	0	0.05	0.25	0.7	0.95	1	1	1	1	1	1

**Table 7.2.8.1. Western horse mackerel. Potential fecundity (10<sup>6</sup> eggs) per kg spawning female vs. weight in kg.**

	1987		1992		1995		1998		2000		2001		2001 (cont)	
	w	pfec.	w	pfec.	w	pfec.	w	pfec.	w	pfec.	w	pfec.	w	pfec.
1	0.168	1.524	0.105	1.317	0.13	1.307	0.172	1.318	0.258	0.841	0.086	0.688	0.165	1.382
2	0.179	0.916	0.109	2.056	0.157	1.246	0.104	0.867	0.268	0.747	0.08	0.812	0.166	1.579
3	0.192	2.083	0.11	1.869	0.168	1.699	0.112	1.312	0.304	1.188	0.081	0.535	0.167	1.479
4	0.233	1.644	0.112	1.772	0.179	1.135	0.206	0.382	0.311	1.411	0.095	0.88	0.113	0.527
5	0.213	1.066	0.115	1.188	0.189	1.529	0.207	0.78	0.337	0.613	0.11	1.164	0.14	0.876
6	0.217	2.392	0.119	1.317	0.168	1.1	0.109	1.133	0.339	1.571	0.113	1.106	0.122	0.589
7	0.277	1.617	0.12	1.413	0.209	1.497	0.132	1.02	0.341	1.522	0.095	0.823	0.12	0.68
8	0.279	1.018	0.123	1.293	0.215	1.524	0.2	1.088	0.355	1.056	0.11	0.883	0.121	0.578
9	0.274	1.62	0.123	1.991	0.218	1.616	0.152	1.417	0.357	0.604	0.108	0.823	0.139	0.723
10	0.3	1.513	0.131	1.617	0.226	1.883	0.149	1.004	0.367	1.15	0.097	0.741	0.144	1.213
11	0.32	1.647	0.135	0.793	0.22	1.324			0.393	1.279	0.101	0.853	0.144	1.265
12	0.273	1.956	0.131	1.039	0.236	1.221			0.393	0.668	0.106	1.133	0.171	0.956
13	0.212	2.83	0.136	1.06	0.261	1.21			0.413	0.694	0.107	0.935	0.121	0.607
14	0.268	1.687	0.138	1.489	0.245	1.445			0.421	1.339	0.107	0.494	0.122	0.689
15	0.32	1.088	0.147	1.214	0.306	1.693			0.423	0.798	0.11	0.85	0.139	0.915
16	0.318	1.208	0.151	1.158	0.314	1.312			0.445	1.03	0.111	0.67	0.153	0.943
17	0.343	1.933	0.16	1.349	0.46	1.575			0.446	1.208	0.103	0.632	0.154	0.709
18	0.378	1.429	0.165	1.359	0.449	1.43			0.152	0.643	0.111	0.547	0.156	0.773
19	0.404	1.849	0.165	0.945					0.165	0.579	0.118	0.88	0.162	1.158
20	0.428	2.236	0.167	1					0.175	0.596	0.107	0.944	0.174	1.389
21	0.398	1.538	0.168	1.545					0.179	0.997	0.104	0.724	0.175	1.426
22	0.431	1.223	0.18	1.299					0.19	0.744	0.111	0.86	0.179	1.248
23	0.432	1.465	0.174	1.487					0.197	0.613	0.11	0.728	0.179	1.236
24	0.421	1.843	0.178	1.594					0.203	0.702	0.111	0.544	0.18	2.353
25	0.481	1.757	0.185	1.475					0.219	0.472	0.129	0.935	0.184	2.255
26	0.494	1.611	0.195	1.41					0.223	0.806	0.114	0.901	0.139	0.931
27	0.54	1.754	0.203	1.937					0.227	0.606	0.114	0.557	0.161	1.037

	1987		1992		1995		1998		2000		2001		2001 (cont)	
28	0.564	2.255	0.205	1.534					0.289	1.273	0.151	1.377	0.162	0.893
29	0.585	1.221	0.213	1.577					0.294	1.395	0.153	1.596	0.169	0.691
30			0.222	0.958					0.3	1.305	0.154	1.699	0.18	1.609
31			0.275	2.444							0.103	0.679	0.185	1.776
32											0.12	1.14	0.211	2.102
33											0.12	0.631	0.224	1.466
34											0.121	0.834	0.162	0.849
35											0.144	0.626	0.17	0.668
36											0.116	0.668	0.187	1.453
37											0.118	1.194	0.198	1.371
38											0.112	0.779	0.219	1.847
39											0.126	0.782	0.22	1.578
40											0.139	1.244	0.201	0.878
41											0.119	1.212	0.206	1.196
42											0.109	0.755	0.223	1.115
43											0.122	0.841	0.225	1.43
44											0.131	0.929	0.233	1.724
45	8										0.135	0.862	0.241	1.131
46											0.142	1.834	0.219	0.96
47											0.146	1.689	0.237	1.33
48											0.148	1.357	0.241	0.918
49											0.151	1.817	0.34	0.605
50											0.164	1.631	0.407	1.189
51											0.164	1.052		

Table 7.3.1.1. Western horse mackerel. Final assessment. Numbers-at-age (thousands).

year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1982	49133200	1349300	2620060	5945940	1160810	1466530	1338810	823304	547967	491299	454429	515775	605038	740588	432484	285366	252509	223561	196418	172296	1248960
1983	1642070	42259700	1157570	2237150	5050480	981983	1237550	1128390	693530	461488	413724	382659	434308	509467	623602	364166	240288	212621	188245	165390	1196740
1984	1748540	1411980	36209700	985396	1890690	4244350	822447	1034740	942761	579257	385398	345489	319539	362664	425421	520725	304088	200646	177543	157189	1137410
1985	2258230	1503660	1210340	30855100	834183	1592390	3563700	689491	866876	789592	485088	322727	289301	267568	303677	356225	436027	254626	168010	148665	1084020
1986	2852830	1942280	1289860	1033190	26197100	705279	1342910	3001560	580406	729556	664449	408188	271561	243432	225143	255526	299741	366889	214252	141370	1037220
1987	6183440	2453260	1664780	1098920	874386	22055500	591916	1125290	2513420	485875	610658	556132	341638	227283	203739	188432	213860	250865	307063	179315	986407
1988	4287780	5316040	2100300	1414280	925615	731594	18379600	492276	935035	2087700	403514	507110	461815	283693	188732	169181	156470	177584	208312	254978	967985
1989	3615060	3685770	4548120	1781300	1187970	771676	607163	15219100	407218	773151	1725950	333568	419192	381743	234502	156006	139845	129337	146790	172190	1010890
1990	2109570	3107390	3152840	3855830	1495280	989554	639805	502238	12576200	336355	638495	1425230	275440	346136	315210	193631	128815	115470	106794	121205	976873
1991	3784560	1812390	2651720	2657270	3205400	1229800	808619	521136	408502	10222900	273347	518831	1158060	223801	281239	256110	157325	104662	93819	86770	892180
1992	8157360	3250710	1545060	2229410	2200020	2622240	998822	654382	421063	329838	8251980	220620	418728	934599	180613	226965	206684	126963	84463	75713	790017
1993	6960790	6999410	2757820	1283660	1809860	1754080	2068100	783485	512074	329164	257740	6447010	172349	327096	730061	141083	177289	161446	99174	65976	676239
1994	6146510	5967090	5912210	2266830	1023790	1409940	1347250	1577250	595664	388807	249790	195542	4890650	130735	248111	553760	107012	134474	122456	75223	562963
1995	4253020	5268510	5037810	4853900	1804390	795527	1079770	1024310	1195340	450825	294101	188898	147857	3697810	98845	187587	418671	80906	101668	92582	482492
1996	2255450	3638500	4408340	4046220	3725870	1337020	577053	774958	731710	852203	321146	209426	134490	105261	2632390	70364	133533	298027	57592	72371	409353
1997	1575040	1931140	3056070	3573830	3154200	2817120	992465	424424	567675	535083	622751	234605	152969	98227	76876	1922480	51387	97519	217648	42059	351798
1998	2816340	1345700	1606040	2418220	2676430	2262980	1969500	684948	291249	388621	365940	425708	160341	104536	67122	52531	1313640	35113	66634	148717	269116
1999	2783680	2411920	1131500	1305420	1893280	2035140	1690700	1458570	505290	214507	286025	269252	313183	117951	76896	49374	38640	966269	25828	49013	307338

year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2000	1952670	2383790	2027330	918962	1020680	1437110	1517440	1249430	1073640	371328	157527	209984	197642	229873	86571	56438	36237	28359	709168	18956	261533
2001	12198800	1674320	2015780	1670960	736249	799868	1111300	1165630	956946	821297	283905	120413	160494	151052	175680	66161	43131	27693	21673	541959	214353
2002	2542750	10450500	1409970	1644630	1316400	564411	603171	831164	868643	712043	610718	211053	89502	119286	112265	130566	49170	32055	20581	16107	562077
2003	1285310	2179180	8816420	1155460	1305160	1018850	430291	456388	626808	654159	535912	459532	158787	67334	89737	84454	98220	36989	24113	15482	434937
2004	2533740	1101620	1839170	7232100	918450	1012310	778632	326418	345088	473300	493669	404330	346663	119779	50791	67689	63703	74086	27900	18188	339741
2005	1634550	2173550	933559	1523890	5844890	728010	793062	606443	253578	267792	367118	382841	313529	268800	92873	39381	52483	49392	57443	21632	277517
2006	1332670	1401740	1839220	770716	1224210	4596670	565240	611819	466528	194843	205662	281882	293924	240698	206353	71296	30231	40289	37916	44096	229642
2007	2195570	1143460	1189010	1527450	625263	975220	3621710	442914	478252	364309	152087	160501	219965	229352	187815	161014	55631	23589	31436	29585	213588
2008	5132080	1884960	972618	994184	1253190	505474	781393	2889010	352616	380436	289697	120920	127602	174870	182329	149306	128000	44224	18752	24990	193311
2009	1300760	4403620	1599240	808179	807277	999475	398794	613156	2261590	275761	297391	226418	94499	99716	136652	142479	116673	100022	34558	14653	170585
2010	986262	1114820	3715760	1311180	641860	625443	762855	302119	462986	1705340	207815	224059	170566	71184	75112	102932	107320	87881	75339	26030	139524
2011	384303	844553	936927	3016760	1024600	486846	465945	563240	222182	339921	1251170	152423	164313	125075	52197	55076	75474	78691	64437	55241	121388
2012	2489660	329029	709222	759195	2349800	773881	360950	342267	412046	162262	248069	912795	111184	119848	91225	38070	40169	55045	57391	46995	128818
2013	1041060	2132060	276598	576175	593890	1784800	577447	266952	252144	303052	119258	182268	670580	81675	88036	67009	27964	29505	40432	42155	129139
2014	3689230	891128	1788570	223562	446919	446118	1315010	421366	193967	182880	219639	86404	132036	485734	59159	63765	48534	20254	21370	29284	124063
2015	2695410	3159110	748879	1451880	174652	338868	332219	970507	309744	142347	134117	161024	63337	96779	356017	43359	46735	35571	14844	15662	112389
2016	2885610	2310670	2668670	615696	1158390	136128	260423	253523	738314	235332	108090	101817	122230	48075	73456	270216	32909	35471	26998	11266	97187
2017	3829570	2473430	1950880	2191130	490151	900267	104270	198037	192174	558902	178045	81758	77003	92436	36355	55549	204339	24886	26823	20416	82012
2018	2880560	3285050	2095720	1615750	1769590	388161	704548	81121	153669	148956	433012	137913	63323	59638	71589	28156	43020	158249	19273	20773	79324

year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2019	1571340	2469710	2776720	1725540	1292280	1383650	299389	539729	61957	117218	113563	330049	105108	48258	45449	54555	21456	32783	120592	14687	76277

**Table 7.3.1.2. Western horse mackerel. Final assessment. Fishing mortality-at-age.**

[illegible]

year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1997	0.007	0.034	0.084	0.139	0.182	0.208	0.221	0.227	0.229	0.230	0.230	0.231	0.231	0.231	0.231	0.231	0.231	0.231	0.231	0.231	0.231
1998	0.005	0.023	0.057	0.095	0.124	0.142	0.150	0.154	0.156	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157	0.157
1999	0.005	0.024	0.058	0.096	0.126	0.144	0.152	0.156	0.158	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.159	0.159
2000	0.004	0.018	0.043	0.072	0.094	0.107	0.114	0.117	0.118	0.118	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119	0.119
2001	0.005	0.022	0.053	0.089	0.116	0.132	0.140	0.144	0.146	0.146	0.147	0.147	0.147	0.147	0.147	0.147	0.147	0.147	0.147	0.147	0.147
2002	0.004	0.020	0.049	0.081	0.106	0.121	0.129	0.132	0.134	0.134	0.134	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135	0.135
2003	0.004	0.020	0.048	0.080	0.104	0.119	0.126	0.130	0.131	0.131	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132	0.132
2004	0.003	0.016	0.038	0.063	0.082	0.094	0.100	0.103	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104	0.104
2005	0.004	0.017	0.042	0.069	0.090	0.103	0.109	0.112	0.113	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114	0.114
2006	0.003	0.015	0.036	0.059	0.077	0.088	0.094	0.096	0.097	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098
2007	0.003	0.012	0.029	0.048	0.063	0.072	0.076	0.078	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079	0.079
2008	0.003	0.014	0.035	0.058	0.076	0.087	0.092	0.095	0.096	0.096	0.096	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097
2009	0.004	0.020	0.049	0.080	0.105	0.120	0.128	0.131	0.132	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133
2010	0.005	0.024	0.058	0.097	0.126	0.144	0.153	0.157	0.159	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160	0.160
2011	0.005	0.025	0.060	0.100	0.131	0.149	0.158	0.163	0.164	0.165	0.165	0.165	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166
2012	0.005	0.024	0.058	0.096	0.125	0.143	0.152	0.156	0.157	0.158	0.158	0.158	0.158	0.158	0.158	0.159	0.159	0.159	0.159	0.159	0.159
2013	0.006	0.026	0.063	0.104	0.136	0.155	0.165	0.169	0.171	0.172	0.172	0.172	0.172	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173
2014	0.005	0.024	0.059	0.097	0.127	0.145	0.154	0.158	0.159	0.160	0.160	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161	0.161



[illegible]

Table 7.3.1.3. Western horse mackerel. Final assessment. Stock summary table.

Year	Recruit (thousands)	Total Bio-mass	Spawning bio-mass	Catch	Yield/SSB	Fbar(1-3)	Fbar(4-8)	Fbar(1-10)
1982	49133200	3217300	2623180	61197	0.023	0.008	0.020	0.017
1983	1642070	3687170	2739660	90442	0.033	0.011	0.028	0.023
1984	1748540	4343350	2850000	96244	0.034	0.010	0.025	0.021
1985	2258230	4966940	3277190	96343	0.029	0.008	0.021	0.018
1986	2852830	5416610	4535850	137499	0.030	0.010	0.026	0.022
1987	6183440	5621800	5279930	187338	0.035	0.013	0.033	0.028
1988	4287780	5617750	5324630	210989	0.040	0.015	0.037	0.031
1989	3615060	5480700	5114970	209583	0.041	0.015	0.038	0.032
1990	2109570	5267270	4851740	275968	0.057	0.021	0.053	0.045
1991	3784560	4932030	4561780	287438	0.063	0.024	0.060	0.050
1992	8157360	4569850	4248040	393631	0.093	0.036	0.090	0.075
1993	6960790	4148240	3792300	453246	0.120	0.047	0.117	0.098
1994	6146510	3749390	3269610	412291	0.126	0.048	0.120	0.100
1995	4253020	3465180	2883260	538950	0.187	0.071	0.175	0.147
1996	2255450	3094560	2549950	422396	0.166	0.061	0.152	0.127
1997	1575040	2829030	2391820	534673	0.224	0.086	0.213	0.178
1998	2816340	2418860	2115690	325340	0.154	0.058	0.145	0.121
1999	2783680	2182890	1961890	298992	0.152	0.059	0.147	0.123
2000	1952670	1956680	1753740	202732	0.116	0.044	0.110	0.092
2001	12198800	1842980	1598450	229081	0.143	0.055	0.136	0.113
2002	2542750	1778730	1437080	196120	0.136	0.050	0.124	0.104
2003	1285310	1800060	1335770	191856	0.144	0.049	0.122	0.102
2004	2533740	1824200	1329740	159742	0.120	0.039	0.096	0.081
2005	1634550	1844520	1524910	182001	0.119	0.043	0.106	0.088
2006	1332670	1796470	1599100	155827	0.097	0.036	0.091	0.076
2007	2195570	1730840	1557620	123356	0.079	0.030	0.073	0.061
2008	5132080	1677390	1508820	143349	0.095	0.036	0.089	0.075

Year	Recruit (thousands)	Total Bio-mass	Spawning bio-mass	Catch	Yield/SSB	Fbar(1-3)	Fbar(4-8)	Fbar(1-10)
2009	1300760	1613210	1413300	183782	0.130	0.050	0.123	0.103
2010	986262	1515440	1268900	203112	0.160	0.060	0.148	0.124
2011	384303	1387390	1152140	193698	0.168	0.062	0.153	0.128
2012	2489660	1248410	1100250	169859	0.154	0.059	0.146	0.123
2013	1041060	1121980	1018290	165258	0.162	0.064	0.159	0.133
2014	3689230	1002900	885328	136360	0.154	0.060	0.149	0.124
2015	2695410	934449	770242	98419	0.128	0.047	0.116	0.097
2016	2885610	932424	726361	98810	0.136	0.048	0.120	0.100
2017	3829570	958281	707114	82961	0.117	0.039	0.098	0.082
2018	2880560	1025340	755274	101682	0.135	0.045	0.112	0.094
2019	1571340	1086810	808972	124947	0.154	0.052	0.130	0.109

**Table 7.4.1. Western Horse Mackerel. Short term prediction: INPUT DATA. \*geometric mean of the recruitment time series from 1983 to 2019. \*\* from assessment output**

Age	N	Mat	M	PF	PM	Stock weight at age**
0	2584096*	0.000	0.150	0	0	0.002626
1	1346400	0.000	0.150	0	0	0.015047
2	2081580	0.047	0.150	0	0	0.038697
3	2270280	0.269	0.150	0	0	0.069972
4	1364160	0.731	0.150	0	0	0.104589
5	995214	0.953	0.150	0	0	0.139179
6	1048870	0.993	0.150	0	0	0.171573
7	225167	0.999	0.150	0	0	0.200615
8	404512	1.000	0.150	0	0	0.225865
9	46367	1.000	0.150	0	0	0.247334
10	87670	1.000	0.150	0	0	0.265292
11	84913	1.000	0.150	0	0	0.280128
12	246752	1.000	0.150	0	0	0.292271
13	78577	1.000	0.150	0	0	0.302138
14	36076	1.000	0.150	0	0	0.310111

Age	N	Mat	M	PF	PM	Stock weight at age**
15	33974	1.000	0.150	0	0	0.316525
16	40781	1.000	0.150	0	0	0.321669
17	16039	1.000	0.150	0	0	0.325782
18	24506	1.000	0.150	0	0	0.329066
19	90145	1.000	0.150	0	0	0.331681
20	67996	1.000	0.150	0	0	0.335422

Table 7.4.2. Western Horse Mackerel. Short term prediction; single area management option table. OPTION: Catch constraint 110 381 t (85% of 2020 TOTAL TAC).

Scenarios	F <sub>factor</sub>	F <sub>bar</sub>	Catch_2020	Catch_2021	SSB_2021	SSB_2022	Change_SSB_2021-2022(%)	Change_Catch_2020-2021(%)
B2022=B <sub>pa</sub>	cannot be reached even by setting F to 0							
F = 0	0.00	0.000	69527	0	961512	1112225	15.67	-100.00
	0.10	0.011	69527	14971	961512	1098482	14.25	-78.47
	0.20	0.022	69527	29761	961512	1084914	12.83	-57.20
	0.30	0.033	69527	44372	961512	1071518	11.44	-36.18
	0.40	0.044	69527	58808	961512	1058291	10.07	-15.42
	0.50	0.054	69527	73069	961512	1045233	8.71	5.10
F <sub>sq</sub>	0.52	0.056	69527	75352	961512	1043144	8.49	8.38
						1032341		
	0.6	0.065	69527	87159	961512		7.37	25.36
F <sub>MSY</sub>	0.68	0.074	69527	98167	961512	1022274	6.32	41.19
	0.7	0.076	69527	101080	961512	1019611	6.04	45.38
	0.80	0.087	69527	114832	961512	1007044	4.74	65.16
	0.90	0.098	69527	128420	961512	994635	3.44	84.71
F <sub>lim</sub>	0.95	0.103	69527	134489	961512	989095	2.87	93.44
	1	0.109	69527	141844	961512	982384	2.17	104.01
	1.10	0.120	69527	155107	961512	970288	0.91	123.09
	1.20	0.131	69527	168211	961512	958345	-0.33	141.94

Scenarios	F <sub>factor</sub>	F <sub>bar</sub>	Catch_2020	Catch_2021	SSB_2021	SSB_2022	Change_SSB_2021-2022(%)	Change_Catch_2020-2021(%)
	1.30	0.142	69527	181158	961512	946554	-1.56	160.56
	1.40	0.153	69527	193950	961512	934912	-2.77	178.96
	1.50	0.163	69527	206589	961512	923417	-3.96	197.14
	1.60	0.174	69527	219076	961512	912068	-5.14	215.10
	1.70	0.185	69527	231414	961512	900862	-6.31	232.84
	1.80	0.196	69527	243604	961512	889798	-7.46	250.38
	1.90	0.207	69527	255649	961512	878874	-8.59	267.70
	2.00	0.218	69527	267550	961512	868088	-9.72	284.82
B2022=B <sub>lim</sub>	2.32	0.253	69527	304688	961512	834480	-13.21	338.23

7.15 Figures

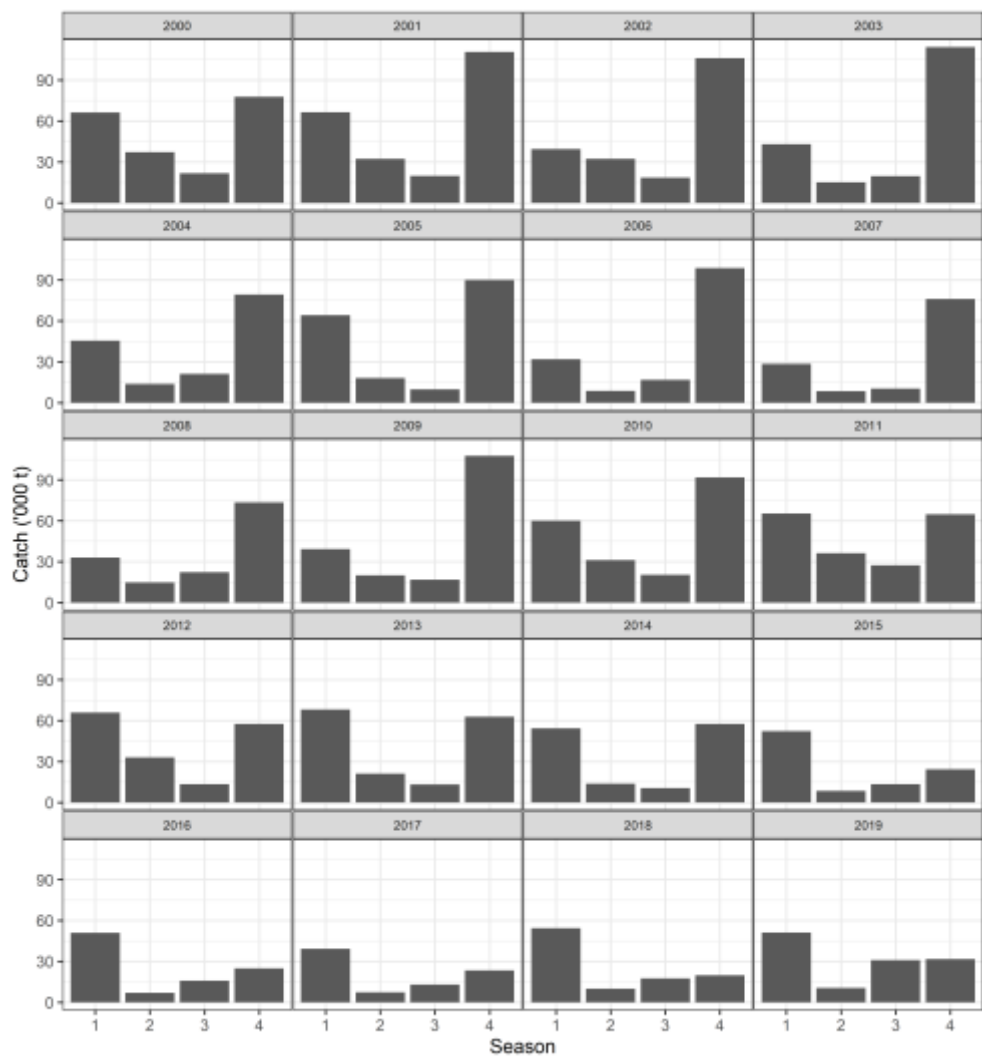


Figure 7.1.1.1: Western horse mackerel. Catch by quarter and year for 2000-2019.

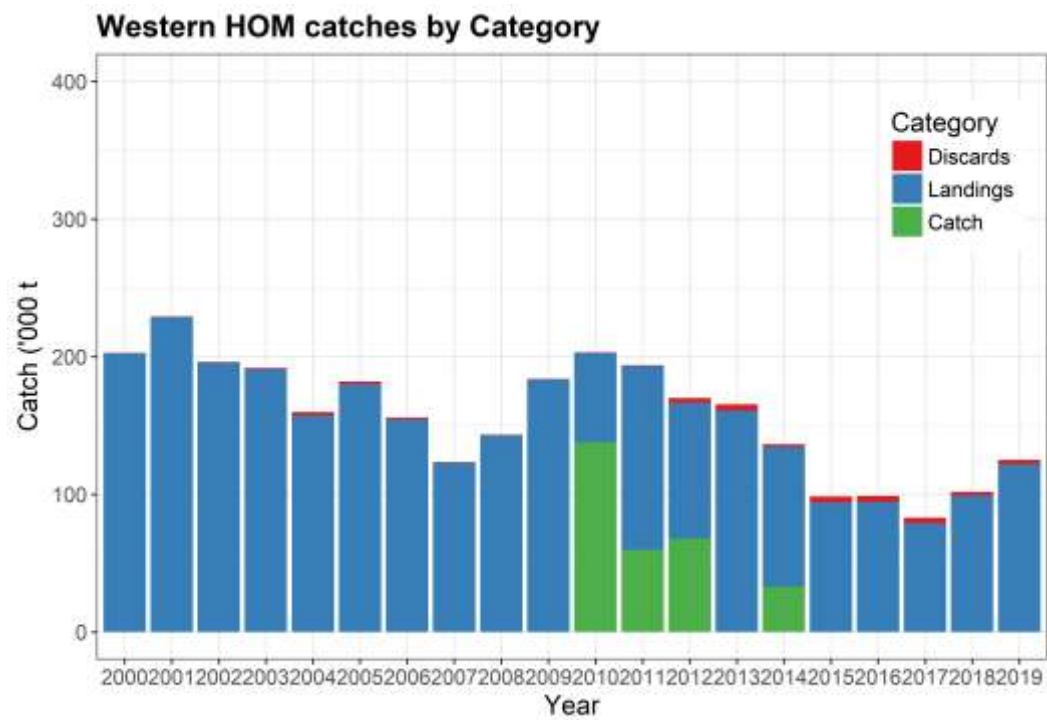


Figure 7.1.2.1. Western horse mackerel. Catch categories since 2000.



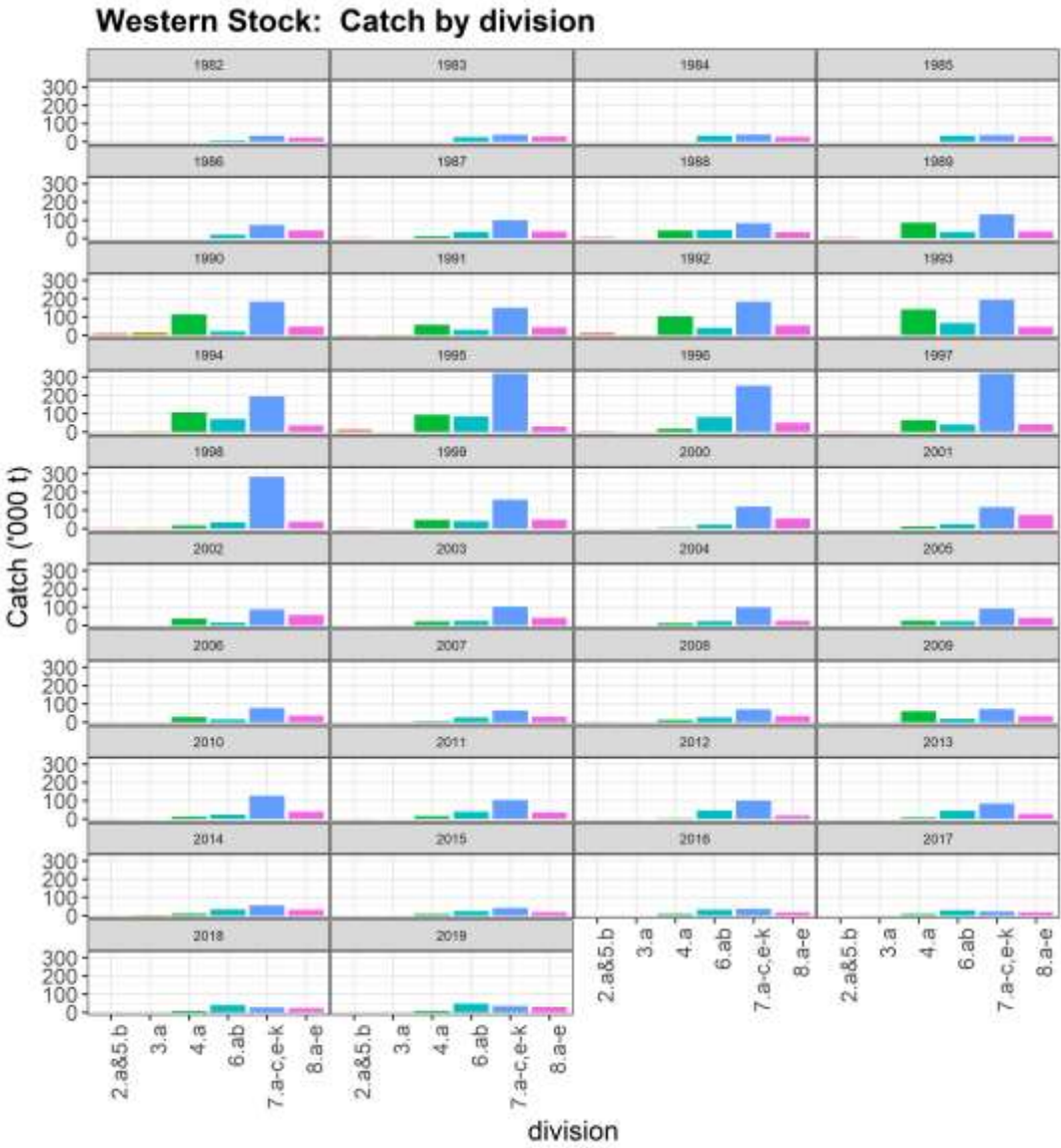


Figure 7.1.3.1: Western horse mackerel. Catch by ICES Division and year for 1982-2019.

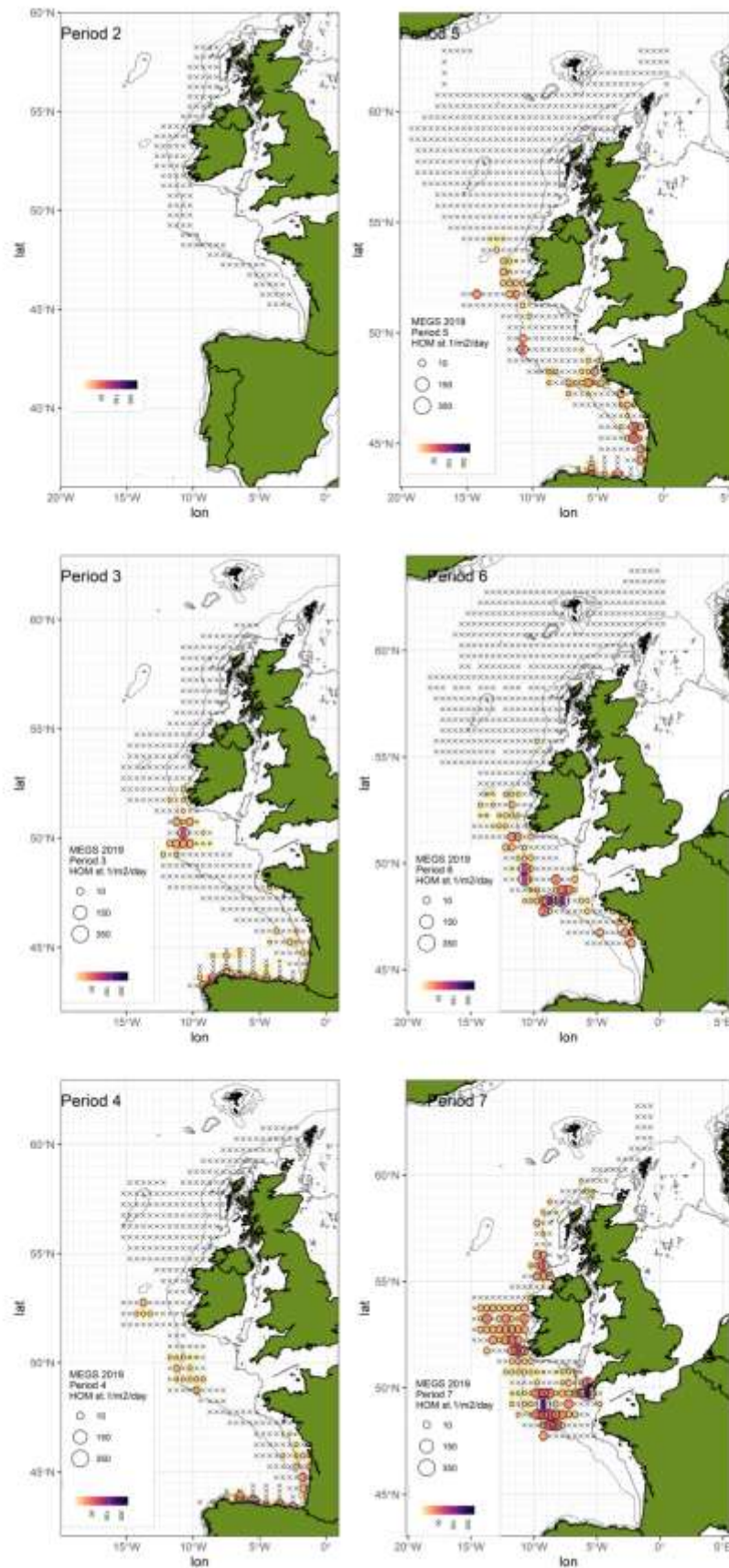


Figure 7.2.1.1: Western horse mackerel egg production by half rectangle for all periods. Circle areas and colour scale represent horse mackerel stage I eggs/m<sup>2</sup>/day by half rectangle. Crosses represent zero values.

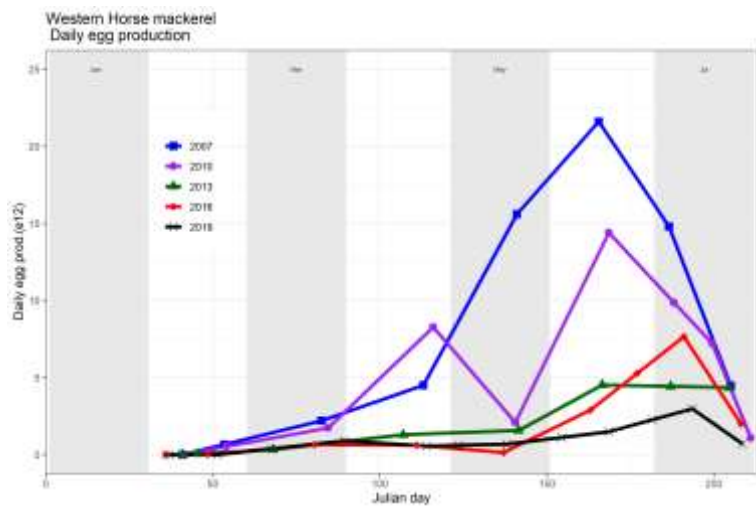


Figure 7.2.1.2: Annual egg production curve for western horse mackerel for 2019 (black line). The curves for 2007, 2010, 2013, and 2016 are included for comparison. Production in numbers exponential 12.

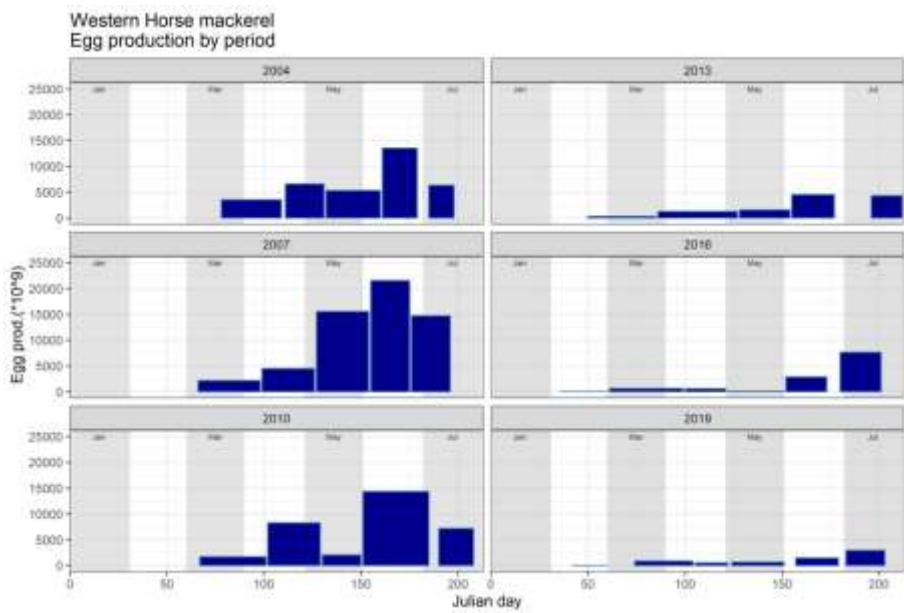


Figure 7.2.1.3: Western horse mackerel egg production by period. Bar area represents its value. Months of January, March, May and July are highlighted in grey background.

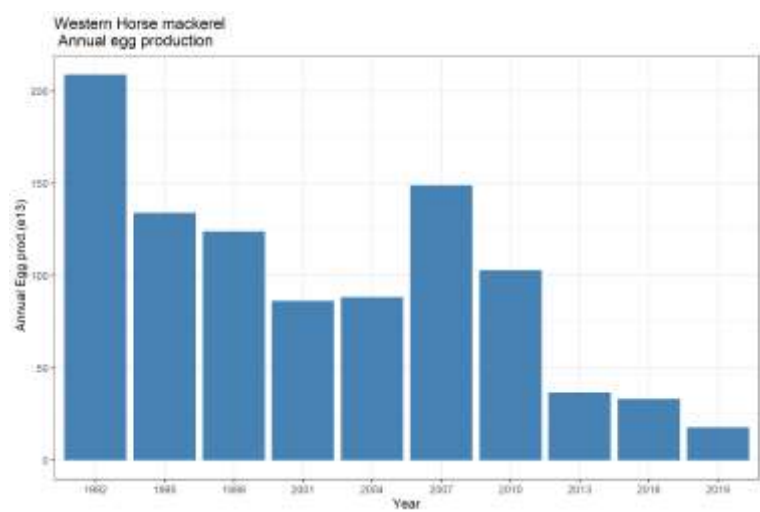
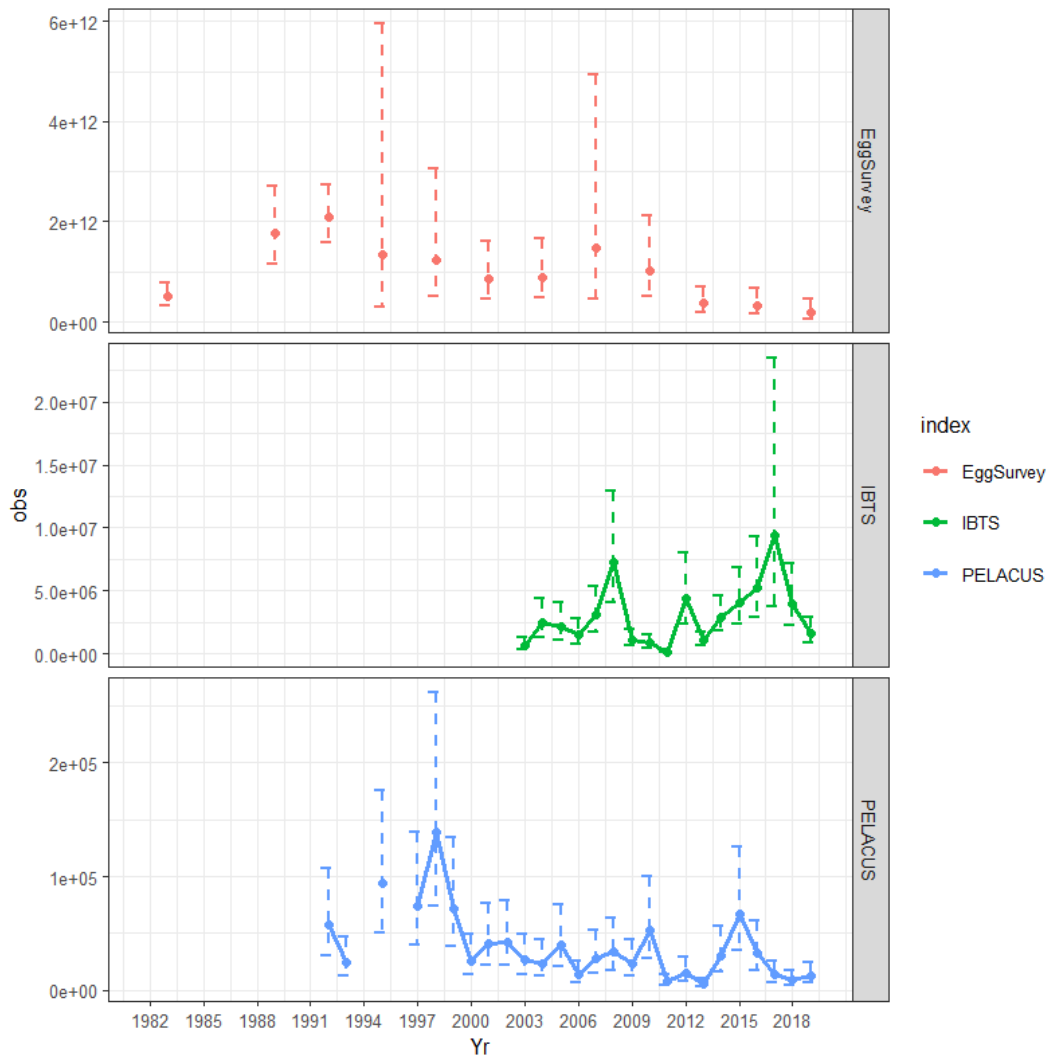


Figure 7.2.1.4. Total Annual Egg Production estimates for western horse mackerel stock. 1992–2019.



**Figure 7.2.2.1: Western horse mackerel. Trend of the fisheries independent indices of abundance used in the assessment of Western Horse mackerel -- Plot on top: Spawning index from egg survey; plot in the middle: recruitment index from IBTS survey; plot at the bottom: biomass estimates from Pelacus acoustic survey. Confidence intervals are shown as well.**

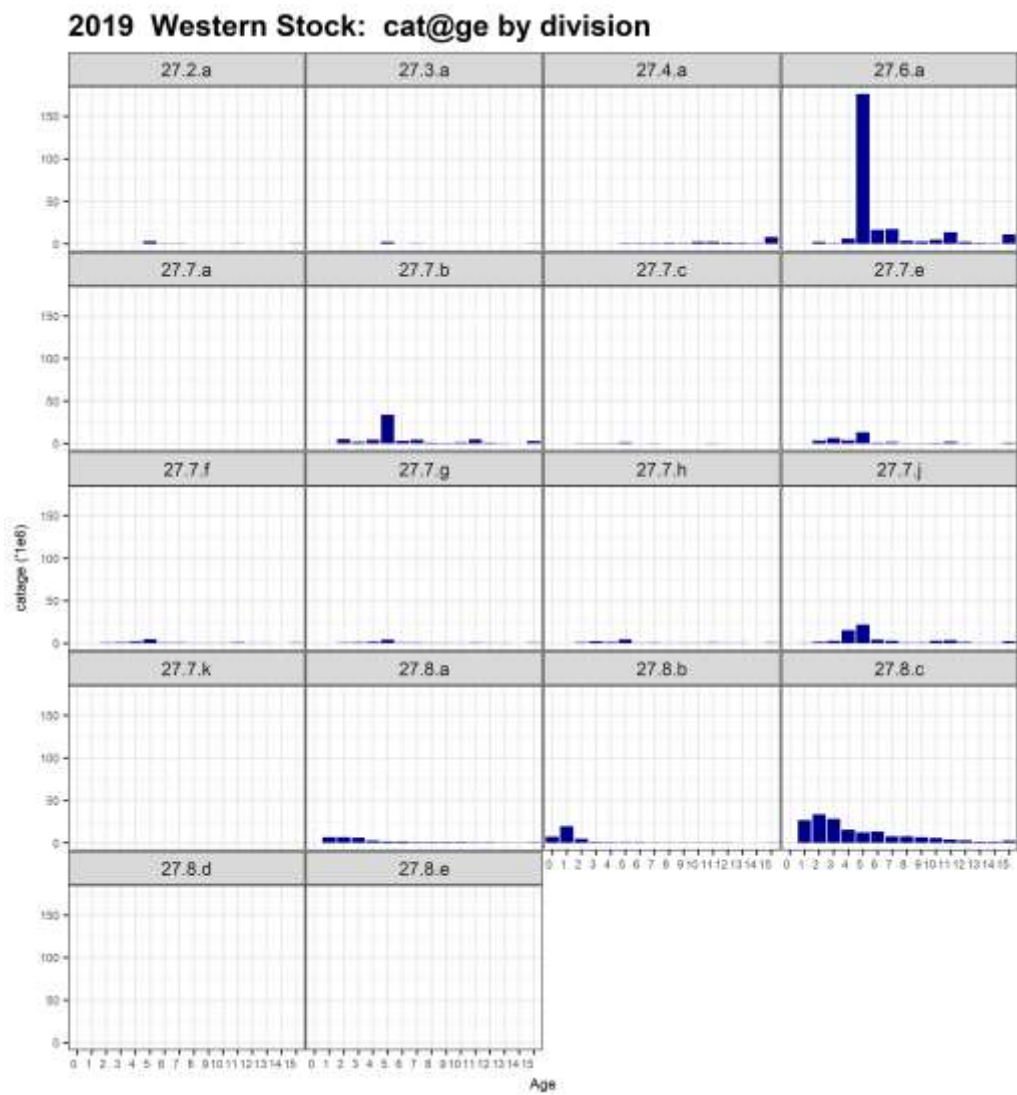


Figure 7.2.4.1: Western horse mackerel. Catch-at-age matrix by division in 2019, expressed as numbers (millions)

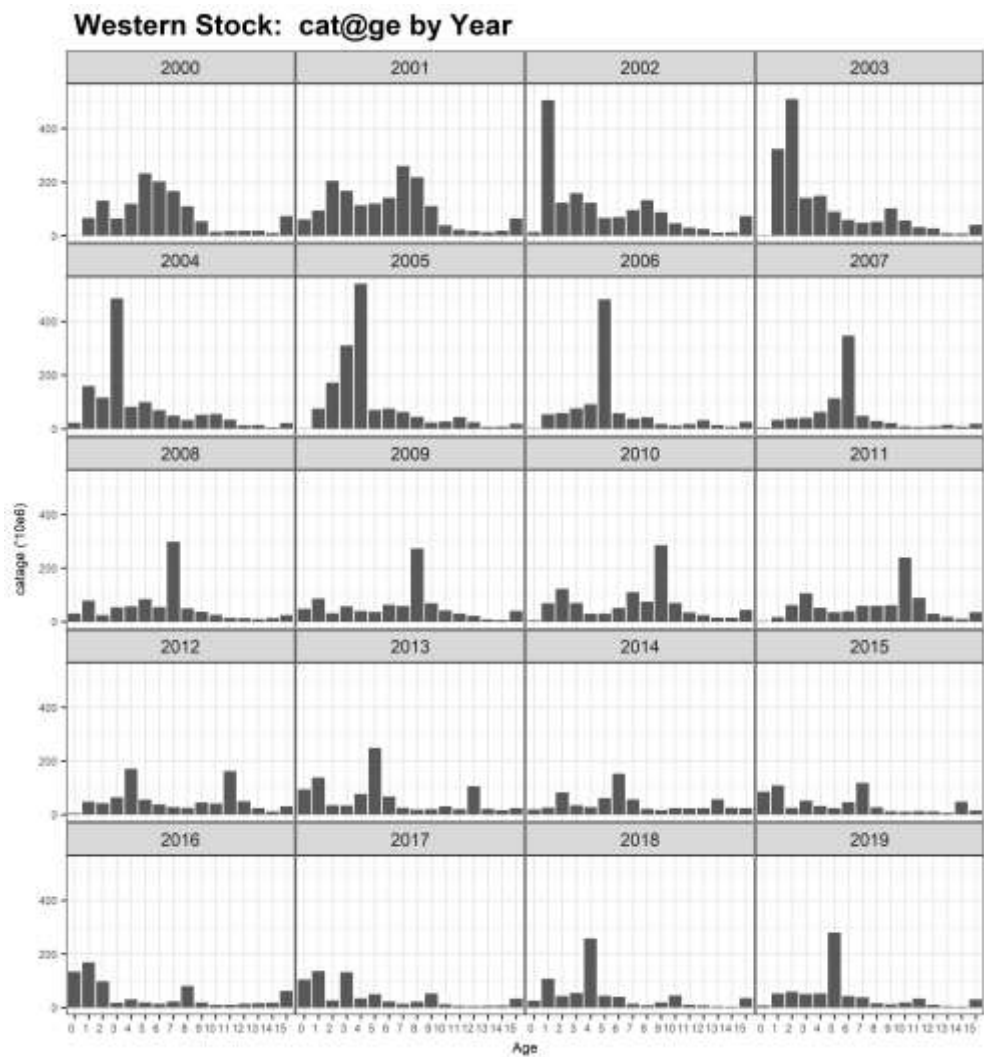


Figure 7.2.4.2: Western horse mackerel. Catch-at-age matrix by year, expressed as numbers (millions)



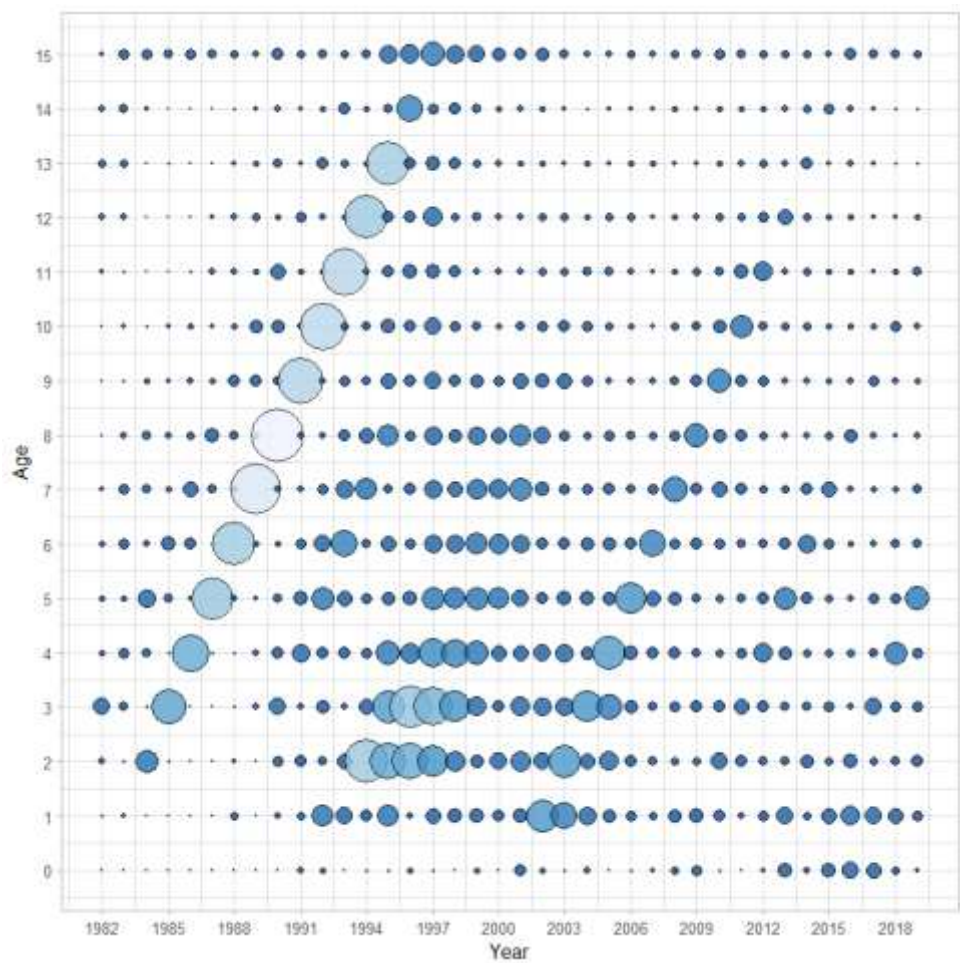


Figure 7.2.4.3: Western horse mackerel. Catch-at-age matrix, expressed as numbers. The area of bubbles is proportional to the catch number. Note that age 15 is a plus group.

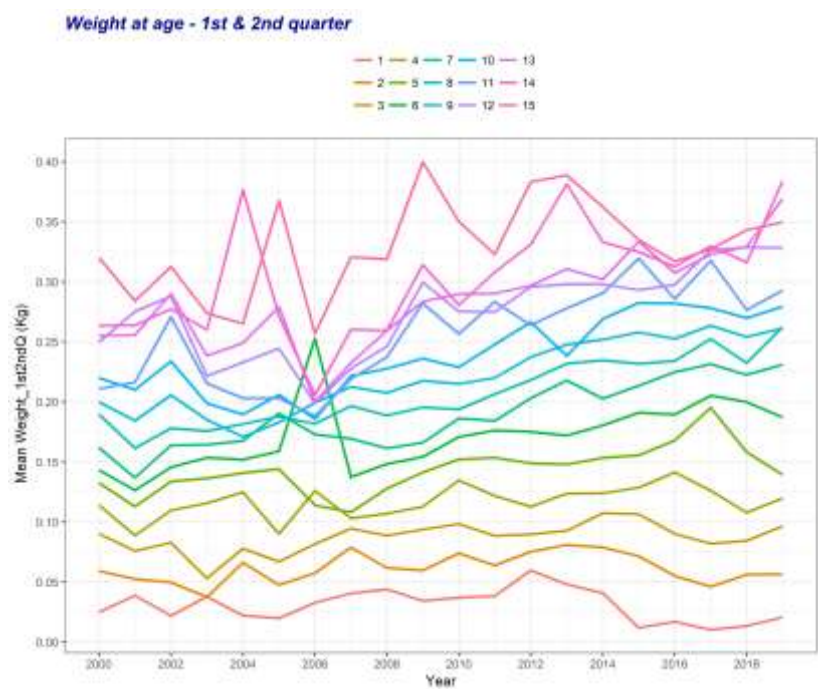


Figure 7.2.5.1: Western horse mackerel. Weight at age in the catch (kg) by year.



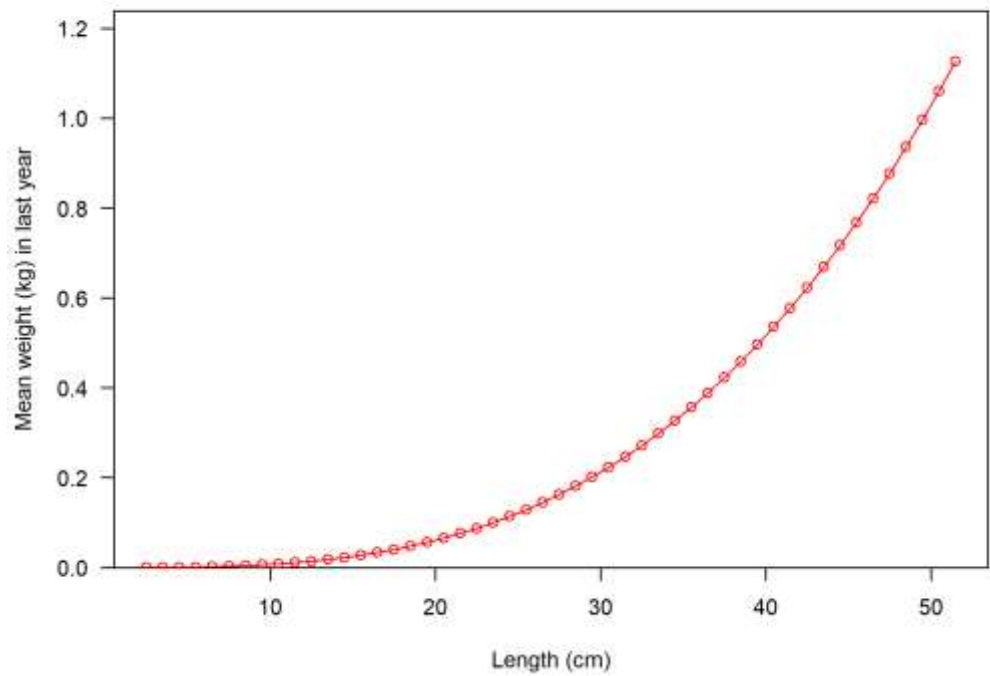


Figure 7.2.5.2: Western horse mackerel. Weight at length in the stock (kg) as estimated by SS.

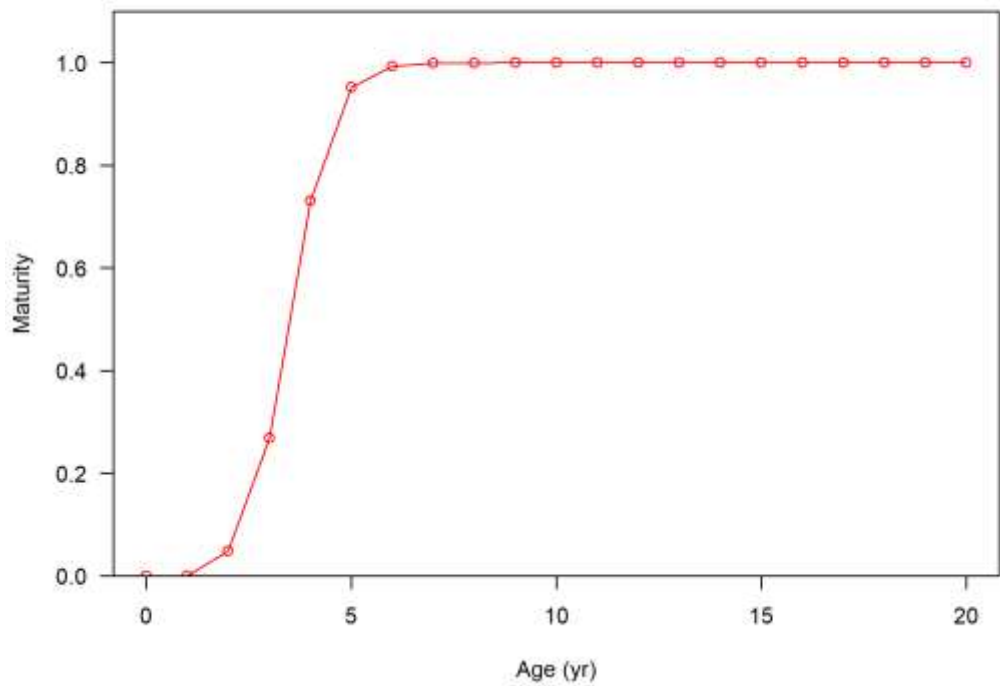


Figure 7.2.6.1: Western horse mackerel. Maturity at age as used in the assessment model.

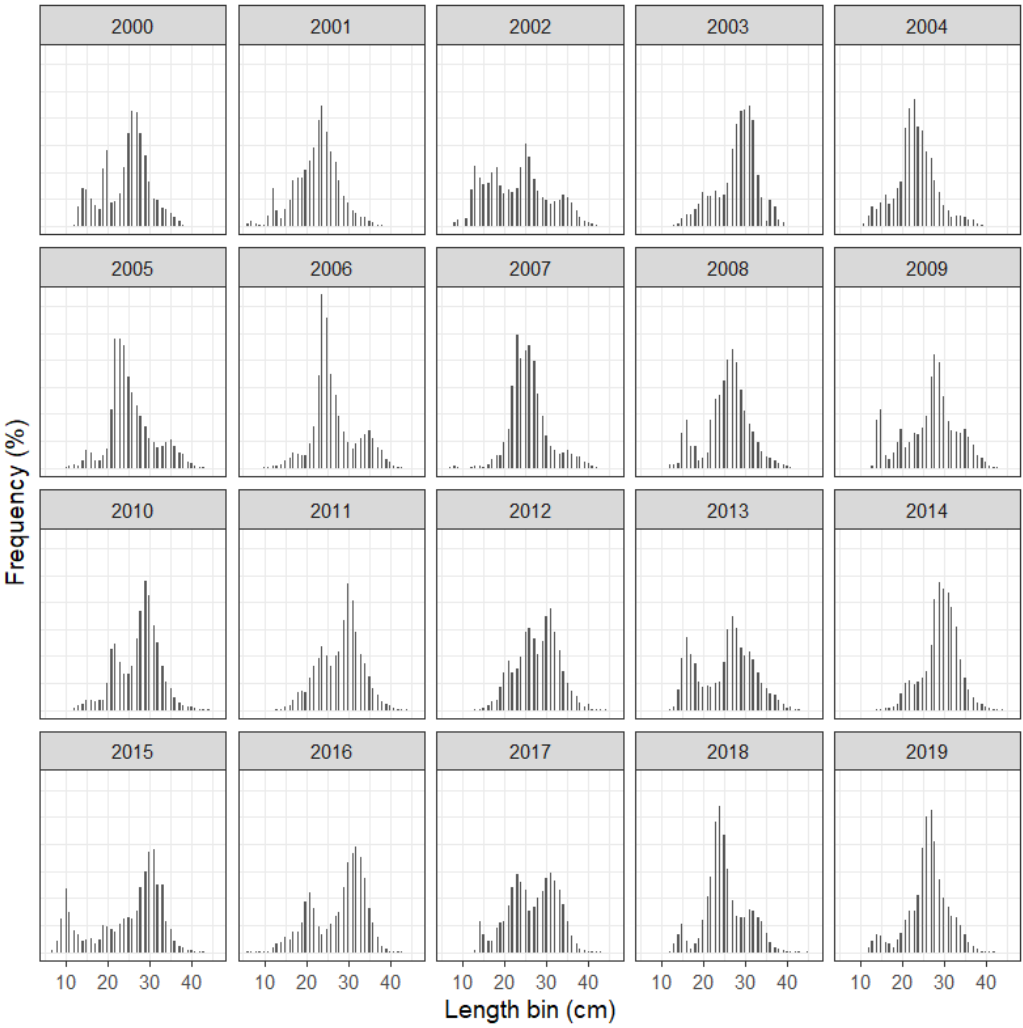
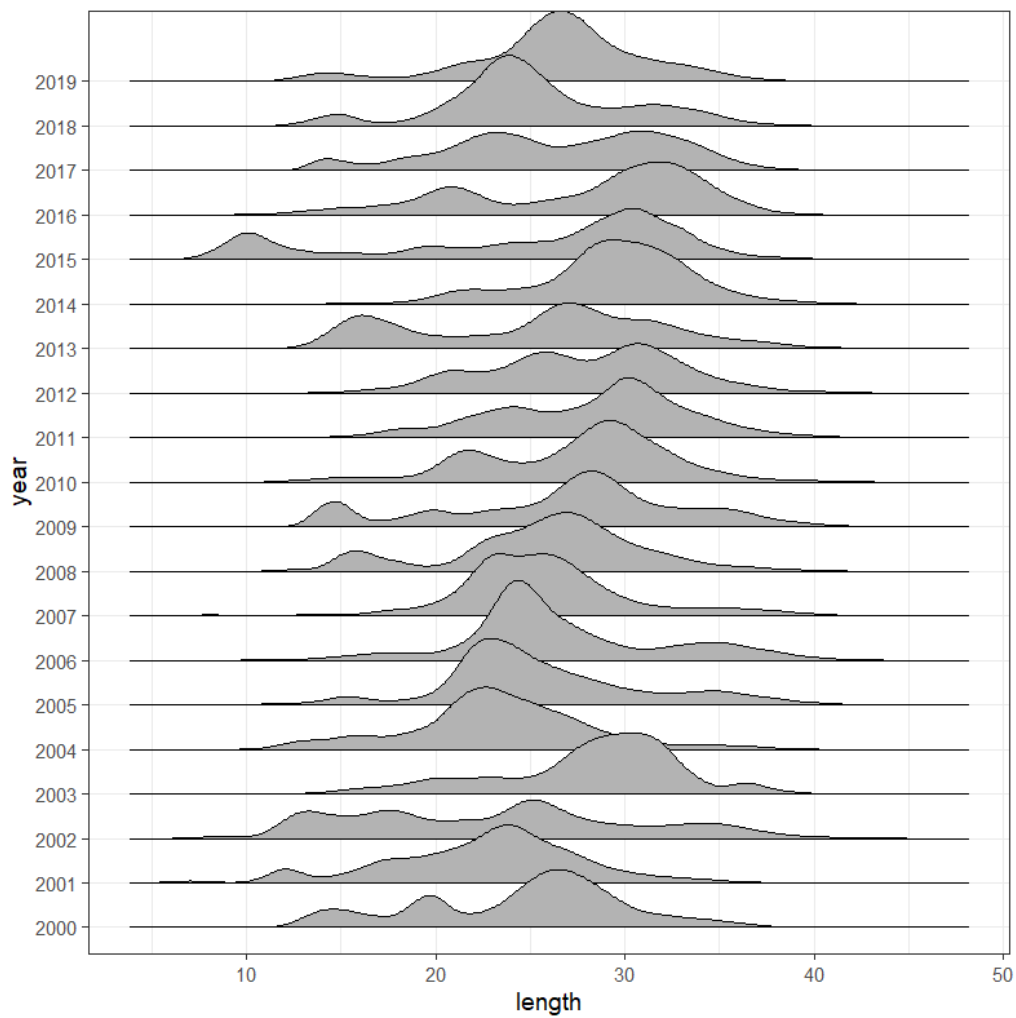


Figure 7.2.10.1: Western horse mackerel. Length frequency distribution of the catch data as used in the assessment model.



**Figure 7.2.10.2:** Western horse mackerel. Stacked length frequency distribution of the catch data as used in the assessment model.

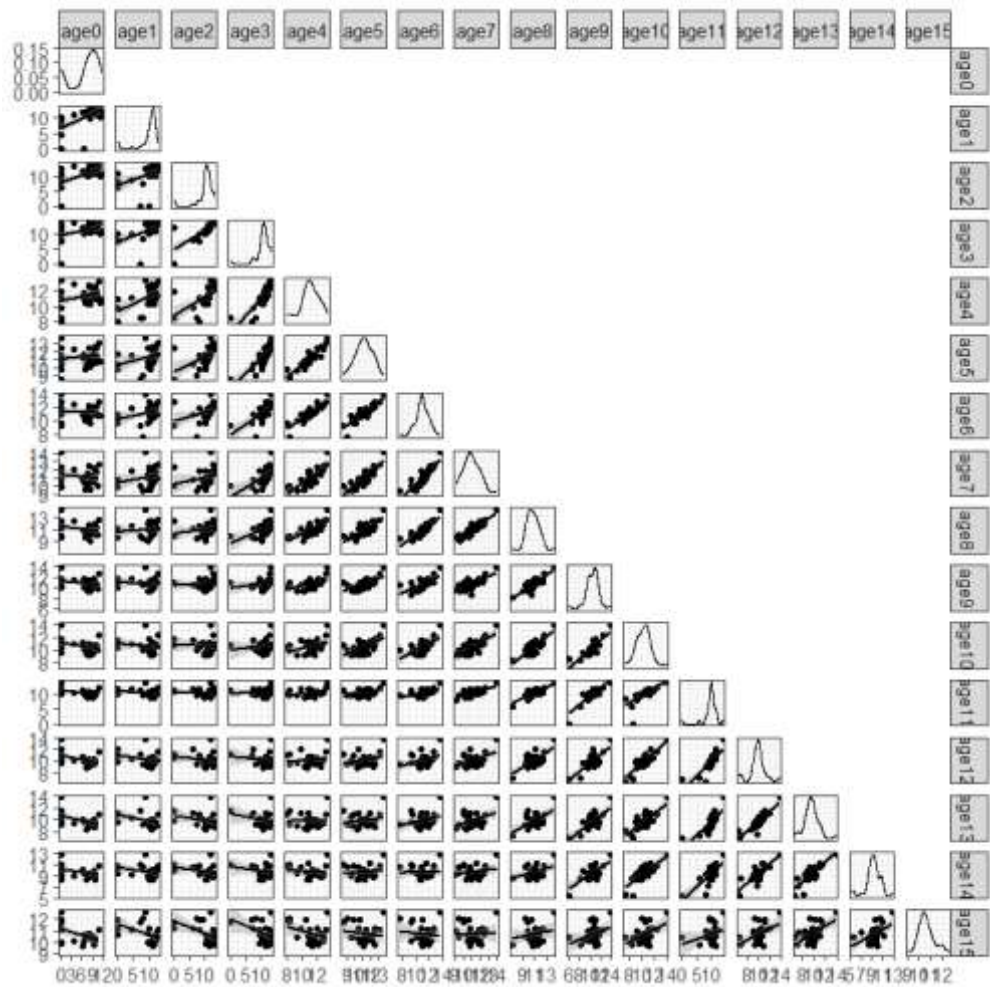


Figure 7.2.10.3: Western horse mackerel. Within-cohort consistency in the catch-at-age matrix, shown by plotting the log-catch of a cohort at a particular age against the log-catch of the same cohort at subsequent ages.

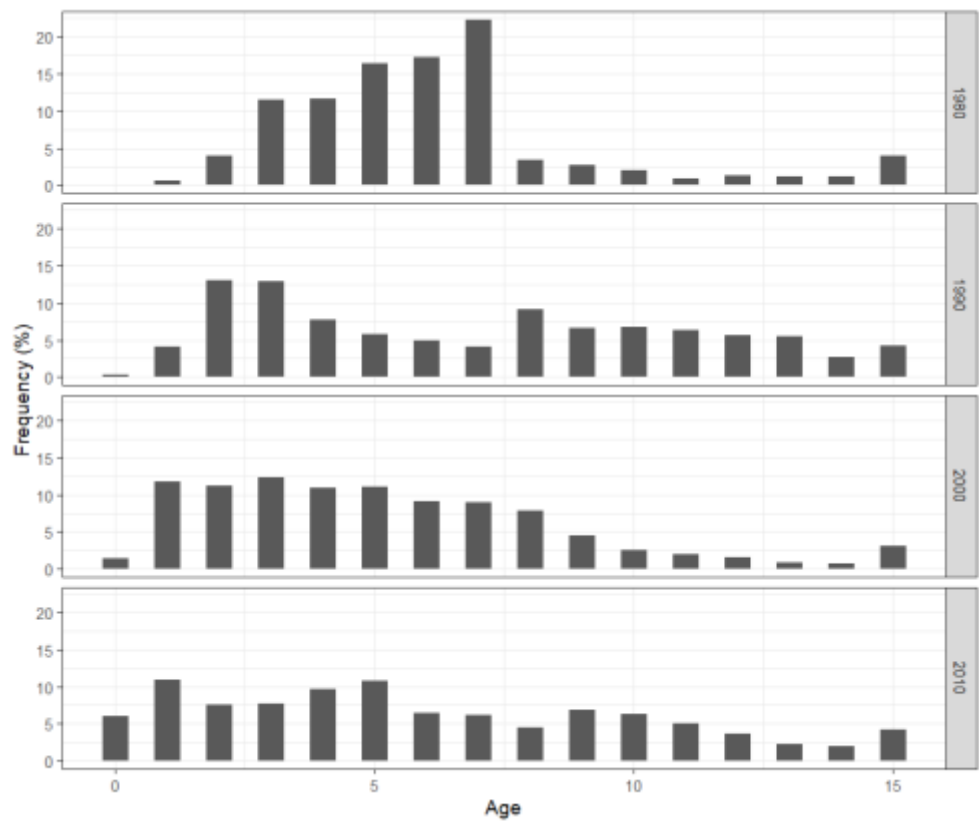


Figure 7.2.10.4: Western horse mackerel. Catch numbers at age composition by decade.

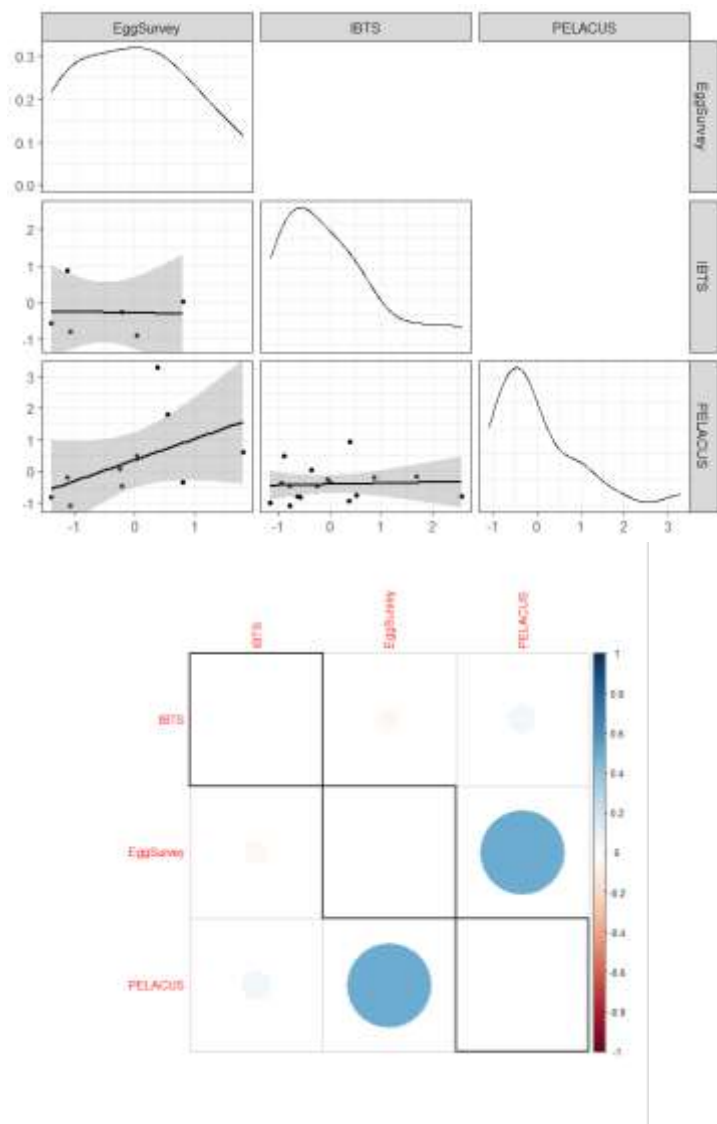


Figure 7.2.10.5: Western horse mackerel. Data exploration. Correlation plots between indices of abundance (including 2019 data points).

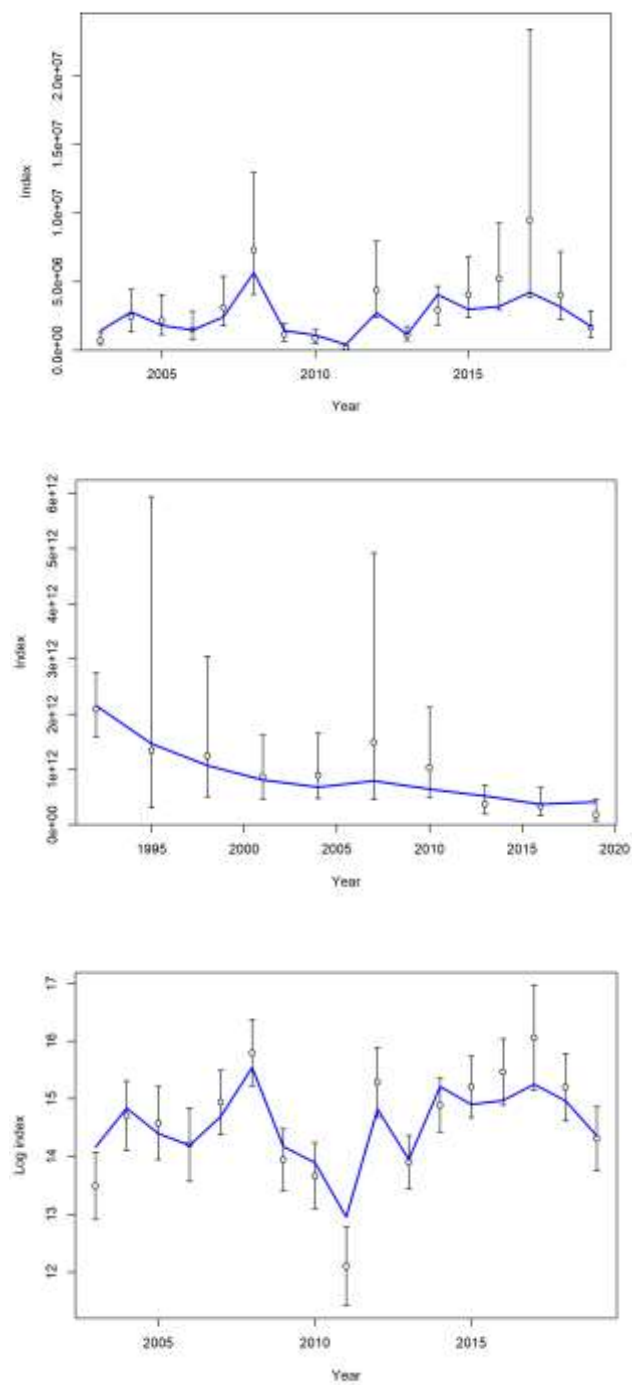


Figure 7.2.11.1: Western horse mackerel. Model fitting. Fitting of the model to the fisheries-independent indices. From top to bottom: IBTS, egg survey, PELACUS.

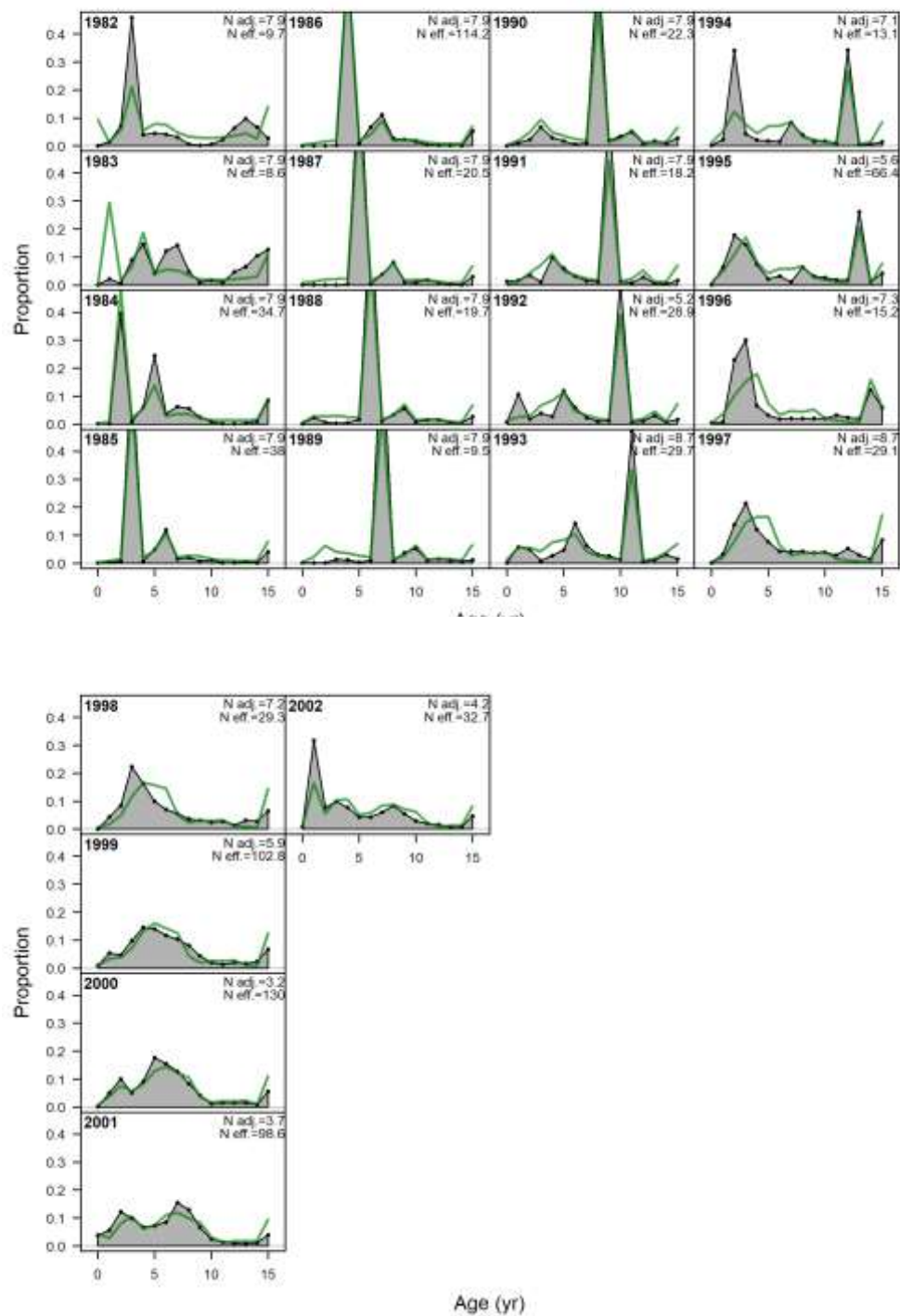


Figure 7.2.11.1 cont.: Western horse mackerel. Model fitting. Fitting of the model to the catch at age matrix from 1982 to 2002.



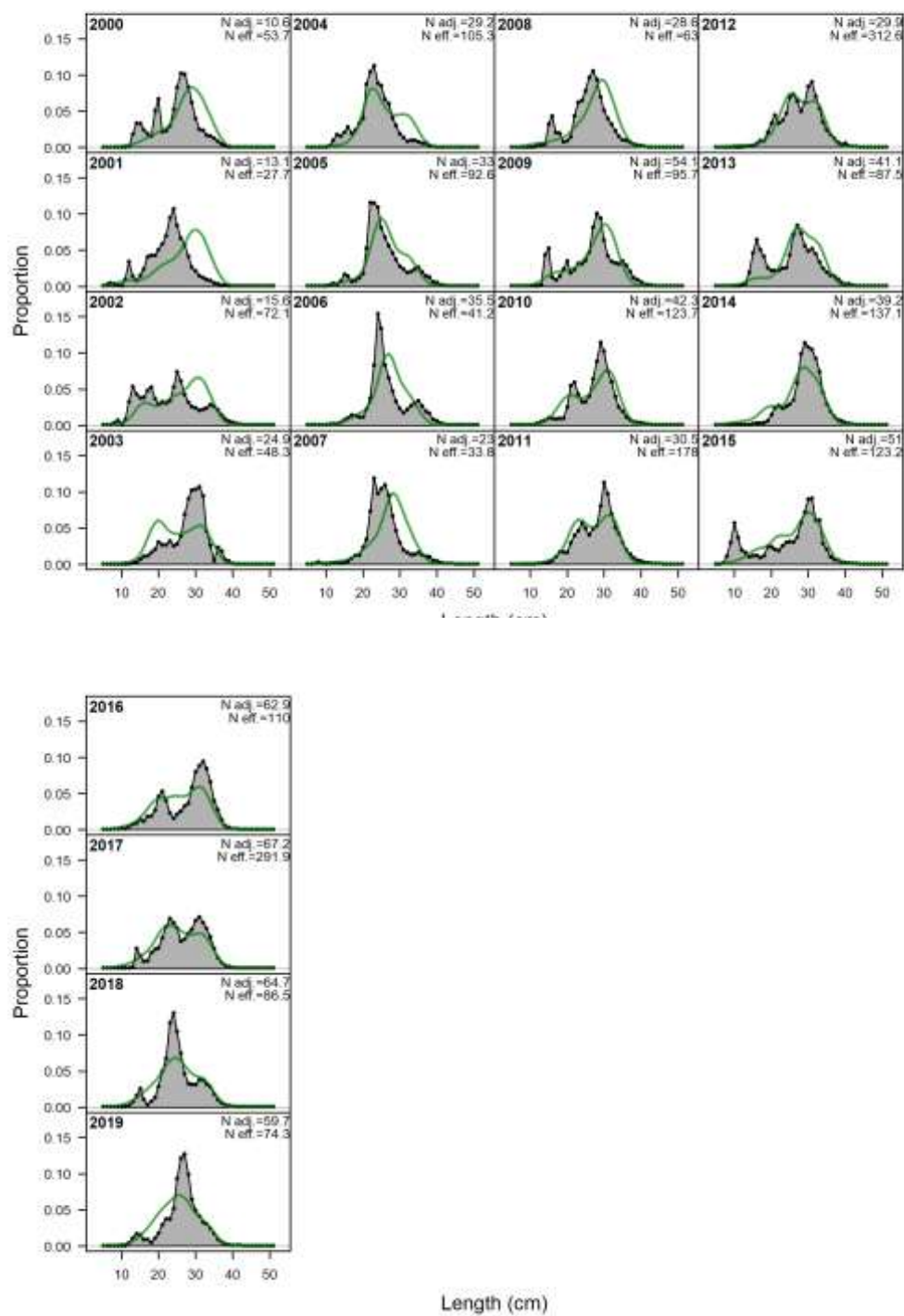


Figure 7.2.11.1 cont.: Western horse mackerel. Model fitting. Fitting of the model to the length composition of the catch data from 2002 to 2019.

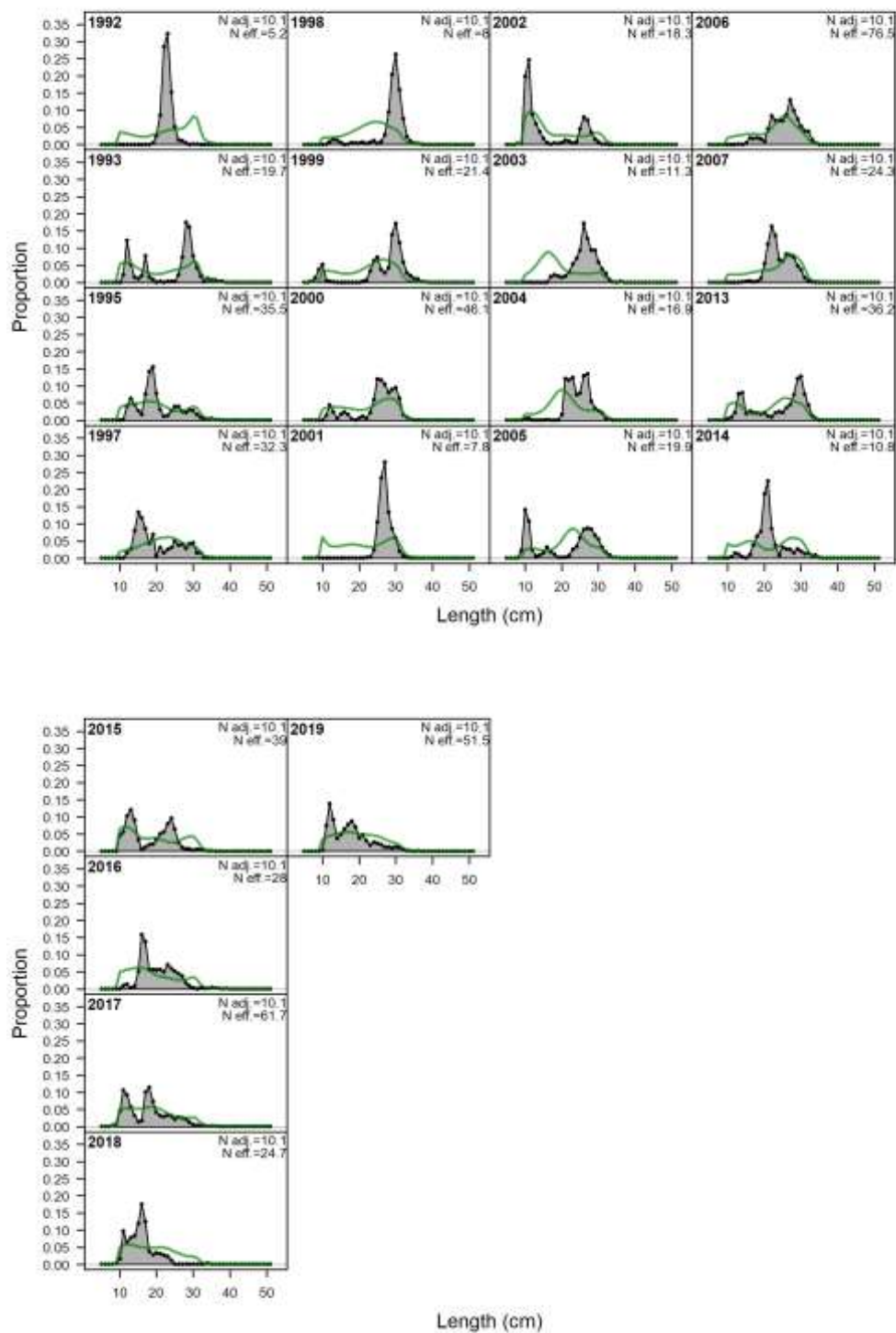


Figure 7.2.11.1 cont.: Western horse mackerel. Model fitting. Fitting of the model to the length composition of the acoustic survey.

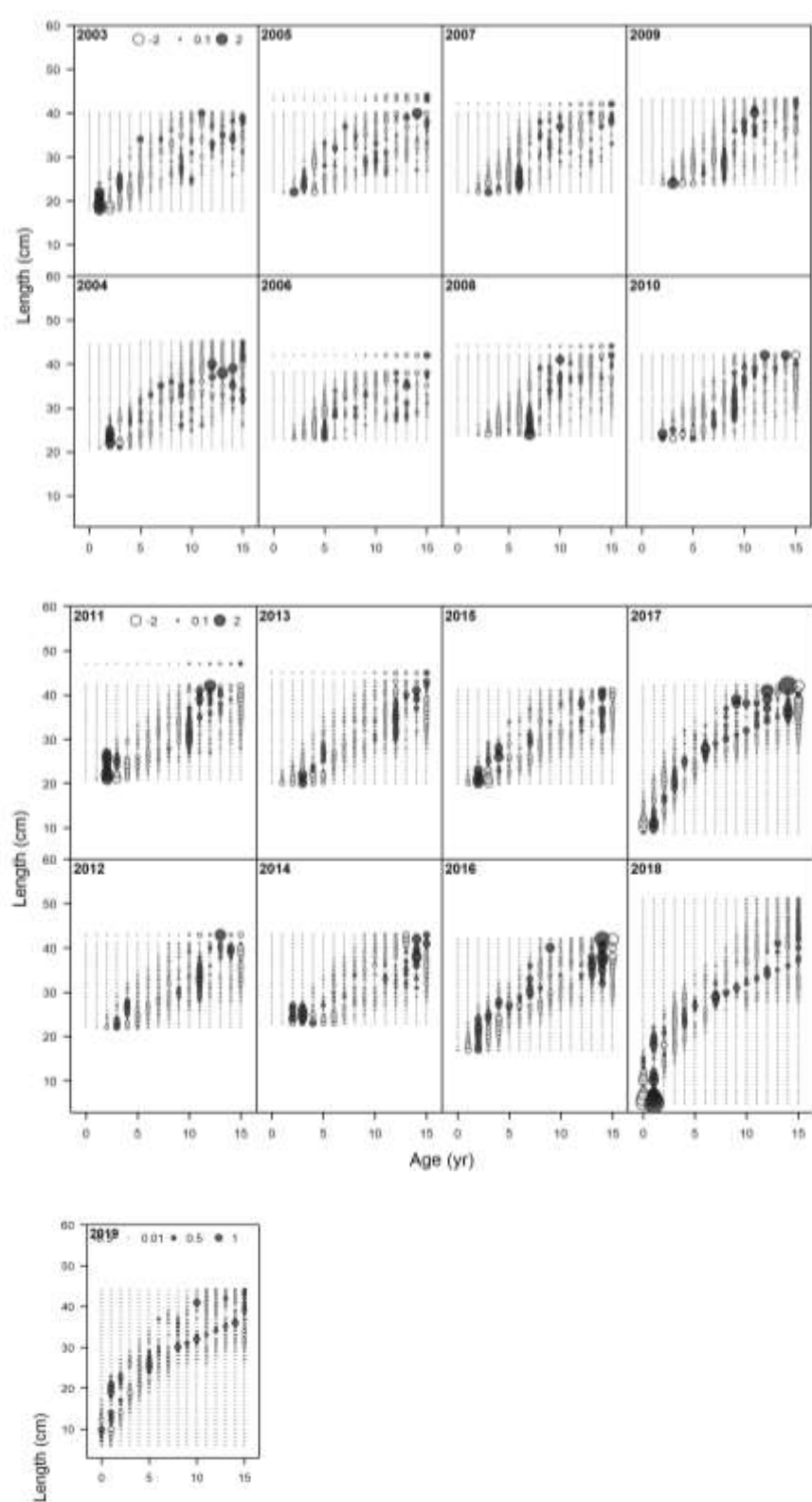


Figure 7.2.11.1 cont.: Western horse mackerel. Model fitting. Fitting of the model to the Age length comp of the catch.

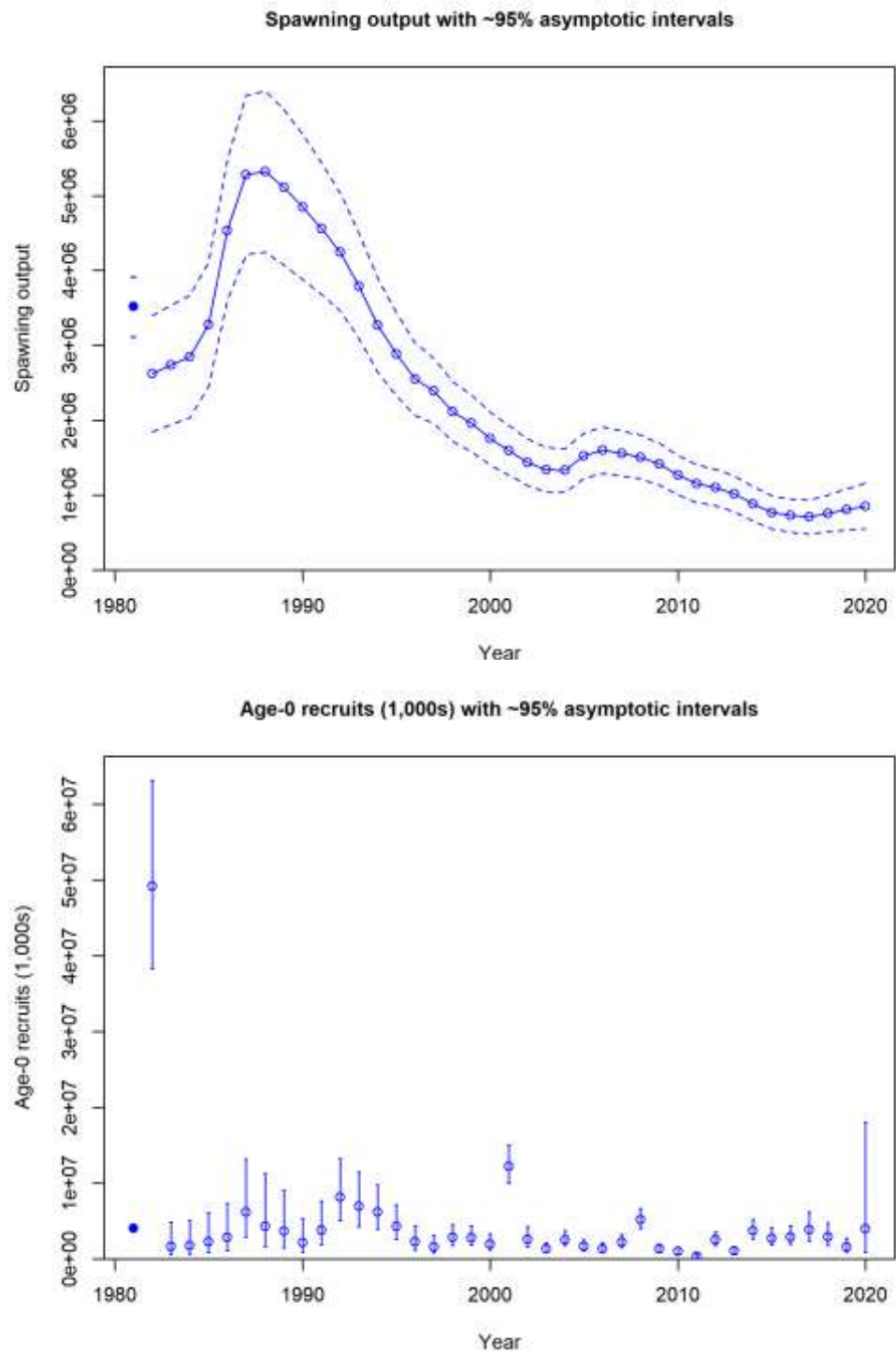


Figure 7.2.11.2: Western horse mackerel. Model results. Spawning stock biomass (0.5 of the overall SSB only is shown; plot on the left) and recruitment estimates (plot on the right) from the assessment model from 1982 to 2019. 95% CI are shown as well.

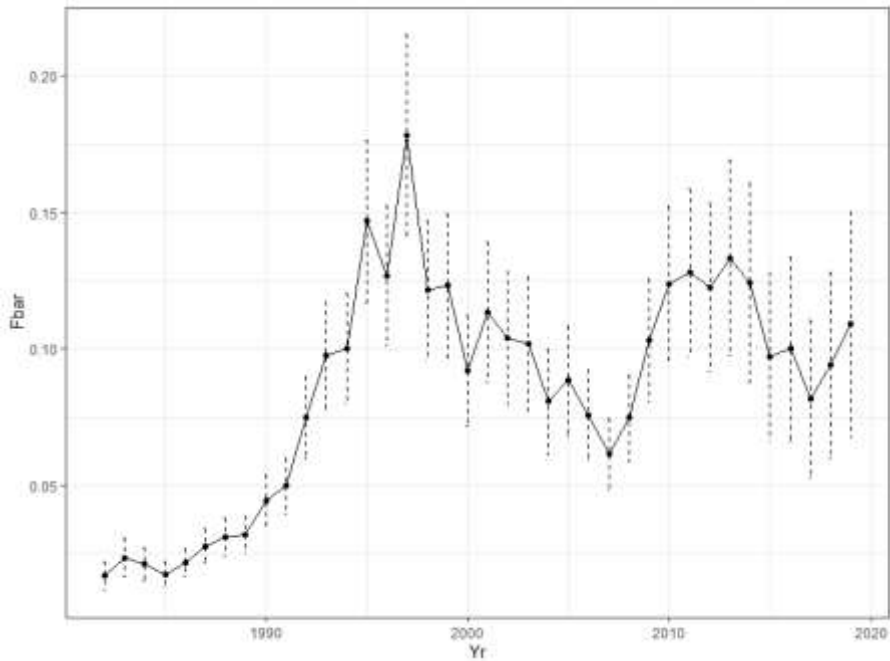


Figure 7.2.11.2 cont.: Western horse mackerel. Model results. Fishing mortality estimates (Fbar ages 1-10) from the assessment model from 1982 to 2019. 95% CI intervals are shown as well.

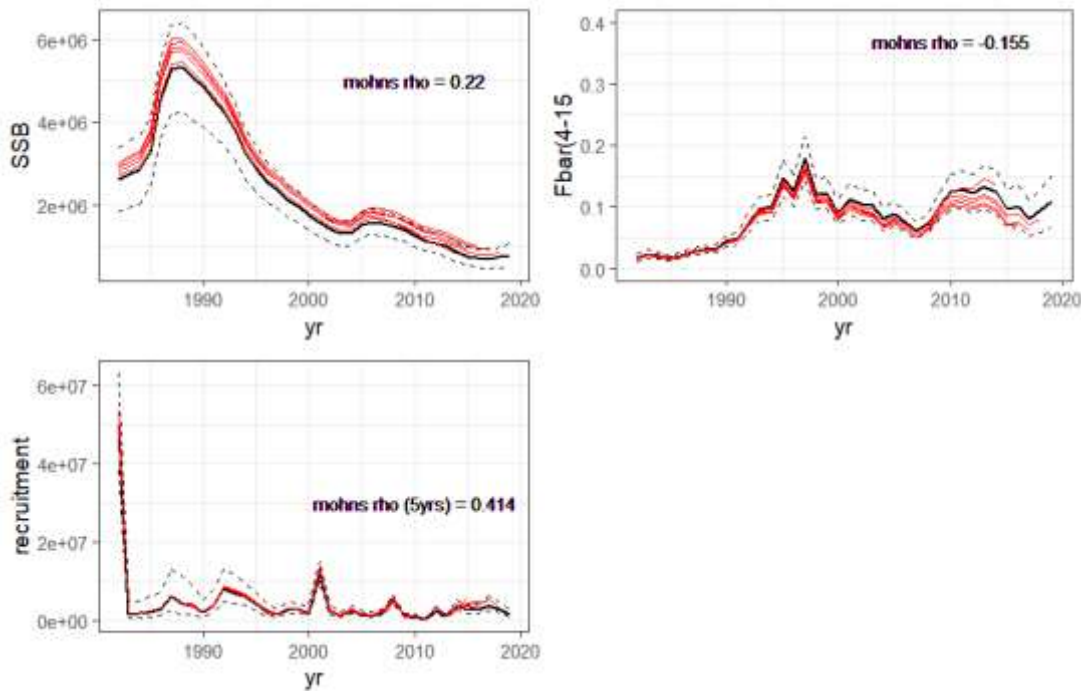


Figure 7.2.11.3: Western horse mackerel. Retrospective analysis. 5 years of retrospective analysis for SSB, F and Recruitment, and F. Dash lines are the 2020 assessment confidence intervals.

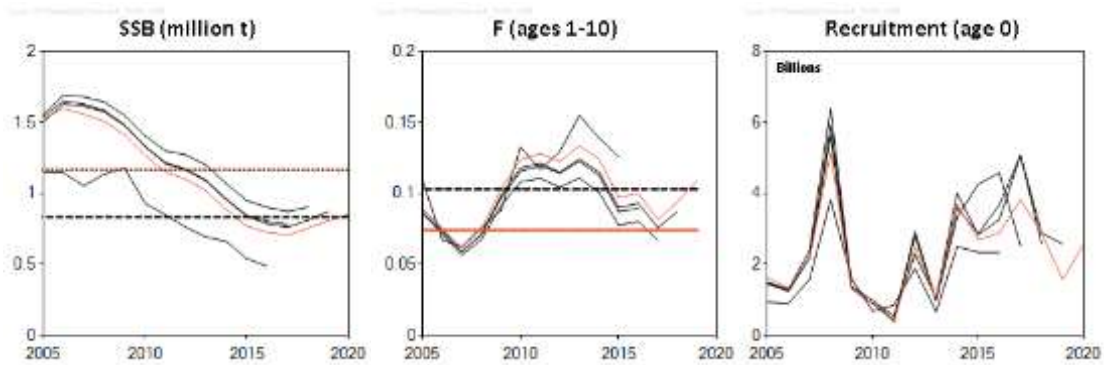


Figure 7.2.11.4: Western horse mackerel. Model results. Historical assessment results. Note: since the 2017 assessment, SSB is estimated on 1st of January. Prior to 2017 SSB has been estimated in May (spawning time).

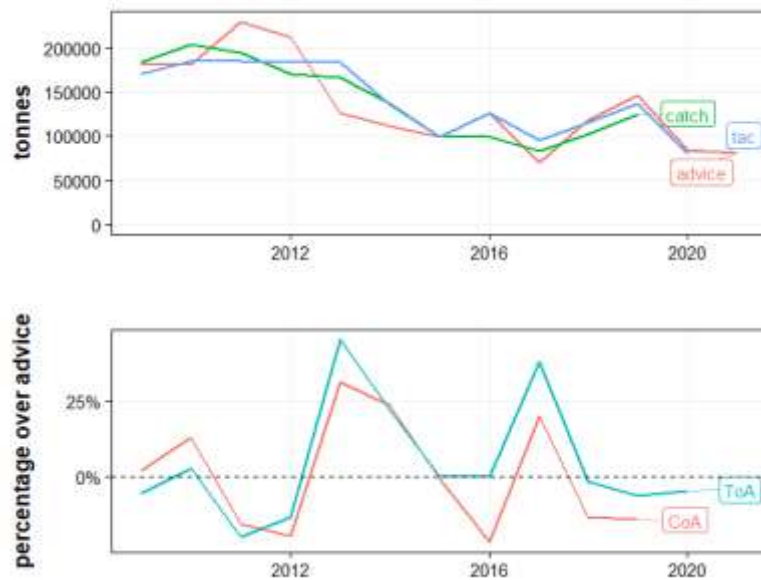


Figure 7.10.1. Western horse mackerel. Top: comparison of (max) scientific advice, TAC (or sum of unilateral quota) and Total Catch. Bottom: percentage deviation from ICES advice, CoA is Catch over Advice, ToA is TAC over Advice.