Report of the 2025 age reading exchange for Mullus spp. (*Mullus barbatus* & *Mullus surmuletus*) - SmartDots event 1914 and 1919

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1 Introduction

The genus Mullus (Family *Mullidae*) comprises demersal fish species of considerable ecological and economic importance in coastal and continental shelf ecosystems. Species of this genus are widely exploited by artisanal and industrial fisheries and are highly valued in regional markets throughout their distribution range (Fischer et al., 1987; Stergiou et al., 2004). In the North and Central-East Atlantic and across the Mediterranean Sea, the genus is primarily represented by *Mullus barbatus* (red mullet) and *Mullus surmuletus* (striped red mullet) (Whitehead et al., 1986; Golani et al., 2006). Although closely related, these two species exhibit distinct ecological preferences, particularly in terms of habitat type, depth distribution, and substrate association, which influence their spatial distribution, abundance, and population dynamics (Labropoulou & Papaconstantinou, 2000; Lombarte et al., 2000). Their geographical ranges partially overlap in several regions, resulting in mixed catches and potential interactions within fisheries. In recent years, increasing fishing pressure emphasizes the need for updated biological and fisheries information to support sustainable management strategies (Tsikliras et al., 2015). Although red mullet are the most studied species in the Mediterranean context, some aspects of its growth and age estimation are still controversial.

Age and growth data are among the most important data input in stock assessment analytical models (Reeves 2003). However, bias in these data can lead to stock diagnosis failures (Eero et al. 2015). Poor quality ageing data have also contributed in certain cases to misleading evaluation of the population status, sometimes resulting in stock collapse (Beamish and McFarlane 1995, Liao et al. 2013). For these reasons, an increasing effort has been devoted during the last few decades to improving the quality of age data (ICES 2011a, 2013), especially in the context of the European Union Data Collection Framework, which is implementing otolith exchange exercises, workshops and meetings concerning the ageing of the most important species in the European fisheries (ICES 2018).

Three age reading workshops were conducted in 2009, 2012, and 2016 (ICES, 2009; 2012; 2017), each of which was preceded by an exchange. The most recent otolith exchange (2016), involving 13 readers from five countries, and was followed by a dedicated workshop in 2017. Subsequently, ICES WGBIOP identified the need to reconsider otolith exchange exercises for red mullet (*Mullus barbatus*) and striped red mullet (*Mullus surmuletus*) during its 2023 meeting, as reported in the 2024 outputs (ICES, 2024). This recommendation led to the proposal of a validation workshop (WKVALMU2), underscoring the continued importance of otolith exchanges for improving ageing consistency and supporting robust stock assessment processes. Pierluigi Carbonara (Fondazione COISPA, Italy) and Andrea Massaro (APLYSIA, Italy) were responsible to organising a *Mullus* species (*Mullus barbatus* and *Mullus surmuletus*) otolith exchange.

2 Participant

A total of 22 readers participated in WKVALMU2 otolith exchange: 7 Advanced and 15 Basic for *Mullus barbatus*, and 8 Advanced and 14 Basic for *Mullus surmuletus*, representing 8 countries (Albania, Croatia, France, Greece, Italy, Slovenia, Spain and United Kingdom). (Tab 2.1)

	Mullus barbatus		***Mullus surmuletus***	
Name	**Reader code**	**Expertise**	**Reader code**	**Expertise**
Cinzia Vita Badalucco	R04 IT	Advanced	R04 IT	Advanced
Andrea Bellodi	R06 IT	Advanced	R24 IT	Basic
Romain Elleboode	R08 FR	Advanced	R08 FR	Advanced
Salvatore Gancitano	R12 IT	Advanced	R12 IT	Advanced
Andrea Massaro	R14 IT	Advanced	R16 IT	Advanced
Paola Pesci	R16 IT	Advanced	R56 IT	Basic
Pietro Rizzo	R18 IT	Advanced	R20 IT	Advanced
Petra Bratina	R20 IT	Basic	R26 IT	Basic
Loredana Casciaro	R22 IT	Advanced	R28 IT	Basic
Ada Chatzispyrou	R24 GR	Advanced		
Louise Straker Cox	R26 GB	Basic	R32 GB	Basic
Lea Desomberg	R30 FR	Basic	R36 FR	Basic
Jan Potočnik Erzin	R32 SI	Basic	R38 SI	Basic
Gabriele Galasso	R36 IT	Basic	R42 IT	Basic
Cristina González	R38 ES	Basic	R14 ES	Advanced
Toni Lakoš	R42 HR	Basic		
Ana Leal	R44 ES	Basic	R48 ES	Basic
Damir Medvešek	R46 HR	Basic		
Michele Palmisano	R50 IT	Advanced	R18 IT	Advanced
Maria Sainza	R54 ES	Basic	R58 ES	Basic
Giacomo Sardo	R56 IT	Basic	R60 IT	Basic
Vasiliki Kousteni	R62 GR	Basic	R22 GR	Advanced
Vasiliki Nikiforidou			R52 GR	Basic
Vaso Papantoniou			R54 GR	Basic
Caterina Stamouli			R62 GR	Basic

3 Methods

A total of 440 otoliths (258 *M. barbatus* & 182 *M. surmuletus*) were collected from Mediterranean Sea (GSAs: 1, 5, 6 7, 9, 11, 16, 18, 19, 22) and Atlantic (ICES: 7, 8c, 9a). To reduce subjectivity in age reading, length information was not provided. Additionally, to avoid bias associated with different ageing schemes, readings were conducted by marking all annual translucent rings on the otoliths and recording the edge type (Opaque/Translucent). Age assignment will be carried out during the data processing phase by applying a standardized ageing scheme to all readings.

The statistical analysis was carried out follows traditional methods where the level of accuracy compared to modal age was indicated by percentage agreement (PA) and bias tests, plots and the level of precision (i.e. the reproducibility of age estimates) was indicated by the coefficient of variation (CV). Additional analyses as average percentage error (APE) and age error matrices (AEM's) were included; average percentage error (APE) and age error matrices (AEM's).

Modal age: a multistage approach to define the modal age by sampled fish,

In this event, the multistage approach to calculate the modal age has been used. When summarizing the output and reporting the results of the exchange events developed within the SmarDots framework, the modal age (the most common age decided by the age readers for every fish sample) is the most relevant measurement. It is a key statistic by itself, but it is also fundamental for the estimation of some other relevant statistics to assess the performance of the techniques assessed in the exchange event, like the Percentage Agreement (PA), or input for stock assessments like the Age Error Matrix (AEM) (see below). However, the standard approach of calculating the mode (each reader has the same weight=1) the mode is taken as the lowest age of the multiple modal ages. This way renders multiple cases (fish samples) with multiple modal ages (i.e. different ages got the same highest number of readers). Accordingly, this imply a wrong perception of the age by fish individual and introduction of bias in the calculation of the PA and AEM. As a solution, in this report a multistage approach to select the modal age is used. This multistage approach is based in the different weight given to the age readers according to their experience. Two different weight scores scales were assigned, a weight score decreasing linearly with the experience and another decreasing with a negative exponential shape. The modal age by fish individual is decided following the next approach:

1.-If there is a single mode estimated with the standard approach (equal weight for all readers) this value is used as the modal age, if not

2.-Adding up, for each age category, the score assigned with the linear weighting for all the readers that decided that age for that fish. Next, the modal age is selected as the age category that obtains the highest score sum. If, despite this approach, there were still multiple ages with the same score (and hence multiple modes), the next step is applied:

3.-Adding up, for each age category, the score assigned with the negative exponential weighting for all the readers that decided that age for that fish. Select as the modal age the age with the highest score sum.

During the WGBIOP 2019 meeting it was found that the combination of the modes decided using these three methods (so called 'multistage approach'), allows assigning a single modal age to each fish individual.

Pecentage Agreement (PA): The percentage agreement per reader per modal age tells how large is the part of readings that are equal to the modal age. The percentage agreement is estimated by modal age and reader as the proportion (as percentage) of times that the lectures of that reader agreed with the resulting modal age.This percentage is estimated as the number of times that a reader agreed with the modal age divided by the total number of otoliths read by a reader for each modal age.

$$PA = \frac{number\ of\ readings\ that\ agree\ with\ modal\ age}{total\ number\ of\ readings\ by\ modal\ age} \cdot 100\%$$

Coefficient of Variation (CV): The table presents the Coefficient of Variation (CV) per modal age and reader. The CV's are calculated as the ratio between the standard deviation (σ) and mean value (μ) per reader and modal age:

$$CV = \frac{\sigma}{\mu} \cdot 100\%$$

To the table is also added the CV of all readers combined per modal age and a weighted mean of the CV per reader.

Relative bias: The relative bias is calculated as the difference between the mean and the modal age. This statistic is presented in first place by modal age and reader, but it is also calculated as an average value by modal age for all readers together (or only advanced readers).

Average Percentage Error (APE): The Average Percentage Error (APE) was calculated based on the method outlined by Beamish & Fournier (1981). This method is dependent of fish age and thus provides a better estimate of precision than percentage agreement. As the calculations of both CV and APE pose problems if the mean age is close to 0, all observations for which modal age was 0 were omitted from the CV and APE calculations.

The average percentage error is calculated per image as:

$$APE = \frac{100\%}{n} \sum_{i=1}^{n} \left| \frac{a_i - \bar{a}}{\bar{a}} \right|$$

where a_i is the age reading of reader i and $\bar{a}$ is the mean of all readings from 1 to n.

Age error matrix (AEM): Age error matrices (AEM) were produced following procedures outlined by WKSABCAL (2014) where the matrix shows the proportion of each modal age mis-aged as other ages. The sum of each row is 1, which equals 100%. The age data was analysed twice, the first time all readers were included and the second time only the "advanced" readers were included. If a reader is "advanced" then they are considered well trained and they provide ages for stock assessment or similar purposes. When the AEM is compiled for assessment purposes it uses only those readers who provide age data for the stock assessment in that specific area.

Otolith Growth Analysis: SmartDots provides a measure of distance between the annotations made by the readers and thus provides a measure of growth increment width. This data is used to establish growth curves for each otolith (fish) and for each reader.

4 Results

Results are presented separately for each species. Table 4.1 summarizes the most general results by species.

Table 4.1: Overall summary of statistics for the total of the samples and species: Number of otoliths (N), Percentage of Agreement (PA, %), Coefficient of Variation (CV, %) and Average Percentage Error (APE, %).

		All Readers			Advanced Readers		
Species	**N**	**CV**	**PA**	**APE**	**CV**	**PA**	**APE**
Mullus barbatus	258	50.0	49.0	38.0	44.0	59.0	32.0
Mullus surmuletus	182	55.0	41.0	49.0	53.0	44.0	41.0

4.1 Overview of samples and readers

Table 4.1: Overview of samples used for *Mullus barbatus* exchange

Year	ICES area	Quarter	Number of samples	Modal age range	Length range
2015	17.0	3	21	0-2	95-170 mm
2017	16.0	1	6	1-3	120-235 mm
2017	16.0	2	5	1-2	110-210 mm
2017	16.0	4	14	0-4	110-250 mm
2019	9.0	1	9	1-2	110-205 mm
2019	9.0	2	6	1-3	130-235 mm
2019	9.0	3	7	1-2	125-210 mm
2019	9.0	4	8	1-4	110-225 mm
2021	19.0	3	7	1-4	105-230 mm
2023	19.0	3	23	1-3	120-235 mm
2023	22.0	1	4	1-4	155-235 mm
2023	22.0	2	11	1-5	135-220 mm
2023	22.0	3	7	1-4	135-200 mm
2023	22.0	4	8	1-6	95-270 mm
2024	7.0	1	9	1-3	110-200 mm
2024	7.0	2	6	2-3	150-220 mm
2024	7.0	3	7	1-4	130-200 mm
2024	7.0	4	8	1-4	115-215 mm
2024	11.1	1	7	1-4	105-210 mm
2024	11.1	2	8	1-4	120-200 mm
2024	11.1	3	15	1-3	140-190 mm
2024	18.0	2	16	2-4	155-245 mm
2024	18.0	3	15	1-3	130-215 mm
2024	20.0	1	5	2-3	145-200 mm
2024	20.0	2	10	2-4	120-215 mm
2024	20.0	3	8	2-3	170-200 mm
2024	20.0	4	7	1-3	145-205 mm
2025	16.0	4	1	3	100 mm

Table 4.2: Overview of samples used for *Mullus surmuletus* exchange

Year	ICES area	Quarter	Number of samples	Modal age range	Length range
2017	16	1	6	1-2	110-270 mm
2017	16	2	4	1-3	180-240 mm
2017	16	4	10	1-3	90-210 mm
2021	21	1	4	2-3	190-290 mm
2021	21	2	6	2-5	145-310 mm
2021	21	3	5	1-2	110-230 mm
2021	21	4	5	2-3	245-300 mm
2022	27.8.c	1	10	1-3	150-265 mm
2022	27.8.c	4	5	1-3	125-285 mm
2022	27.9.a	4	3	1-2	125-135 mm
2023	22	1	8	2-4	155-285 mm
2023	22	2	2	4-5	175-225 mm
2023	22	3	2	2-4	155-185 mm
2023	22	4	7	2-4	175-250 mm
2023	27.8.c	4	2	2-4	280 mm
2024	18	2	15	1-3	130-215 mm
2024	18	3	17	0-3	135-265 mm
2024	19	1	9	1-3	145-250 mm
2024	19	3	7	1-2	125-235 mm
2024	19	4	4	1-3	135-240 mm
2024	22	3	1	1	165 mm
2024	7	2	6	1-5	160-270 mm
2024	7	3	1	2	225 mm
2024	7	4	8	0-4	130-250 mm
2024	8	1	9	0-3	140-290 mm
2024	8	3	6	0-2	130-250 mm
2024	8	1	5	3-4	190-215 mm
2024	8	2	5	3-5	160-250 mm
2024	8	3	10	1-5	95-265 mm

4.2 *Mullus barbatus* (Event-ID 1914)

4.2.1 All readers

All samples included

For *Mullus barbatus*, the results showed low precision, with percent agreement (PA) of 49.0% for all readers and 59.0% for advanced readers. The coefficient of variation (CV) ranged from 50.0% (all readers) to 45.0% (advanced readers), while the average percent error (APE) decreased from 38.0% (all readers) to 32.0% (advanced readers). 9.1% of the annotations received an AQ3 score.

Multimodal cases

Table 4.3: Total number of samples (NSample) and percentage of cases (fish samples) with multiple modes depending on the approach to weight the experience of the reader which will be considered when defining the fish age mode. PercMM_traditional shows the percentage of the total samples for which multiple modes are obtained when all the readers are equally weighted. PercMM_linear_weight shows the percentage of the total samples for which multiple modes are obtained when the weight assigned to the different readers decreases linearly with the experience, while in the PercMM_negexp the weight applied decreases with a negative exponential shape with the experience. The PercMM_multistage shows the percentage of multiple mode cases when a combination of the different methodologies is used, as explained in the material and methods section

NSample	PercMM_traditional	PercMM_linear_weight	PercMM_negexp_weight	PercMM_multistage
258	8 %	2 %	0 %	0 %

List of multimodal cases

Table 4.4: List of cases for which multiple modes where obtained when all readers are considered. The column NModes_trad shows the number of multiple modes for each FishID or SampleID when all readers are given the same expertise weight.

NModes_trad	SampleID
2	17mb10_11_24
3	1mb14_11_24
2	24MULLBAR501-0114
2	24MULLBAR501-0189
2	24MULLBAR501-0200
2	29mb113_11_24
3	2mb18_11_24
3	31mb104_11_24
2	33mb40_11_24
2	3mb10_11_24
2	6mb8_11_24
3	GSA17-32116
2	GSA17-32138
2	GSA18_COISPA_MB-01
2	GSA18_COISPA_MB-04
2	GSA18_COISPA_MB-05
2	GSA18_COISPA_MB-07
2	GSA18_COISPA_MB-12
2	GSA18_COISPA_MB-17
2	GSA18_COISPA_MB-20
2	GSA18_COISPA_MB-22

NModes_trad	SampleID
5	GSA18_COISPA_MB-23
2	GSA19_MULLBAR_11
2	GSA19_MULLBAR_16
2	GSA19_MULLBAR_17
2	GSA20_Mulbar_15
2	GSA20_Mulbar_19
2	GSA20_Mulbar_20
2	GSA20_Mulbar_22
2	GSA20_Mulbar_28
2	GSA20_Mulbar_30
2	GSA9_MB_04
2	GSA9_MB_08
2	MBAR_DCF23_03
2	MBAR_DCF23_11
2	MBAR_DCF23_23
4	MBAR_DCF23_30
2	MULLBARGSA16_02
2	MULLBARGSA16_09

Summary statistics

Table 4.5: Summary of statistics; Total number of samples (NSample), coefficient of variance (CV), percentage of agreement (PA) and average percentage error (APE) for all ages and readers

NSample	CV	PA	APE
258	50 %	49 %	38 %

In this exchange event, 258 otolith fish individuals were aged. Of those, 8 %when the traditional approach (all readers equally weighted) is used to define the mode. The percentage of multiple mode cases is reduced to 0 %. The complete list of cases with multiple modes is presented in table X in the annex 3 section, where the ageing from each of the readers participating in the exchange event is presented. When all the otolith samples are considered (both single and multimodal cases) the weighted average percentage agreement based on modal ages for all readers is 49 %, with the weighted average CV of 50 % and APE of 38 %.

Coefficient of Variation (CV)

Table 4.6: Coefficient of Variation (CV) table presents the CV per modal age and reader, the CV of all readers combined per modal age and a weighted mean of the CV per reader

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	all
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1	79	46	76	48	52	43	39	51	54	65	41	46	49	44	44	59	28	63	50	49	62	77	**69**
2	53	24	46	32	30	30	44	37	34	36	40	50	39	31	32	34	29	38	32	26	41	38	**46**
3	42	23	48	32	29	23	32	37	25	33	36	29	32	22	22	25	24	22	30	27	37	36	**37**
4	32	22	51	31	35	27	26	19	20	44	24	36	28	15	18	20	22	24	49	17	34	40	**34**
5	16	0	0	16	13	16	0	0	0	16	24	0	16	0	13	0	20	28	-	0	0	0	**15**
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**32**
Weighted Mean	**57**	**30**	**56**	**37**	**37**	**32**	**38**	**40**	**37**	**45**	**38**	**43**	**40**	**30**	**32**	**37**	**27**	**40**	**38**	**33**	**46**	**50**	**50**

Percentage of Agreement (PA)

The percentage agreement per reader per modal age tells how large part of the readings that are equal to the modal age. The weighted mean including at the bottom of the table is weighted according to number of age readings.

Table 4.7: Percentage agreement (PA) table represents the PA per modal age and reader, the PA of all readers combined per modal age and a weighted mean of the PA per reader.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	all
0	100	50	100	100	100	50	-	0	50	50	-	50	50	-	50	100	0	100	0	50	0	100	**59**
1	48	71	63	72	53	61	45	51	72	69	2	65	22	21	12	63	0	65	67	51	55	66	**51**
2	32	76	47	65	60	73	47	62	68	64	34	40	32	22	29	69	6	59	70	66	52	55	**52**
3	34	62	24	54	52	67	38	38	60	44	33	54	36	31	31	59	18	70	49	57	28	44	**45**
4	47	57	18	41	53	40	41	67	64	29	19	18	24	58	53	60	7	60	30	53	29	38	**41**
5	50	100	100	50	50	50	100	100	100	50	50	100	50	100	50	100	0	0	0	0	100	100	**65**
6	0	-	0	0	-	-	100	100	-	100	0	0	0	0	-	0	-	0	-	0	100	-	**29**
Weighted Mean	**39**	**70**	**46**	**63**	**56**	**65**	**45**	**54**	**67**	**59**	**23**	**50**	**29**	**27**	**26**	**64**	**7**	**63**	**61**	**58**	**47**	**56**	**49**

Average Percentage Error (APE)

Table 4.8: Average Percentage Error (APE) table represents the APE per modal age and reader, the APE of all advanced readers combined per modal age and a weighted mean of the APE per reader.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	all
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	58	37	71	35	45	38	35	44	36	50	29	38	42	37	33	38	22	37	36	43	49	58	**55**
2	43	13	42	19	23	16	34	28	18	29	30	37	30	27	26	21	24	26	20	21	33	34	**34**
3	31	17	35	24	24	17	26	28	16	29	25	22	24	15	16	19	19	12	26	21	28	31	**25**
4	23	19	41	24	28	22	19	14	15	35	17	28	21	13	15	16	16	18	42	13	28	33	**26**
5	11	0	0	11	9	11	0	0	0	11	17	0	11	0	9	0	14	20	0	0	0	0	**9**
6	0	-	0	0	-	-	0	0	-	0	0	0	0	0	-	0	-	0	-	0	0	-	**23**
Weighted Mean	**43**	**22**	**49**	**26**	**30**	**23**	**31**	**31**	**23**	**36**	**28**	**33**	**32**	**25**	**25**	**25**	**21**	**25**	**27**	**27**	**36**	**40**	**38**

Relative bias

The relative bias is the difference between the mean age (per modal age per reader) and modal age. As for the previous tables, a combined bias for all readers and weighted means are calculated.

Table 4.9: The relative bias (as the difference between the mean and modal age) per modal age and reader is presented, as well as the weighted mean relative bias per reader and the relative bias per modal age for all readers combined.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	all
0	0	0.5	0	0	0	0.5	-	1	0.5	0.5	-	0.5	0.5	-	2.5	0	1	0	1	1	1	0	-
1	0.1	0.3	-0.3	0.2	0.6	0.4	0.6	0.5	0.2	-0.2	1.9	0.3	1.6	1.5	1.9	0	2.1	0	0.1	0.5	0.3	-0.2	**0.6**
2	0.3	0	-0.6	0	0.2	0	0.3	0.4	0	-0.3	1.2	-0.1	1.1	1.3	1.2	0.1	2	0.1	-0.1	0.3	-0.3	-0.4	**0.3**
3	-0	-0.2	-0.9	-0.3	-0.3	-0.2	0.3	0.1	-0.1	-0.6	1.3	-0.2	0.9	1	0.8	-0.2	1.4	-0	-0.4	-0.2	-0.7	-0.7	**0**
4	0.3	-0.6	-1.4	-0.4	-0.7	-0.9	-0.1	-0.3	-0.3	-1	1.2	-1.3	0.4	0.5	0.5	-0.3	1.3	-0.3	-1.4	0.1	-1.2	-1	**-0.3**
5	-0.5	0	0	-0.5	0.5	-0.5	0	0	0	-0.5	1	0	-0.5	0	0.5	0	2	0	-1	1	0	0	**0.1**
6	1	-	3	2	-	-	0	0	-	0	5	-4	-1	3	-	1	-	-1	-	1	0	-	-
Weighted Mean	**0.2**	**0.1**	**-0.6**	**0**	**0.2**	**0**	**0.4**	**0.3**	**0**	**-0.4**	**1.4**	**-0.1**	**1.2**	**1.2**	**1.3**	**-0**	**1.8**	**0**	**-0.2**	**0.3**	**-0.2**	**-0.4**	**0.3**

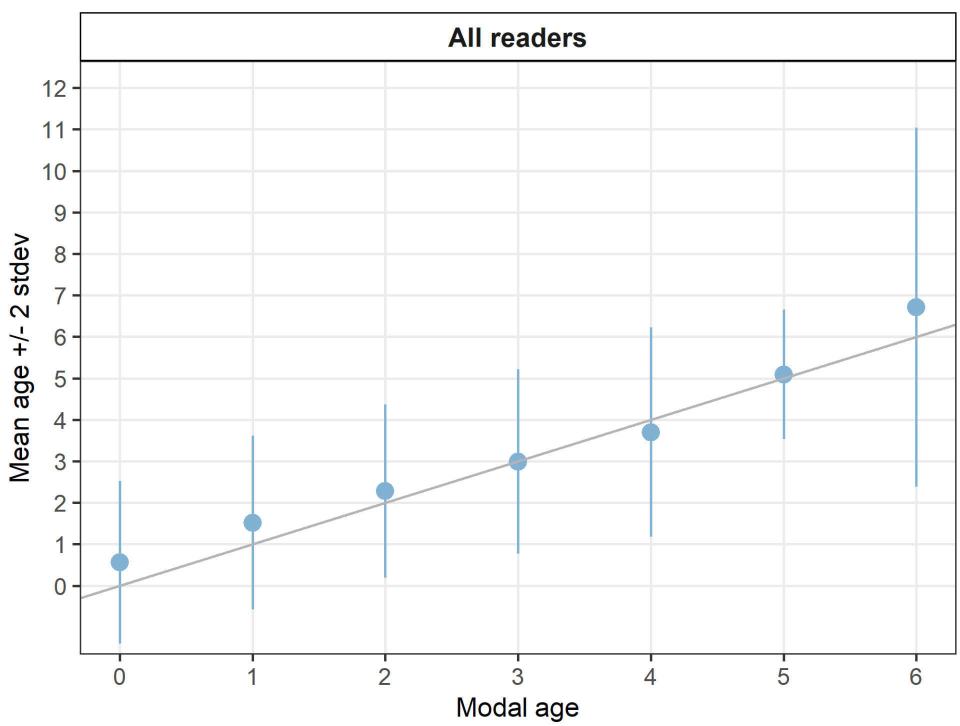

Figure 4.1: Age bias plot for all readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated mean age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age.

Inter-reader bias test

Table 4.10: Inter reader bias test. The Inter-reader bias test gives probability of bias between readers and with modal age. - = no sign of bias (p>0.05), * = possibility of bias (0.01<p<0.05), * * = certainty of bias (p<0.01) , / = diagonal of the table (no bias)

Comparison	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR
R04 IT	/	*	**	**	**	*	**	**	**	-	**	*	**	**	**	*	*	**	*	**	*	-
R06 IT	*	/	**	**	**	*	**	**	*	-	**	*	**	**	**	**	**	*	**	**	**	**
R08 FR	**	**	/	**	**	**	**	**	**	*	*	**	*	*	*	**	*	**	-	**	*	**
R12 IT	**	**	**	/	**	**	**	-	*	*	*	*	**	**	*	*	*	**	*	**	**	-
R14 IT	**	**	**	**	/	*	**	**	**	**	**	**	**	**	*	**	*	*	*	**	-	**
R16 IT	*	*	**	**	*	/	**	**	*	-	*	**	**	**	**	*	*	*	**	**	**	-
R18 IT	**	**	**	**	**	**	/	**	**	**	**	-	**	*	**	-	**	**	-	*	**	**
R20 IT	**	**	**	-	**	**	**	/	**	**	**	**	**	**	**	**	**	**	**	**	-	**
R22 IT	**	*	**	*	**	*	**	**	/	-	**	*	**	**	**	**	*	*	**	**	**	**
R24 IT	-	-	*	*	**	-	**	**	-	/	*	**	*	**	*	**	*	*	**	**	*	*
R26 GB	**	**	*	*	**	*	**	**	**	*	/	*	**	**	**	**	-	**	**	**	*	*
R30 FR	*	*	**	*	**	**	-	**	*	**	*	/	**	**	*	*	*	*	**	-	**	*
R32 SI	**	**	*	**	**	**	**	**	**	*	**	**	/	**	**	**	-	**	**	**	**	*
R36 IT	**	**	*	**	**	**	*	**	**	**	**	**	**	/	**	**	-	**	**	**	**	**
R38 ES	**	**	*	*	*	**	**	**	**	*	**	*	**	**	/	**	**	**	**	**	*	*
R42 HR	*	**	**	*	**	*	-	**	**	**	**	*	**	**	**	/	*	**	**	**	**	-
R44 ES	*	**	*	*	*	*	**	**	*	*	-	*	-	-	**	*	/	*	**	**	*	*
R46 HR	**	*	**	**	*	*	**	**	*	*	**	*	**	**	**	**	*	/	**	**	**	**
R50 IT	*	**	-	*	*	**	-	**	**	**	**	**	**	**	**	**	**	**	/	-	**	**
R54 ES	**	**	**	**	**	**	*	**	**	**	**	-	**	**	**	**	**	**	-	/	-	**
R56 IT	*	**	*	**	-	**	**	-	**	*	*	**	**	**	*	**	*	**	**	-	/	**
R62 GR	-	**	**	-	**	-	**	**	**	*	*	*	*	**	*	-	*	**	**	**	**	/
Modal age	*	**	**	*	**	**	**	**	*	-	*	*	**	**	*	**	*	*	**	-	**	**

Growth analysis

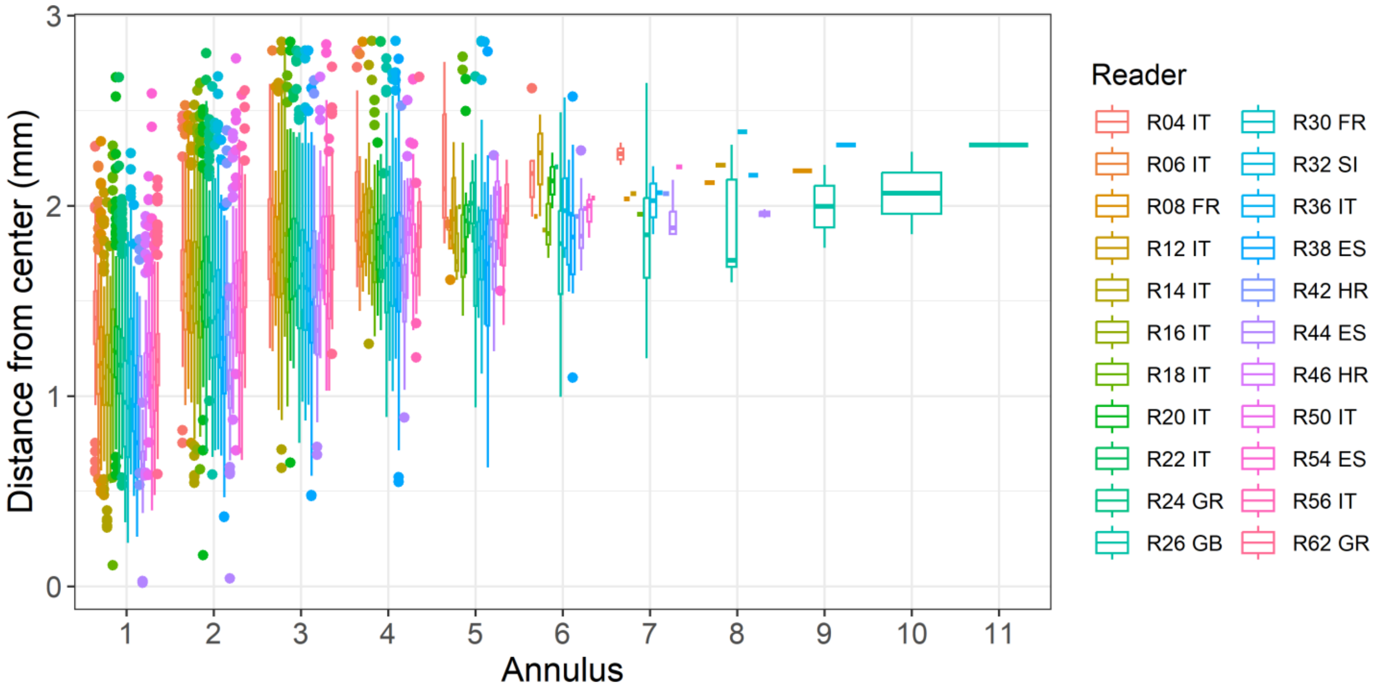

Figure 4.2: Plot of average distance from the centre to the winter rings for all readers. The boxes represent the median, upper and lower box boundaries of the interquartile range, whiskers represent the minimum and maximum values and the dots represent the outliers.

4.2.2 Advanced readers

All samples included

Multimodal cases

Table 4.11: Summary of statistics; Total number of samples (NSample), a percentage of cases (fish samples) with multiple modes depending on the approach to weight the experience of the reader which will be considered when defining the fish age mode. PercMM_traditional shows the percentage of the total samples for which multiple modes are obtained when all the readers are equally weighted. PercMM_linear_weight shows the percentage of the total samples for which multiple modes are obtained when the weight assigned to the different readers decreases linearly with the experience, while in the PercMM_negexp the weight applied decreases with a negative exponential shape with the experience. The PercMM_multistage shows the percentage of multiple mode cases when a combination of the different methodologies is used, as explained in the material and methods section

NSample	PercMM_traditional	PercMM_linear_weight	PercMM_negexp_weight	PercMM_multistage
258	12 %	0 %	0 %	0 %

Summary statistics

Table 4.12: Summary of statistics; Total number of samples (NSample), coefficient of variance (CV), percentage of agreement (PA) and average percentage error (APE) for all ages and readers

NSample	CV	PA	APE
258	44 %	59 %	32 %

In this exchange event, 258 otolith fish individuals were aged. Of those, 15 %when the traditional approach (all readers equally weighted) is used to define the mode. The percentage of multiple mode cases is reduced to 0 %. The complete list of cases with multiple modes is presented in table X in the annex 3 section, where the ageing from each of the readers participating in the exchange event is presented. When all the otolith samples are considered (both single and multimodal cases) the weighted average percentage agreement based on modal ages for all readers is 59 %, with the weighted average CV of 45 % and APE of 32 %.

Coefficient of Variation (CV)

Table 4.13: Coefficient of Variation (CV) table presents the CV per modal age and advanced reader, the CV of all advanced readers combined per modal age and a weighted mean of the CV per reader.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R24 GR	R50 IT	all
0	-	-	-	-	-	-	-	-	-	-	**-**
1	74	53	70	53	49	47	47	60	58	50	**61**
2	51	25	42	29	30	28	41	33	34	27	**38**
3	33	20	44	32	17	20	31	24	30	32	**30**
4	22	29	46	22	20	28	22	23	35	36	**31**
5	16	0	0	16	13	16	0	0	16	-	**11**
6	-	-	-	-	-	-	-	-	-	-	**18**
Weighted Mean	**55**	**35**	**53**	**37**	**34**	**35**	**40**	**42**	**43**	**38**	**44**

Percentage of Agreement (PA)

Table 4.14: Percentage agreement (PA) table represents the PA per modal age and reader, advanced the PA of all advanced readers combined per modal age and a weighted mean of the PA per reader.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R24 GR	R50 IT	total
0	100	20	100	80	67	40	0	**20**	80	33	**57**
1	55	65	67	68	53	53	44	**67**	71	60	**61**
2	38	76	56	67	61	70	51	**64**	67	69	**61**
3	43	76	31	57	76	76	41	**61**	57	57	**57**
4	56	54	28	44	56	38	44	**56**	28	38	**44**
5	50	100	100	50	50	50	100	**100**	50	0	**68**
6	0	-	0	0	-	-	100	**-**	100	-	**40**
Weighted Mean	**47**	**69**	**56**	**64**	**60**	**62**	**47**	**64**	**64**	**62**	**59**

Average Percentage Error (APE)

Table 4.15: Average Percentage Error (APE) table represents the APE per modal age and reader, the APE of all advanced readers combined per modal age and a weighted mean of the APE per reader.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R24 GR	R50 IT	all
0	-	-	-	-	-	-	-	**-**	-	-	**-**
1	55	44	64	40	42	41	38	**44**	37	40	**47**
2	41	17	37	19	24	18	33	**24**	25	17	**25**
3	23	12	35	23	10	12	23	**16**	25	25	**22**
4	17	26	35	17	16	23	17	**19**	27	25	**24**
5	11	0	0	11	9	11	0	**0**	11	0	**9**
6	0	-	0	0	-	-	0	**-**	0	-	**14**
Weighted Mean	**42**	**27**	**46**	**27**	**28**	**27**	**32**	**30**	**30**	**27**	**32**

Relative Bias

Table 4.16: The relative bias (as the difference between the mean and modal age) per modal age and advanced reader is presented, as well as the weighted mean relative bias per reader and the relative bias per modal age for all advanced readers combined.

Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R24 GR	R50 IT	all
0	0	1	0	0.2	0.33	0.6	1	**1**	0.2	0.67	**0.5**
1	0.22	0.47	-0.31	0.36	0.59	0.51	0.76	**0.3**	-0.08	0.2	**0.3**
2	0.45	0.16	-0.44	0.09	0.24	0.13	0.51	**0.19**	-0.19	0.06	**0.12**
3	0.06	-0.09	-0.86	-0.26	-0.06	-0.09	0.09	**-0.06**	-0.43	-0.3	**-0.2**
4	0.56	-0.77	-1.17	-0.17	-0.38	-0.94	0.22	**-0.44**	-0.83	-1	**-0.5**
5	-0.5	0	0	-0.5	0.5	-0.5	0	**0**	-0.5	-1	**-0.3**
6	1	-	3	2	-	-	0	-	0	-	-
Weighted Mean	**0.3**	**0.19**	**-0.47**	**0.13**	**0.29**	**0.16**	**0.52**	**0.17**	**-0.22**	**0.01**	**0.1**

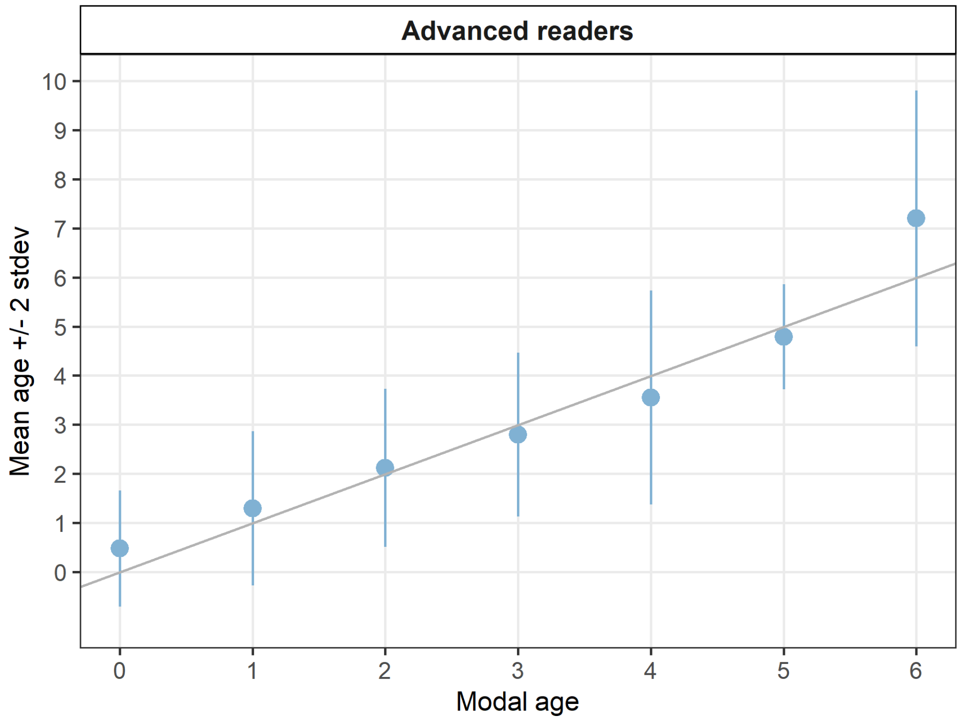

Figure 4.3: Age bias plot for advanced readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated mean age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age.

Growth analysis

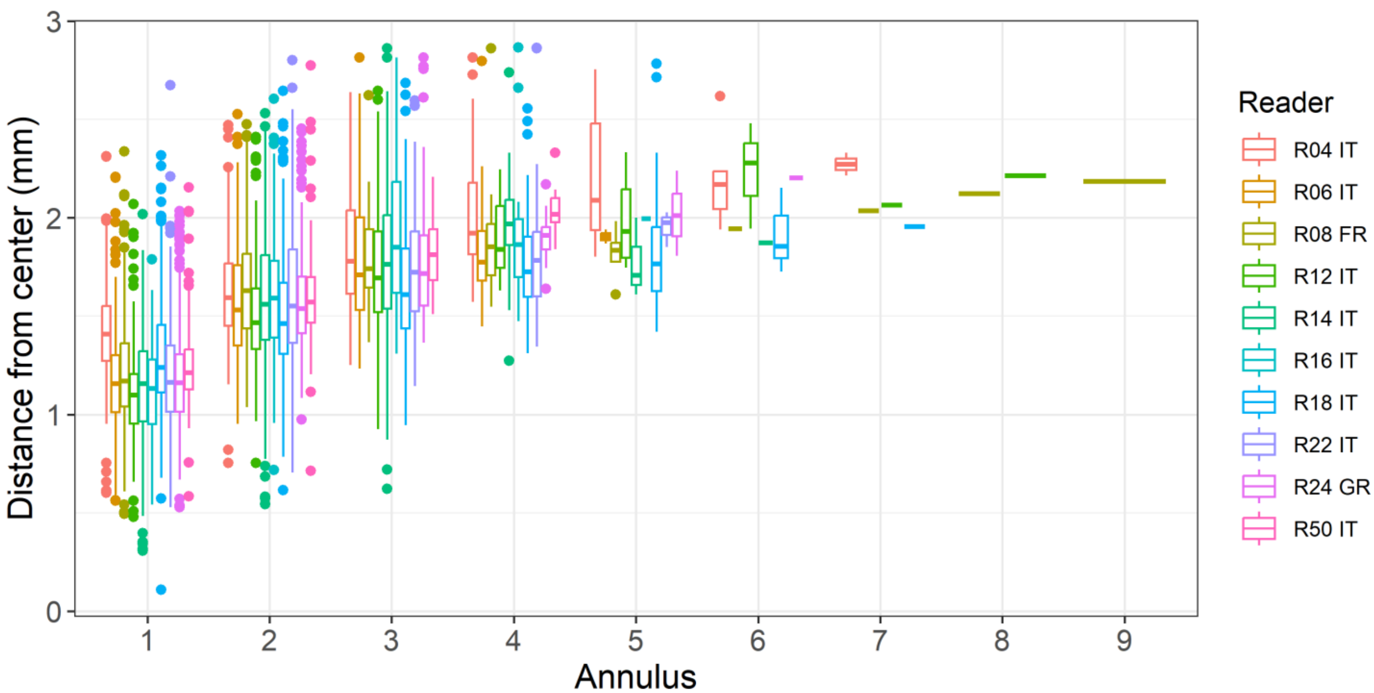

Figure 4.4: Plot of average distacne from the centre to the winter rings for advanced readers. The boxes represent the mean, upper and lower box boundaries of the interquartile range, whiskers represent the minimum and maximum values and the dots represent the outliers.

General Age Error Matrix (AEM)

Table 4.17: General Age error matrix (AEM). The modal age is in rows and the age classifications by the advanced readers in columns.

modal_age	0	1	2	3	4	5	6	7	8	9	Total
0	0.57	0.39	0.05	-	-	-	-	-	-	-	1.01
1	0.09	0.61	0.23	0.06	0.01	0.00	-	-	-	-	1.00
2	0.01	0.15	0.61	0.18	0.04	0.01	0.00	-	-	-	1.00
3	0.00	0.06	0.22	0.57	0.12	0.01	0.01	-	-	-	0.99
4	0.01	0.03	0.13	0.26	0.44	0.11	0.03	0.01	-	-	1.02
5	-	-	-	-	0.26	0.68	0.05	-	-	-	0.99
6	-	-	-	-	-	-	0.40	0.20	0.2	0.2	1.00

AEM by ICES area

Table 4.18: Age error matrix (AEM) for ICES area/GSA

ices_area	modal_age	0	1	2	3	4	5	6	7	8	9	Total
11.1	0	0.50	0.40	0.10	-	-	-	-	-	-	-	1.00
11.1	1	0.14	0.62	0.19	0.05	0.01	-	-	-	-	-	1.01
11.1	2	0.03	0.29	0.55	0.10	0.01	0.03	-	-	-	-	1.01
11.1	3	0.10	0.30	0.20	0.40	-	-	-	-	-	-	1.00
11.1	4	0.10	0.10	0.10	0.30	0.40	-	-	-	-	-	1.00
16	0	0.59	0.41	-	-	-	-	-	-	-	-	1.00
16	1	0.19	0.56	0.19	0.05	0.01	-	-	-	-	-	1.00
16	2	0.07	0.19	0.60	0.09	0.05	-	-	-	-	-	1.00
16	3	-	0.18	0.26	0.50	0.05	-	-	-	-	-	0.99
16	4	-	0.25	0.12	0.12	0.38	0.12	-	-	-	-	0.99
17	0	0.71	0.29	-	-	-	-	-	-	-	-	1.00
17	1	0.10	0.65	0.17	0.07	0.01	-	-	-	-	-	1.00
17	2	-	0.13	0.70	0.13	0.04	-	-	-	-	-	1.00
18	1	0.02	0.57	0.34	0.05	0.02	-	-	-	-	-	1.00
18	2	0.02	0.09	0.53	0.29	0.07	0.01	-	-	-	-	1.01
18	3	-	0.04	0.19	0.57	0.19	0.02	-	-	-	-	1.01
18	4	-	-	0.15	0.26	0.40	0.11	0.06	0.02	-	-	1.00
19	1	0.06	0.62	0.29	0.03	-	-	-	-	-	-	1.00
19	2	-	0.09	0.66	0.21	0.03	0.01	0.01	-	-	-	1.01
19	3	-	0.05	0.14	0.57	0.22	-	0.02	-	-	-	1.00
19	4	-	-	0.17	0.33	0.33	0.11	0.06	-	-	-	1.00
20	1	-	0.48	0.29	0.19	0.02	0.02	-	-	-	-	1.00
20	2	-	0.13	0.57	0.23	0.03	0.03	-	-	-	-	0.99
20	3	-	0.04	0.30	0.56	0.06	0.01	0.03	-	-	-	1.00
20	4	-	0.03	0.21	0.29	0.38	0.09	-	-	-	-	1.00
22	1	0.14	0.62	0.23	0.02	-	-	-	-	-	-	1.01
22	2	-	0.09	0.68	0.21	0.02	-	-	-	-	-	1.00
22	3	-	0.01	0.25	0.62	0.12	-	-	-	-	-	1.00
22	4	-	-	-	0.15	0.67	0.19	-	-	-	-	1.01
22	5	-	-	-	-	0.26	0.68	0.05	-	-	-	0.99
22	6	-	-	-	-	-	-	0.40	0.20	0.20	0.20	1.00
7	1	0.06	0.55	0.21	0.13	0.04	0.01	-	-	-	-	1.00
7	2	0.01	0.17	0.67	0.10	0.04	-	0.01	-	-	-	1.00
7	3	-	-	0.15	0.70	0.15	-	-	-	-	-	1.00
7	4	-	-	0.11	0.33	0.56	-	-	-	-	-	1.00
9	0	0.50	0.40	0.10	-	-	-	-	-	-	-	1.00
9	1	0.07	0.67	0.25	0.01	-	-	-	-	-	-	1.00
9	2	-	0.14	0.63	0.17	0.04	0.01	0.01	-	-	-	1.00
9	3	-	0.22	0.33	0.44	-	-	-	-	-	-	0.99

4.3 *Mullus surmuletus* (Event-ID 1919)

4.3.1 All readers

All samples included

Results for *Mullus surmuletus* show the same low precision with PA 41.0% (all readers) and 44.0% (advanced readers), CV 55.0% (all readers) and 53.0% (advanced readers), APE 49.0% (all readers) and 41.0% (advanced readers). An AQ3 score was assigned to 10.9% of the annotations.

Multimodal cases

Table 4.19: Total number of samples (NSample) and percentage of cases (fish samples) with multiple modes depending on the approach to weight the experience of the reader which will be considered when defining the fish age mode. PercMM_traditional shows the percentage of the total samples for which multiple modes are obtained when all the readers are equally weighted. PercMM_linear_weight shows the percentage of the total samples for which multiple modes are obtained when the weight assigned to the different readers decreases linearly with the experience, while in the PercMM_negexp the weight applied decreases with a negative exponential shape with the experience. The PercMM_multistage shows the percentage of multiple mode cases when a combination of the different methodologies is used, as explained in the material and methods section

NSample	PercMM_traditional	PercMM_linear_weight	PercMM_negexp_weight	PercMM_multistage
182	13 %	2 %	0 %	0 %

List of multimodal cases

Table 4.20: List of cases for which multiple modes where obtained when all readers are considered. The column NModes_trad shows the number of multiple modes for each FishID or SampleID when all readers are given the same expertise weight.

NModes_trad	SampleID
3	03_musur-22
2	04_musur-22
3	07_musur-22
2	08_musur-22
2	10.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L
4	10004_musur-23
3	10045_musur-22
2	10049_musur-22
3	10096_musur-22
2	12_musur-22
3	13_musur-22
2	1ms111_11_24
3	24MULLSUR251-0015
2	24MULLSUR251-0025
2	24MULLSUR351-0021
2	24MULLSUR351-0025
2	24MULLSUR351-0032
2	24MULLSUR351-0048
2	24MULLSUR351-0053
3	24MULLSUR551-0001
3	24MULLSUR551-0002
2	24MULLSUR551-0008
2	24MULLSUR551-0015
2	24MULLSUR551-0019
2	24MULLSUR551-0028

NModes_trad	SampleID
2	24MULLSUR551-0031
3	24MULLSUR551-0036
2	28ms8_11_24
2	34ms8_11_24
2	57ms84_11_24
2	6.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L
2	9.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L
3	GSA18_MS-08
2	GSA18_MS-12
3	GSA18_MS-14
2	GSA18_MS-18
2	GSA18_MS-19
3	GSA18_MS-22
4	GSA18_MS-23
2	GSA18_MS-24
2	GSA18_MS-25
4	GSA18_MS-26
4	GSA19_MULLSUR_01
2	GSA19_MULLSUR_02
2	GSA19_MULLSUR_07
2	GSA19_MULLSUR_12
2	GSA19_MULLSUR_14
2	GSA19_MULLSUR_16
2	GSA19_MULLSUR_20
3	MSUR_DCF23_05
2	MSUR_DCF23_06
2	MSUR_DCF23_09
3	MSUR_DCF23_10
2	MSUR_DCF23_12
6	MSUR_DCF23_16
3	MSUR_DCF23_17
2	MULLSURGSA16_03
2	MULLSURGSA16_11
2	MULLSURGSA16_14
2	**MULLSURGSA16_17**

Summary statistics

Table 4.21: Summary of statistics; Total number of samples (NSample), coefficient of variance (CV), percentage of agreement (PA) and average percentage error (APE) for all ages and readers

NSample	CV	PA	APE
182	55 %	41 %	42 %

In this exchange event, 182 otolith fish individuals were aged. Of those, 13 %when the traditional approach (all readers equally weighted) is used to define the mode. The percentage of multiple mode cases is reduced to 0 %. The complete list of cases with multiple modes is presented in table X in the annex 3 section, where the ageing from each of the readers participating in the exchange event is presented. When all the otolith samples are considered (both single and multimodal cases) the weighted average percentage agreement based on modal ages for all readers is 41 %, with the weighted average CV of 55 % and APE of 42 %.

Coefficient of Variation (CV)

Table 4.22: Coefficient of Variation (CV) table presents the CV per modal age and reader, the CV of all readers combined per modal age and a weighted mean of the CV per reader

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 IT	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	all
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1	-	89	79	43	63	47	50	93	36	66	53	42	46	52	68	43	50	70	64	40	74	-	**75**
2	62	53	45	32	39	37	39	51	24	46	24	41	36	36	37	24	37	50	32	32	51	67	**52**
3	56	43	35	25	30	20	32	38	29	36	26	35	24	39	31	24	21	32	24	27	49	50	**43**
4	58	29	30	36	15	27	19	35	41	22	31	27	31	32	12	19	25	29	23	19	36	50	**40**
5	47	32	32	17	0	16	10	55	34	13	41	0	25	26	10	9	24	13	33	10	31	64	**37**
Weighted Mean	**59**	**58**	**50**	**33**	**41**	**36**	**38**	**58**	**30**	**44**	**34**	**37**	**35**	**41**	**40**	**28**	**35**	**48**	**38**	**32**	**55**	**59**	**55**

Percentage of Agreement (PA)

The percentage agreement per reader per modal age tells how large part of the readings that are equal to the modal age. The weighted mean including at the bottom of the table is weighted according to number of age readings.

Table 4.23: Percentage agreement (PA) table represents the PA per modal age and reader, the PA of all readers combined per modal age and a weighted mean of the PA per reader.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 IT	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	total
0	83	100	0	0	86	0	0	100	67	100	57	-	0	0	0	0	86	100	67	0	29	100	**48**
1	41	59	47	11	61	46	34	53	69	50	62	0	37	29	35	0	38	53	58	9	45	44	**42**
2	24	51	44	22	46	57	42	38	78	29	75	16	49	51	31	0	59	41	72	23	54	13	**43**
3	33	39	52	19	42	67	28	33	56	29	59	33	63	41	25	6	54	47	64	30	43	13	**40**
4	18	42	25	17	60	50	33	0	33	33	58	25	17	17	56	11	25	44	42	50	50	0	**32**
5	60	20	20	50	100	50	60	0	0	33	0	100	40	0	33	0	0	33	0	75	60	0	**32**
Weighted Mean	**34**	**51**	**43**	**18**	**53**	**54**	**35**	**40**	**64**	**37**	**63**	**21**	**45**	**37**	**33**	**3**	**49**	**48**	**63**	**23**	**48**	**23**	**41**

Average Percentage Error (APE)

Table 4.24: Average Percentage Error (APE) table represents the APE per modal age and reader, the APE of all advanced readers combined per modal age and a weighted mean of the APE per reader.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 IT	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	all
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1	-	73	64	34	48	39	34	86	33	56	44	32	34	41	57	34	44	54	48	31	61	-	**59**
2	50	45	36	27	32	27	32	44	14	38	15	31	30	31	32	20	25	41	19	25	36	48	**40**
3	40	35	26	19	24	14	27	30	26	26	18	26	16	28	26	19	20	25	14	22	36	43	**31**
4	47	25	26	23	11	21	15	24	35	18	24	22	26	22	11	16	17	24	19	17	29	41	**32**
5	38	24	24	13	0	11	9	45	28	10	30	0	20	20	8	7	13	10	22	7	23	46	**30**
Weighted Mean	**45**	**48**	**40**	**26**	**32**	**28**	**30**	**51**	**24**	**36**	**26**	**28**	**27**	**33**	**34**	**22**	**28**	**38**	**25**	**26**	**42**	**45**	**42**

Relative bias

The relative bias is the difference between the mean age (per modal age per reader) and modal age. As for the previous tables, a combined bias for all readers and weighted means are calculated.

Table 4.25: The relative bias (as the difference between the mean and modal age) per modal age and reader is presented, as well as the weighted mean relative bias per reader and the relative bias per modal age for all readers combined.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 IT	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	all
0	0.17	0.00	1.57	2.43	0.14	1.67	2.00	0.00	0.33	0.00	0.71	-	1.14	1.43	1.00	2.00	0.14	0.00	0.33	1.50	1.29	0.00	-
1	-0.02	-0.31	0.73	1.94	0.65	0.73	1.00	-0.39	0.31	1.17	0.40	2.62	0.88	1.20	1.70	2.19	0.44	0.25	0.21	1.60	0.82	-0.52	**0.80**
2	0.27	-0.46	0.24	1.47	0.54	0.33	0.71	-0.60	-0.08	1.36	0.10	1.87	0.46	0.48	1.28	2.72	-0.06	0.30	0.09	1.28	0.29	-1.11	**0.52**
3	0.12	-0.50	-0.17	1.26	0.79	-0.11	0.48	-0.87	-0.56	0.71	-0.14	1.22	0.13	-0.13	1.15	2.71	-0.41	-0.21	0.02	0.84	-0.20	-1.50	**0.21**
4	-1.09	-0.92	-0.42	0.92	0.20	-0.33	0.67	-2.08	-1.25	-0.33	-0.50	1.75	-0.17	-1.00	0.44	1.78	-1.00	-0.56	-0.50	0.83	-0.50	-2.42	**-0.29**
5	-1.20	-1.40	-1.40	0.75	0.00	-0.50	0.40	-2.25	-2.40	-0.67	-1.80	0.00	-1.00	-1.80	0.67	1.33	-2.00	-0.67	-2.00	0.25	-0.80	-3.60	**-0.91**
Weighted Mean	**0.02**	**-0.47**	**0.23**	**1.53**	**0.59**	**0.31**	**0.76**	**-0.72**	**-0.24**	**0.79**	**0.06**	**1.74**	**0.43**	**0.40**	**1.25**	**2.44**	**-0.13**	**0.05**	**0.03**	**1.21**	**0.27**	**-1.17**	**0.41**

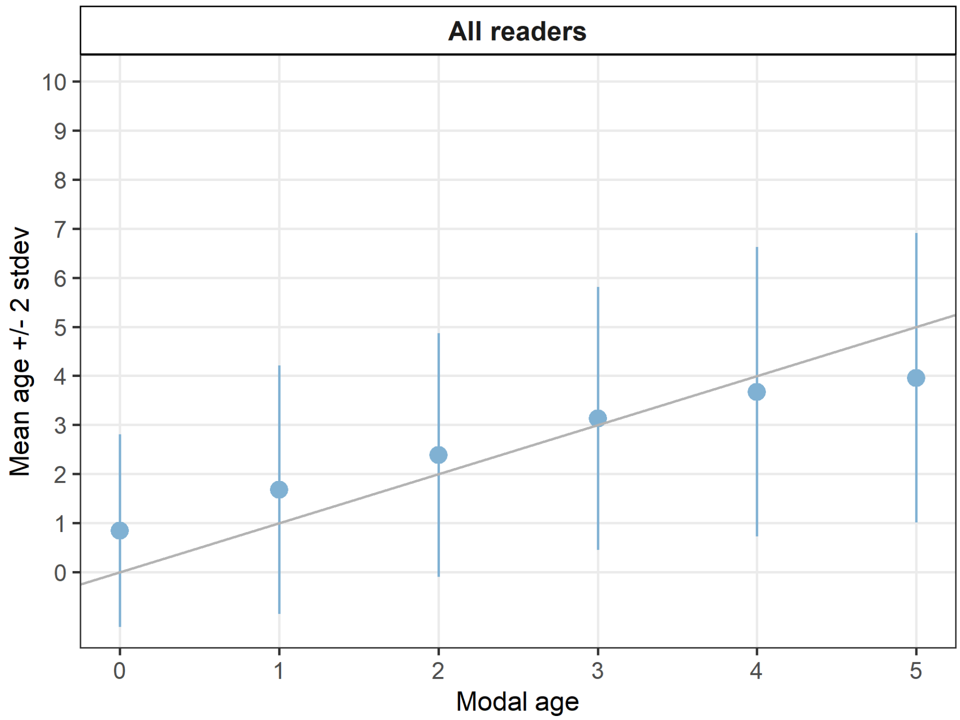

Figure 4.5: Age bias plot for all readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated mean age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age.

Inter-reader bias test

Table 4.26: Inter reader bias test. The Inter-reader bias test gives probability of bias between readers and with modal age. - = no sign of bias (p>0.05), * = possibility of bias (0.01<p<0.05), * * = certainty of bias (p<0.01) , / = diagonal of the table (no bias)

Comparison	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 IT	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR
R04 IT	/	**	-	**	-	-	**	-	**	**	*	**	-	-	**	**	**	**	**	**	**	**
R08 FR	**	/	-	*	**	**	**	**	**	**	**	**	**	**	**	**	**	*	-	*	**	**
R12 IT	-	-	/	**	**	**	-	**	**	-	**	**	**	**	**	**	**	**	**	**	**	**
R14 ES	**	*	**	/	**	**	**	*	**	-	**	-	**	**	**	**	**	**	**	*	**	*
R16 IT	-	**	**	**	/	**	**	**	**	**	-	**	**	**	**	**	**	-	-	*	-	*
R18 IT	-	**	**	**	**	/	*	**	-	-	**	**	**	**	**	**	-	**	**	**	**	**
R20 IT	**	**	-	**	**	*	/	**	**	**	-	**	**	**	-	**	**	-	-	-	-	*
R22 GR	-	**	**	*	**	**	**	/	**	**	**	**	**	**	**	**	**	**	**	*	**	**
R24 IT	**	**	**	**	**	-	**	**	/	**	**	**	**	-	**	**	*	**	**	**	-	**
R26 IT	**	**	-	-	**	-	**	**	**	/	-	*	**	**	*	**	**	-	-	-	-	**
R28 IT	*	**	**	**	-	**	-	**	**	-	/	**	*	**	**	**	**	**	**	**	**	**
R32 GB	**	**	**	-	**	**	**	**	**	*	**	/	**	**	-	**	**	**	**	-	**	**
R36 FR	-	**	**	**	**	**	**	**	**	**	*	**	/	**	**	**	-	**	**	**	**	*
R38 SI	-	**	**	**	**	**	**	**	-	**	**	**	**	/	**	**	-	*	**	**	**	**
R42 IT	**	**	**	**	**	**	-	**	**	*	**	-	**	**	/	**	**	**	**	-	**	**
R48 ES	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	/	**	**	**	**	**	**
R52 GR	**	**	**	**	**	-	**	**	*	**	**	**	-	-	**	**	/	**	**	**	**	**
R54 GR	**	*	**	**	-	**	-	**	**	-	**	**	**	*	**	**	**	/	**	**	**	**
R56 IT	**	-	**	**	-	**	-	**	**	-	**	**	**	**	**	**	**	**	/	**	*	**
R58 ES	**	*	**	*	*	**	-	*	**	-	**	-	**	**	-	**	**	**	**	/	**	*
R60 IT	**	**	**	**	-	**	-	**	-	-	**	**	**	**	**	**	**	**	*	**	/	**
R62 GR	**	**	**	*	*	**	*	**	**	**	**	**	*	**	**	**	**	**	**	*	**	/
Modal age	**	**	**	**	**	-	**	**	**	-	**	**	-	-	**	**	**	**	**	**	*	**

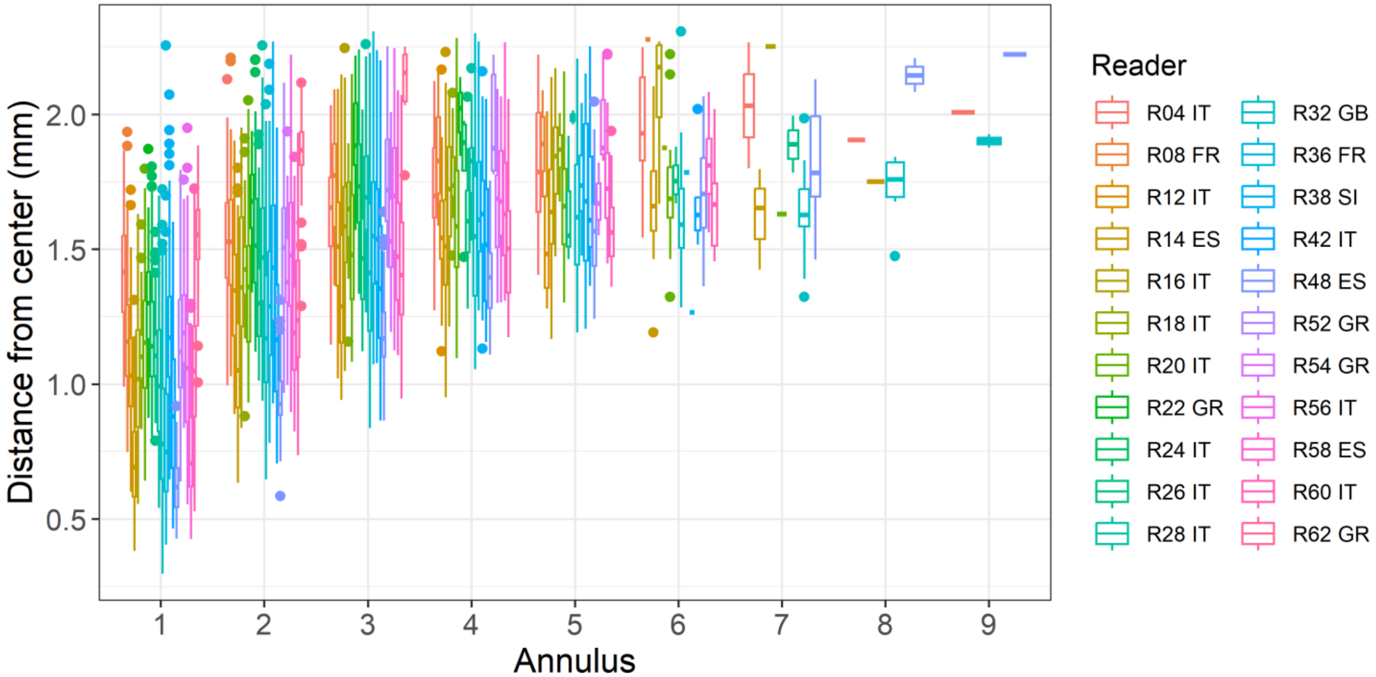

Figure 4.6: Plot of average distance from the centre to the winter rings for all readers. The boxes represent the median, upper and lower box boundaries of the interquartile range, whiskers represent the minimum and maximum values and the dots represent the outliers.

4.3.2 Advanced readers

All samples included

Multimodal cases

Table 4.27: Summary of statistics; Total number of samples (NSample), a percentage of cases (fish samples) with multiple modes depending on the approach to weight the experience of the reader which will be considered when defining the fish age mode. PercMM_traditional shows the percentage of the total samples for which multiple modes are obtained when all the readers are equally weighted. PercMM_linear_weight shows the percentage of the total samples for which multiple modes are obtained when the weight assigned to the different readers decreases linearly with the experience, while in the PercMM_negexp the weight applied decreases with a negative exponential shape with the experience. The PercMM_multistage shows the percentage of multiple mode cases when a combination of the different methodologies is used, as explained in the material and methods section

NSample	PercMM_traditional	PercMM_linear_weight	PercMM_negexp_weight	PercMM_multistage
182	33 %	2 %	0 %	0 %

Summary statistics

Table 4.28: Summary of statistics; Total number of samples (NSample), coefficient of variance (CV), percentage of agreement (PA) and average percentage error (APE) for all ages and readers

NSample	CV	PA	APE
182	53 %	44 %	41 %

In this exchange event, 182 otolith fish individuals were aged. Of those, 33 %when the traditional approach (all readers equally weighted) is used to define the mode. The percentage of multiple mode cases is reduced to 0 %. The complete list of cases with multiple modes is presented in table X in the annex 3 section, where the ageing from each of the readers participating in the exchange event is presented. When all the otolith samples are considered (both single and multimodal cases) the weighted average percentage agreement based on modal ages for all readers is 44 %, with the weighted average CV of 53 % and APE of 41 %.

Coefficient of Variation (CV)

Table 4.20: Coefficient of Variation (CV) table presents the CV per modal age and advanced reader, the CV of all advanced readers combined per modal age and a weighted mean of the CV per reader.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	all
0	-	-	-	-	-	-	-	**-**	**-**
1	97	61	66	41	59	41	48	**79**	**74**
2	65	52	42	38	40	39	36	**51**	**52**
3	52	38	33	21	34	18	34	**42**	**40**
4	35	36	39	38	24	23	26	**37**	**38**
5	33	55	45	16	16	30	16	**61**	**42**
6	28	55	29	0	23	-	20	**40**	**36**
Weighted Mean	**66**	**50**	**49**	**33**	**45**	**34**	**37**	**56**	**53**

Percentage of Agreement (PA)

Table 4.30: Percentage agreement (PA) table represents the PA per modal age and reader, advanced the PA of all advanced readers combined per modal age and a weighted mean of the PA per reader.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	all
0	93	94	25	0	33	0	0	**88**	**44**
1	57	72	53	9	51	41	33	**57**	**47**
2	35	62	53	27	39	68	43	**36**	**45**
3	53	44	51	30	44	72	36	**20**	**43**
4	50	38	46	36	33	50	38	**0**	**36**
5	56	10	30	67	75	17	70	**0**	**41**
6	50	25	0	100	25	0	25	**0**	**29**
Weighted Mean	**53**	**58**	**47**	**25**	**44**	**52**	**36**	**37**	**44**

Average Percentage Error (APE)

Table 4.31: Average Percentage Error (APE) table represents the APE per modal age and reader, the APE of all advanced readers combined per modal age and a weighted mean of the APE per reader.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	all
0	-	-	-	-	-	-	-	**-**	**-**
1	60	47	55	31	44	35	33	**64**	**59**
2	48	42	32	30	33	27	30	**44**	**40**
3	30	33	24	17	25	11	28	**30**	**28**
4	28	30	31	26	19	19	19	**27**	**31**
5	24	46	39	13	12	24	8	**44**	**36**
6	20	43	21	0	18	0	16	**30**	**31**
Weighted Mean	**43**	**40**	**39**	**25**	**35**	**25**	**28**	**44**	**41**

Relative Bias

Table 4.32: The relative bias (as the difference between the mean and modal age) per modal age and advanced reader is presented, as well as the weighted mean relative bias per reader and the relative bias per modal age for all advanced readers combined.

Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	all
0	0.07	0.06	1.19	2.50	0.87	1.33	1.80	**0.12**	**0.99**
1	-0.04	-0.19	0.79	2.02	0.74	0.74	0.98	**-0.21**	**0.60**
2	0.19	-0.40	0.28	1.59	0.70	0.35	0.78	**-0.53**	**0.37**
3	0.05	-0.58	-0.18	0.93	0.22	-0.07	0.33	**-1.07**	**-0.05**
4	-0.67	-1.08	-0.62	0.45	0.08	-0.40	0.15	**-1.92**	**-0.50**
5	-0.89	-2.40	-1.70	0.56	-0.38	-1.50	0.00	**-3.00**	**-1.16**
6	-1.00	-2.50	-2.50	0.00	-0.50	-1.00	-1.25	**-3.50**	**-1.53**
Weighted Mean	**-0.06**	**-0.55**	**0.14**	**1.46**	**0.49**	**0.27**	**0.67**	**-0.81**	**0.20**

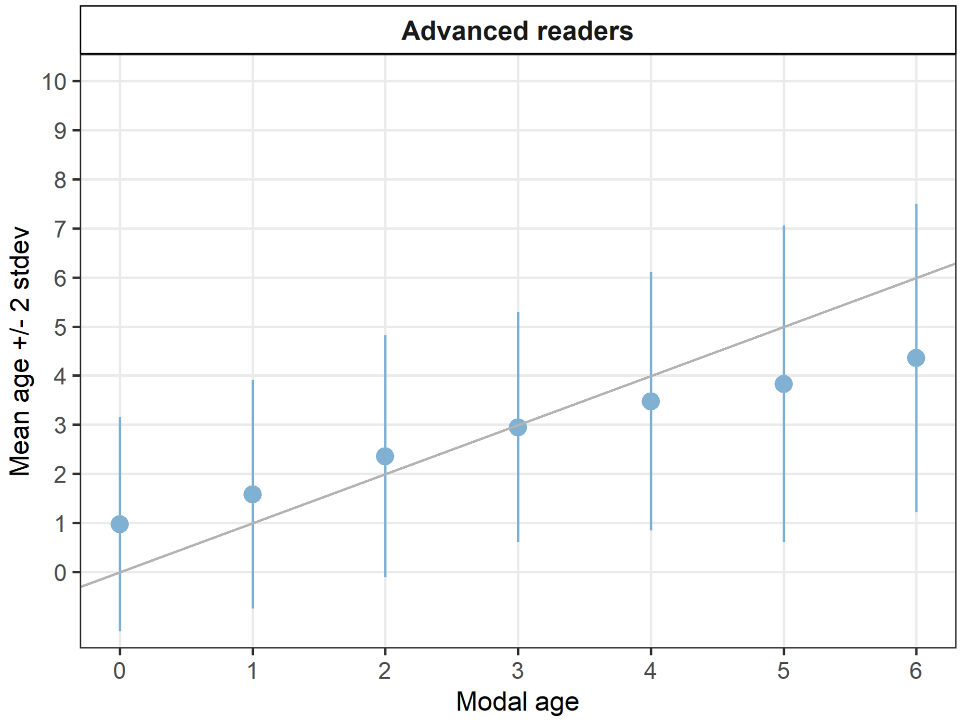

Figure 4.7: Age bias plot for advanced readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated mean age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age.

Growth analysis

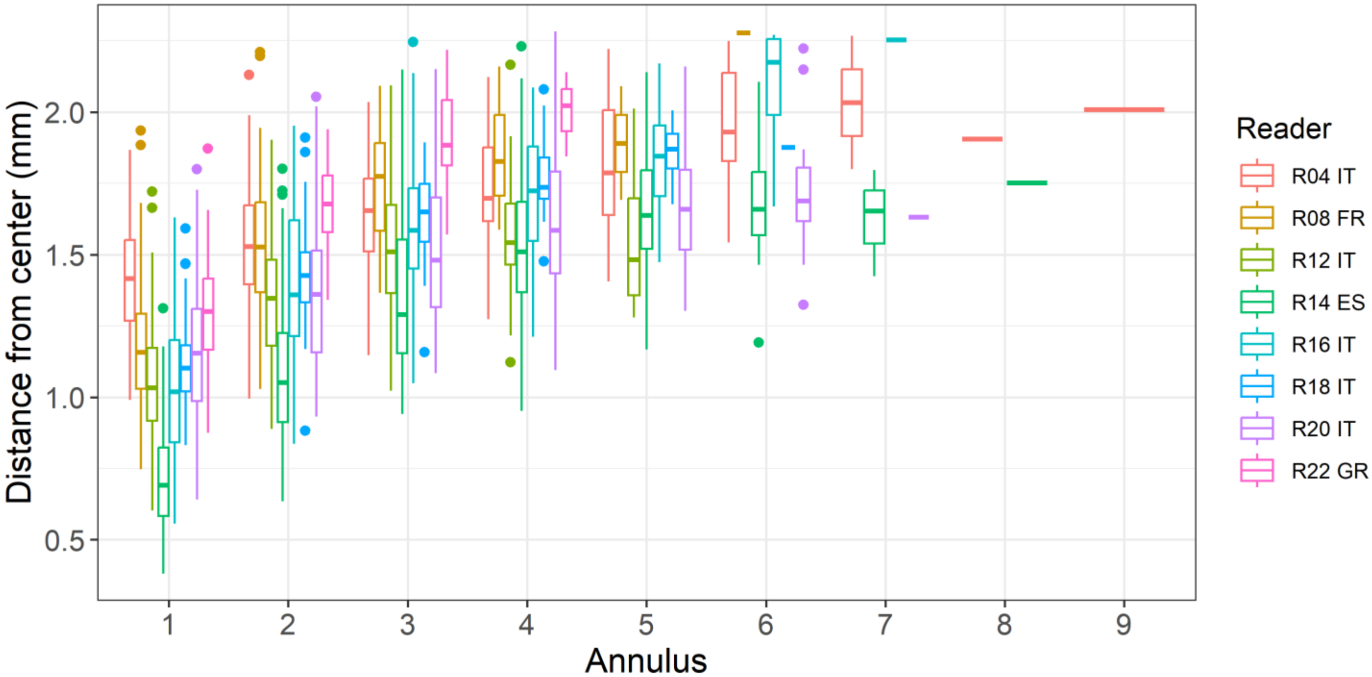

Figure 4.8: Plot of average distacne from the centre to the winter rings for advanced readers. The boxes represent the mean, upper and lower box boundaries of the interquartile range, whiskers represent the minimum and maximum values and the dots represent the outliers.

General Age Error Matrix (AEM)

Table 4.33: General Age error matrix (AEM). The modal age is in rows and the age classifications by the advanced readers in columns.

modal_age	0	1	2	3	4	5	6	7	8	9	Total
0	0.44	0.27	0.19	0.08	0.01	0.01	-	-	-	-	1.00
1	0.12	0.47	0.22	0.11	0.06	0.02	0.01	-	-	-	1.01
2	0.03	0.17	0.45	0.17	0.12	0.04	0.01	-	0	-	0.99
3	0.00	0.10	0.21	0.43	0.17	0.07	0.01	0.00	-	0	0.99
4	0.01	0.07	0.15	0.21	0.36	0.14	0.05	-	-	-	0.99
5	-	0.13	0.13	0.11	0.15	0.41	0.04	0.03	-	-	1.00
6	-	0.04	0.07	0.25	0.14	0.18	0.29	0.04	-	-	1.01

AEM by ICES area

Table 4.34: Age error matrix (AEM) for ICES area/GSA

ices_area/ GSA	modal_age	0	1	2	3	4	5	6	7	8	9	Total
16	0	0.43	0.27	0.23	0.07	-	-	-	-	-	-	1.00
16	1	0.13	0.51	0.16	0.16	0.05	-	-	-	-	-	1.01
16	2	0.12	0.25	0.45	0.12	0.04	0.02	-	-	-	-	1.00
16	3	-	0.14	0.14	0.57	0.14	-	-	-	-	-	0.99
18	0	0.33	0.27	0.13	0.13	0.07	0.07	-	-	-	-	1.00
18	1	0.11	0.44	0.17	0.11	0.12	0.05	0.01	-	-	-	1.01
18	2	-	0.10	0.38	0.22	0.22	0.07	-	-	-	-	0.99
18	3	-	0.14	0.21	0.40	0.16	0.10	-	-	-	-	1.01
18	4	-	0.13	0.22	0.26	0.30	0.09	-	-	-	-	1.00
19	0	0.44	0.44	0.12	-	-	-	-	-	-	-	1.00
19	1	0.16	0.48	0.33	0.03	-	-	-	-	-	-	1.00
19	2	0.01	0.21	0.54	0.15	0.07	0.01	-	-	-	-	0.99
19	3	-	-	0.25	0.38	0.25	0.12	-	-	-	-	1.00
21	1	-	0.50	0.27	0.20	0.03	-	-	-	-	-	1.00
21	2	-	0.12	0.49	0.18	0.14	0.06	-	-	-	-	0.99
21	3	-	0.12	0.22	0.53	0.06	-	0.03	0.03	-	-	0.99
21	4	-	-	0.20	0.20	0.40	0.20	-	-	-	-	1.00
21	5	-	0.07	0.14	0.14	0.14	0.43	0.07	-	-	-	0.99
21	6	-	-	0.17	0.33	0.17	-	0.33	-	-	-	1.00
22	1	-	0.33	0.17	-	0.17	0.17	0.17	-	-	-	1.01
22	2	-	0.18	0.39	0.14	0.18	0.07	0.04	-	-	-	1.00
22	3	-	-	0.13	0.35	0.22	0.26	0.04	-	-	-	1.00
22	4	0.02	0.04	0.13	0.15	0.39	0.15	0.11	-	-	-	0.99
22	5	-	0.18	0.11	0.11	0.16	0.37	0.03	0.05	-	-	1.01
22	6	-	0.14	0.14	0.14	0.14	0.14	0.29	-	-	-	0.99
27.8.c	0	0.29	0.29	0.29	0.14	-	-	-	-	-	-	1.01
27.8.c	1	0.38	0.50	-	0.12	-	-	-	-	-	-	1.00
27.8.c	2	-	0.11	0.36	0.14	0.21	0.07	0.11	-	-	-	1.00
27.8.c	3	-	0.11	0.21	0.41	0.20	0.05	-	-	-	0.02	1.00
27.8.c	4	-	0.14	-	0.29	0.29	0.29	-	-	-	-	1.01
27.8.c	6	-	-	-	0.27	0.13	0.27	0.27	0.07	-	-	1.01
27.9.a	1	0.21	0.43	0.21	0.07	0.07	-	-	-	-	-	0.99
27.9.a	2	0.12	0.25	0.38	0.12	0.12	-	-	-	-	-	0.99
7	0	0.50	-	0.33	0.17	-	-	-	-	-	-	1.00
7	1	-	0.43	0.29	0.14	0.14	-	-	-	-	-	1.00
7	2	-	0.17	0.47	0.30	0.03	0.03	-	-	-	-	1.00
7	3	0.02	0.17	0.18	0.38	0.12	0.10	0.03	-	-	-	1.00
7	5	-	-	0.25	-	-	0.75	-	-	-	-	1.00
8	0	0.50	0.22	0.17	0.11	-	-	-	-	-	-	1.00
8	1	0.13	0.61	0.22	0.04	-	-	-	-	-	-	1.00
8	2	0.13	0.17	0.48	0.13	0.09	-	-	-	-	-	1.00
8	3	-	-	0.42	0.48	0.10	-	-	-	-	-	1.00

4.4 Discussion and conclusion

The WKVALMU2 otolith exchange for *Mullus barbatus* and *Mullus surmuletus* provides a comprehensive and up-to-date evaluation of age reading performance across a broad geographical range and a heterogeneous group of readers. Overall, the results confirm that age estimation for both *Mullus* species remains challenging, with relatively low precision and agreement levels, particularly when considering all participating readers. Despite previous exchanges and workshops, substantial inter-reader variability persists, underlining the need for continued calibration, training, and methodological harmonisation

General performance and comparison between species

Across both species, the percentage agreement (PA), coefficient of variation (CV), and average percentage error (APE) values indicate modest ageing precision. For *Mullus barbatus*, PA reached 49% for all readers and improved to 59% when only advanced readers were considered, while CV and APE decreased accordingly. For *Mullus surmuletus*, performance was consistently lower, with PA values of 41% (all readers) and 44% (advanced readers), and higher CV and APE values. These results suggest that *M. surmuletus* otoliths are inherently more difficult to interpret, likely due to more complex growth patterns, higher variability in ring clarity, and potentially stronger environmental influences on otolith microstructure.

The systematic improvement observed when restricting analyses to advanced readers highlights the importance of experience and training. Nevertheless, even among advanced readers, agreement and precision remain below levels typically considered optimal for robust stock assessment inputs, indicating that experience alone does not fully resolve the ageing uncertainty for these species.

Multimodal ages and the multistage modal age approach

A key methodological outcome of this exchange is the successful application of the multistage approach for modal age determination. When using the traditional unweighted mode, a non-negligible proportion of otoliths exhibited multiple modal ages for both species (8-14% for *M. barbatus* and 13-33% for *M. surmuletus*, depending on the reader group). Such ambiguity can introduce bias into performance metrics and downstream stock assessment products.

By incorporating reader experience through linear and negative exponential weighting, the multistage approach consistently reduced multimodal cases to zero. This confirms previous findings within the SmartDots and WGBIOP frameworks and demonstrates that weighted modal age selection is an effective and pragmatic solution for complex exchange datasets. Importantly, this approach allows the full dataset to be retained for analysis while minimising artefacts related to reader heterogeneity.

Age-specific patterns and bias

Age-specific analyses reveal that disagreement and imprecision are most pronounced at younger ages (0–1) and again at older ages (≥4–5). For young fish, difficulties are likely related to the identification of the first annulus and edge interpretation, especially in the absence of length information. For older fish, progressively narrower growth increments and increased ring crowding reduce readability and contribute to age underestimation or overestimation, as reflected in the observed relative bias patterns.

Bias plots and inter-reader bias tests indicate systematic differences among readers, with several statistically significant pairwise biases for both species. While some degree of bias is expected in large international exchanges, the magnitude and consistency observed here suggest that differences in interpretation criteria, such as the treatment of false checks, split rings, and marginal increments, remain unresolved. These issues are particularly evident for *M. surmuletus*, where stronger positive bias at younger ages and negative bias at older ages were frequently observed.

Growth increment analysis

The otolith growth analyses based on SmartDots measurements provide additional insight into the sources of ageing variability. The dispersion of increment widths among readers, especially beyond the second or third winter ring, reflects differing interpretations of annulus boundaries rather than true biological variability alone. Although median increment patterns were broadly consistent, the presence of outliers and wide interquartile ranges suggests that clearer operational definitions of annulus identification are required, potentially supported by reference collections and annotated image libraries.

Implications for stock assessment and management

From a stock assessment perspective, the results of WKVALMU2 raise important considerations. The relatively high CV and APE values, combined with detectable inter-reader bias, imply that age data for both *Mullus* species, particularly *M. surmuletus*, should be used with caution. The age error matrices indicate substantial misclassification between adjacent age classes, which can propagate uncertainty into estimates of growth, mortality, and recruitment.

The improved performance of advanced readers supports the continued use of restricted reader pools for assessment purposes. However, the remaining uncertainty even within this group suggests that additional quality control measures are warranted. These may include routine re-calibration exercises, regional ageing workshops focused on problematic age classes, and the increased use of otolith growth information to support age interpretation.

Recommendations

In conclusion, WKVALMU2 confirms that age estimation for *Mullus barbatus* and *Mullus surmuletus* remains a complex and error-prone task. While methodological advances such as the multistage modal age approach substantially improve analytical robustness, biological and interpretative challenges persist. The exchange highlights the clear benefits of reader experience but also demonstrates that further harmonisation is necessary to achieve consistently reliable age data.

Future efforts should prioritise (i) targeted training on early and late age classes, (ii) refinement and dissemination of common ageing criteria, (iii) continued application of weighted modal age approaches within exchange analyses, and (iv) integration of growth increment information into routine ageing validation. Regular international exchanges such as WKVALMU2 remain essential for maintaining data quality and supporting sustainable management of *Mullus* stocks. Consequently, a dedicated workshop is considered necessary to review and harmonize ageing criteria among the responsible readers. The workshop should aim to standardize protocols by reaching agreement on date of birth, ageing schemes, and methodologies, as well as to update otolith reference collections and associated image databases in accordance with standardized procedures and current best practices. In addition, it should address the discussion and proposal of appropriate validation methods for *Mullus* species.

5 References

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6 Annex 3. Additional results

6.1 Results *M. barbatus* (Event-ID1914)

6.1.1 All readers

All samples included

Summary statistics

Table 6.1: Summary of statistics; PA (%), CV (%) and APE (%).

NSample	CV	PA	APE
258	50 %	49 %	38 %

Data Overview

Table 6.2: Data overview including modal age and statistics per sample.

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
10mb113_11_24	187	F	25/09/2024	11.1	1	2	1	2	2	2	2	2	2	1	2	2	3	2	3	2	-	1	2	2	2	1	2	67	31	22
13mb111_11_24	151	M	23/09/2024	11.1	1	1	0	1	1	1	2	2	2	1	2	2	1	2	2	1	3	1	0	2	1	1	1	50	53	45
14mb111_11_24	141	M	23/09/2024	11.1	1	2	1	2	2	1	1	2	2	1	2	2	2	2	2	2	-	1	0	3	1	1	2	52	43	37
16mb104_11_24	159	F	16/07/2024	11.1	1	2	1	1	1	1	2	2	2	1	2	1	3	3	3	1	4	1	1	2	1	1	1	55	53	44
17mb10_11_24	168	F	18/03/2024	11.1	3	4	0	3	3	4	4	4	4	2	4	3	3	4	5	3	5	3	1	4	3	2	4	36	37	27
19mb111_11_24	146	M	23/09/2024	11.1	1	1	0	1	1	1	1	2	1	1	2	1	3	3	3	2	3	2	1	3	1	1	1	55	57	50
1mb113_11_24	188	F	25/09/2024	11.1	2	-	2	2	2	2	2	3	2	2	2	2	2	4	2	2	-	-	2	3	2	2	2	84	24	16
1mb14_11_24	193	F	26/03/2024	11.1	1	3	1	3	2	2	5	2	2	2	3	1	3	-	4	2	3	2	2	4	3	2	2	43	42	34
1mb16_11_24	202	F	08/04/2024	11.1	1	1	1	2	1	2	2	2	2	2	2	2	3	3	2	-	2	-	2	2	2	2	2	70	29	19
1mb9_11_24	106	M	12/03/2024	11.1	0	1	0	1	0	1	1	1	2	0	2	1	2	2	2	-	-	-	0	2	1	1	1	42	74	57
21mb104_11_24	182	F	16/07/2024	11.1	1	2	1	2	1	2	2	2	2	1	2	1	5	-	2	-	4	-	1	2	2	2	2	58	53	31
22mb14_11_24	137	F	26/03/2024	11.1	1	1	0	2	1	1	1	1	1	0	2	1	3	-	3	-	-	-	1	2	2	1	1	56	63	50
22mb40_11_24	141	M	12/06/2024	11.1	1	0	0	1	1	1	2	1	1	0	2	2	3	3	2	1	4	1	1	2	2	1	1	45	69	56
24MULLBAR501-0003	195	F	10/01/2024	7	1	2	2	2	2	2	2	2	2	2	3	2	3	2	3	2	3	2	2	3	3	2	2	68	24	19
24MULLBAR501-0005	200	F	10/01/2024	7	3	2	1	1	2	2	4	2	2	2	2	1	3	4	3	2	3	2	2	3	2	2	2	55	36	28
24MULLBAR501-0011	170	F	10/01/2024	7	3	2	2	2	2	2	4	3	3	2	3	1	3	5	2	2	3	3	2	2	3	2	2	50	34	27
24MULLBAR501-0023	190	F	10/01/2024	7	1	2	1	2	2	2	3	2	2	2	2	1	5	2	2	2	3	2	2	2	2	2	2	73	39	21
24MULLBAR501-0034	175	F	10/01/2024	7	1	3	1	2	1	-	3	2	1	1	3	1	2	4	3	1	3	1	-	3	3	1	1	45	51	45
24MULLBAR501-0039	165	F	10/01/2024	7	1	3	1	1	2	3	4	2	3	1	3	2	4	6	3	3	3	3	2	3	5	1	3	41	49	38

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
24MULLBAR501-0056	150	M	27/03/2024	7	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	86	19	9
24MULLBAR501-0072	115	F	27/03/2024	7	0	1	0	1	1	2	2	1	1	1	2	1	3	-	1	0	2	1	-	1	1	1	1	60	65	46
24MULLBAR501-0084	110	M	27/03/2024	7	0	2	1	1	1	2	3	1	2	1	2	1	4	2	2	1	2	1	-	1	2	1	1	48	55	44
24MULLBAR501-0091	165	M	03/09/2024	7	1	3	1	1	1	3	3	2	3	1	2	1	5	4	1	2	2	3	1	2	2	1	1	41	55	43
24MULLBAR501-0098	140	M	03/09/2024	7	0	2	1	2	1	2	2	2	1	1	3	1	4	1	1	1	2	1	-	1	2	1	1	52	57	46
24MULLBAR501-0099	165	F	03/09/2024	7	1	4	1	2	1	4	3	3	4	1	5	3	4	4	3	3	3	2	1	4	4	1	4	32	47	40
24MULLBAR501-0114	130	M	03/09/2024	7	2	3	1	1	1	2	2	2	4	1	2	1	5	3	2	1	2	1	1	3	3	1	1	41	56	41
24MULLBAR501-0126	165	F	03/09/2024	7	2	2	1	1	1	1	2	1	1	1	2	1	4	1	2	1	2	1	1	2	2	1	1	59	49	39
24MULLBAR501-0130	200	F	03/09/2024	7	3	4	2	3	3	3	3	3	3	3	3	3	4	3	4	3	4	3	3	3	3	3	3	77	15	10
24MULLBAR501-0164	175	F	11/09/2024	7	2	3	1	1	1	1	-	1	1	1	2	2	2	-	2	1	3	1	-	3	2	1	1	53	47	41
24MULLBAR501-0172	215	F	02/12/2024	7	3	-	2	2	2	3	4	3	2	2	3	3	3	3	3	3	3	3	-	3	3	2	3	65	20	16
24MULLBAR501-0174	215	F	02/12/2024	7	6	4	2	3	2	3	3	3	2	2	3	3	4	3	3	3	4	3	-	3	3	2	3	57	30	18
24MULLBAR501-0180	195	F	02/12/2024	7	2	2	1	1	2	1	2	2	2	1	2	1	2	2	2	2	3	2	-	2	1	1	2	62	33	28
24MULLBAR501-0189	175	F	02/12/2024	7	3	-	1	3	1	2	5	3	1	2	4	1	3	2	2	2	-	2	2	2	4	1	2	40	49	39
24MULLBAR501-0200	165	M	02/12/2024	7	3	2	0	1	1	-	2	0	1	1	4	1	1	-	2	1	2	1	-	2	1	0	1	47	74	57
24MULLBAR501-0231	120	F	04/12/2024	7	2	1	1	1	1	1	2	1	1	0	4	1	2	1	2	1	2	1	1	1	1	0	1	64	65	45
24MULLBAR501-0234	115	M	04/12/2024	7	1	2	0	1	1	1	2	-	1	0	2	1	3	3	2	1	-	1	1	1	1	0	1	55	68	52
24MULLBAR501-0245	160	M	05/12/2024	7	4	4	2	3	3	4	4	4	4	3	7	3	5	4	4	4	5	4	-	4	4	2	4	57	28	18
24MULLBAR551-0026	192	F	28/05/2024	7	2	2	2	2	2	2	2	2	2	2	3	2	2	-	2	2	-	3	2	2	1	2	2	85	19	9
24MULLBAR551-0056	180	F	29/05/2024	7	3	2	1	1	2	2	2	2	2	2	2	1	2	3	2	2	2	2	2	2	0	1	2	68	37	25
24MULLBAR551-0091	151	F	06/06/2024	7	1	2	1	2	2	2	1	2	2	2	3	1	3	2	3	2	3	2	2	1	2	1	2	55	36	26
24MULLBAR551-0111	161	F	06/06/2024	7	2	2	1	1	2	2	3	2	2	2	2	1	3	-	2	2	3	1	1	2	1	2	2	57	35	26

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
24MULLBAR551-0176	205	F	09/06/2024	7	0	2	2	2	2	3	4	3	3	3	3	3	-	3	3	2	-	2	2	3	2	2	3	45	34	27
24MULLBAR551-0180	220	F	09/06/2024	7	3	3	2	3	2	3	4	4	3	4	4	3	5	4	4	3	4	3	3	3	4	3	3	50	22	18
24mb104_11_24	154	M	16/07/2024	11.1	0	1	1	1	1	1	1	-	1	1	1	1	1	-	2	-	4	-	0	2	1	1	1	72	73	43
29mb113_11_24	141	M	25/09/2024	11.1	0	-	0	3	1	1	2	1	1	0	3	1	3	-	3	-	3	-	1	1	2	1	1	44	73	63
2mb18_11_24	175	M	15/04/2024	11.1	2	2	1	3	1	3	4	2	3	2	4	3	4	5	3	2	3	-	-	3	3	2	3	40	37	29
31mb104_11_24	186	M	16/07/2024	11.1	1	3	1	2	2	-	3	3	1	2	4	2	2	-	4	-	6	-	-	4	3	2	2	35	50	39
33mb40_11_24	121	M	12/06/2024	11.1	1	1	0	2	1	2	2	1	2	0	3	2	4	-	2	1	3	1	1	2	1	1	1	43	62	50
36mb104_11_24	157	M	16/07/2024	11.1	0	1	1	1	1	2	2	2	1	1	2	2	4	3	3	2	4	1	1	3	2	2	1	36	56	43
3mb10_11_24	211	F	18/03/2024	11.1	1	-	2	3	1	2	5	3	2	2	3	2	3	4	3	2	3	3	1	3	3	3	3	48	38	30
4mb21_11_24	180	F	29/04/2024	11.1	2	1	1	2	1	2	2	2	2	2	2	2	2	-	2	-	2	-	2	2	2	2	2	84	20	14
55mb104_11_24	150	M	16/07/2024	11.1	0	1	1	1	2	1	2	2	1	1	2	1	4	-	3	1	3	1	0	3	1	1	1	52	68	55
5mb104_11_24	182	F	16/07/2024	11.1	2	-	0	2	1	2	3	-	3	1	4	3	5	4	4	-	4	-	-	3	3	2	3	29	48	39
5mb111_11_24	144	F	23/09/2024	11.1	1	1	0	1	1	2	3	2	2	1	2	2	3	4	2	2	3	2	0	3	1	1	2	36	58	46
5mb22_11_24	152	F	15/05/2024	11.1	1	2	0	1	1	1	1	2	1	1	2	2	2	4	3	2	3	2	-	3	2	2	2	43	51	39
5mb40_11_24	138	M	12/06/2024	11.1	3	3	1	2	1	-	3	3	4	1	5	4	5	4	4	2	4	2	1	4	3	1	4	29	47	40
6mb8_11_24	179	F	11/03/2024	11.1	1	2	0	2	1	2	1	2	2	1	3	2	2	3	2	1	-	1	1	2	2	2	2	52	44	36
7mb104_11_24	160	F	16/07/2024	11.1	1	2	1	1	1	2	2	2	1	1	3	3	3	4	3	1	4	-	1	3	3	1	1	43	52	45
7mb22_11_24	165	F	15/05/2024	11.1	1	3	0	3	2	2	3	2	3	1	4	3	3	-	4	2	5	3	1	4	3	2	3	38	47	38
7mb8_11_24	192	F	11/03/2024	11.1	2	3	2	3	1	2	5	3	2	2	3	3	3	4	3	2	-	2	1	3	2	2	2	43	37	29
GSA17-32115	172	F	11/08/2015	17	2	-	-	2	-	-	-	1	-	1	3	-	1	-	-	-	-	-	-	1	1	2	1	56	47	40
GSA17-32116	168	F	11/08/2015	17	3	-	2	2	3	1	1	2	-	1	3	1	1	-	6	-	-	-	-	1	1	1	1	53	72	51
GSA17-32117	166	F	11/08/2015	17	4	2	2	2	3	2	1	2	-	2	3	1	4	-	6	-	-	-	-	2	2	2	2	56	51	38

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
GSA17-32118	158	U	11/08/2015	17	-	1	1	1	3	1	1	2	2	1	3	1	1	-	5	-	-	-	-	2	1	1	1	62	67	51
GSA17-32119	153	U	11/08/2015	17	-	-	1	2	-	2	-	-	-	-	3	1	0	-	-	-	-	-	-	1	1	1	1	56	65	50
GSA17-32120	150	U	11/08/2015	17	2	1	1	1	2	1	1	1	1	1	3	1	1	-	-	-	-	-	-	1	1	1	1	81	46	32
GSA17-32121	139	U	11/08/2015	17	3	2	2	2	2	2	3	2	2	2	2	1	1	-	-	-	-	-	-	2	2	1	2	69	30	18
GSA17-32122	140	U	11/08/2015	17	2	1	1	1	3	2	-	2	-	1	3	1	2	-	-	-	-	-	-	1	2	1	1	50	45	39
GSA17-32123	137	U	11/08/2015	17	2	1	1	1	2	1	1	1	1	1	3	1	2	-	-	-	-	-	-	1	2	1	1	69	45	38
GSA17-32124	121	U	11/08/2015	17	0	-	1	1	-	-	-	-	0	1	-	1	1	-	4	-	-	-	-	-	2	1	1	60	95	60
GSA17-32125	135	U	11/08/2015	17	1	1	1	1	3	2	1	2	2	1	2	2	2	-	-	1	-	1	2	2	1	1	1	53	40	36
GSA17-32129	109	U	11/08/2015	17	1	-	1	1	-	1	1	1	0	-	-	1	1	-	4	0	-	0	-	1	1	0	1	67	103	53
GSA17-32130	98	U	11/08/2015	17	0	0	0	0	-	0	-	1	1	1	-	1	0	-	5	0	-	0	-	2	1	0	0	56	-	-
GSA17-32131	116	U	11/08/2015	17	2	-	1	1	4	-	-	2	1	1	5	1	3	-	5	-	-	0	-	1	2	0	1	40	84	65
GSA17-32132	119	U	11/08/2015	17	-	1	1	1	3	1	1	0	0	1	4	1	1	-	5	-	-	0	-	1	2	0	1	53	104	75
GSA17-32133	111	U	11/08/2015	17	-	1	1	1	2	1	1	0	0	1	-	1	1	-	5	1	-	1	-	1	1	0	1	71	99	50
GSA17-32134	111	U	11/08/2015	17	1	1	1	1	3	1	2	1	0	1	-	1	1	-	5	0	-	0	-	1	1	0	1	61	103	62
GSA17-32135	118	U	11/08/2015	17	1	1	0	1	1	1	-	0	0	1	-	1	1	-	-	0	-	1	-	1	1	0	1	69	70	62
GSA17-32136	116	U	11/08/2015	17	1	-	0	1	3	1	2	1	-	1	-	1	2	-	5	2	-	2	-	1	1	0	1	50	81	58
GSA17-32137	94	U	11/08/2015	17	0	1	1	2	3	1	2	1	2	1	6	1	2	-	5	0	-	0	-	1	1	0	1	42	102	73
GSA17-32138	99	U	11/08/2015	17	0	-	0	1	-	1	2	1	1	2	6	1	5	-	6	0	-	0	-	1	0	0	1	35	-	-
GSA18_COISPA_MB-01	215	F	20/09/2024	18	2	3	2	3	4	3	2	3	4	2	6	3	3	5	5	3	4	3	2	4	3	2	3	41	34	27
GSA18_COISPA_MB-02	200	F	20/09/2024	18	2	2	2	2	3	2	2	4	2	2	5	2	6	5	3	2	5	2	2	3	2	2	2	64	46	37
GSA18_COISPA_MB-03	175	M	20/09/2024	18	2	-	2	2	2	2	4	4	3	2	3	4	4	5	5	2	5	3	2	2	2	2	2	52	39	34
GSA18_COISPA_MB-04	170	M	20/09/2024	18	3	2	2	3	3	2	4	3	3	2	4	4	2	5	6	2	6	2	2	2	3	1	2	41	45	33

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
GSA18_COISPA_MB-05	165	M	20/09/2024	18	3	2	2	2	3	3	4	4	4	2	5	3	5	6	5	3	6	3	3	2	2	2	3	32	40	33
GSA18_COISPA_MB-06	165	M	20/09/2024	18	2	3	2	2	3	3	2	3	3	2	4	3	3	4	4	2	4	2	3	2	2	1	2	41	31	27
GSA18_COISPA_MB-07	130	M	07/08/2024	18	1	-	1	1	2	2	2	3	1	1	3	2	4	3	4	1	3	1	2	1	3	1	1	43	52	43
GSA18_COISPA_MB-08	135	M	07/08/2024	18	2	1	1	1	3	1	2	-	1	1	3	2	5	-	4	2	4	1	2	1	1	1	1	50	63	49
GSA18_COISPA_MB-09	135	F	07/08/2024	18	2	3	1	3	3	3	-	2	3	3	4	3	3	3	4	3	4	3	3	3	3	1	3	67	28	18
GSA18_COISPA_MB-10	135	F	07/08/2024	18	1	1	1	1	2	2	-	1	1	1	2	2	2	3	3	2	4	2	2	2	1	1	1	43	47	37
GSA18_COISPA_MB-11	140	F	07/08/2024	18	2	2	1	1	3	3	2	2	1	1	4	3	3	4	5	1	4	2	2	3	1	1	1	32	52	44
GSA18_COISPA_MB-12	140	M	07/08/2024	18	2	1	1	1	3	2	2	2	2	1	-	3	2	-	5	2	4	2	2	2	2	1	2	55	49	31
GSA18_COISPA_MB-13	145	F	07/08/2024	18	1	1	1	1	1	1	2	-	1	1	2	2	2	-	3	2	5	2	2	1	1	1	1	55	60	43
GSA18_COISPA_MB-14	145	M	07/08/2024	18	4	3	2	3	3	2	5	4	2	3	3	3	4	5	5	3	5	3	2	3	2	2	3	41	33	27
GSA18_COISPA_MB-15	150	F	07/08/2024	18	3	-	2	1	-	-	2	-	1	2	5	1	3	-	-	-	-	-	-	2	0	1	2	33	68	49
GSA18_COISPA_MB-16	225	F	23/05/2024	18	5	-	3	4	-	2	4	-	3	4	4	1	1	5	5	-	5	-	2	5	2	4	4	29	41	35
GSA18_COISPA_MB-17	220	F	23/05/2024	18	4	3	3	4	4	2	3	4	5	4	5	4	5	5	4	4	6	4	3	5	3	3	4	41	24	18
GSA18_COISPA_MB-18	210	F	23/05/2024	18	4	3	3	2	3	3	4	5	3	4	5	2	3	-	4	4	-	4	4	3	2	3	3	40	26	22
GSA18_COISPA_MB-19	210	F	23/05/2024	18	4	2	2	3	2	2	3	-	2	2	2	1	1	5	4	4	4	4	3	3	3	2	2	38	40	33
GSA18_COISPA_MB-20	190	F	23/05/2024	18	4	-	1	3	3	2	2	-	2	2	-	2	4	4	5	4	5	4	3	2	3	1	2	32	42	34
GSA18_COISPA_MB-21	180	F	23/05/2024	18	-	3	2	2	3	2	2	3	3	3	3	3	6	4	4	2	4	3	-	2	2	1	3	40	38	27
GSA18_COISPA_MB-22	245	F	25/04/2024	18	7	4	3	6	4	3	5	4	-	5	8	3	6	6	6	4	6	5	4	4	4	5	4	33	28	23
GSA18_COISPA_MB-23	240	F	25/04/2024	18	6	2	3	5	-	-	4	-	-	4	-	1	5	-	4	-	-	-	-	4	2	-	4	36	41	33
GSA18_COISPA_MB-24	230	F	25/04/2024	18	6	3	4	5	4	2	4	5	3	3	6	2	5	5	4	4	8	4	4	3	2	3	4	32	36	26
GSA18_COISPA_MB-25	225	F	25/04/2024	18	4	3	3	3	4	3	2	4	-	3	-	2	4	-	4	3	-	-	4	3	2	3	3	47	23	18
GSA18_COISPA_MB-26	215	F	25/04/2024	18	4	2	3	3	-	-	3	3	1	3	-	3	4	6	5	-	6	-	-	1	2	2	3	38	48	36

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
GSA18_COISPA_MB-27	215	F	25/04/2024	18	4	3	2	3	-	3	3	5	2	3	7	4	5	-	5	4	6	4	3	2	2	2	3	30	40	32
GSA18_COISPA_MB-28	205	F	25/04/2024	18	4	2	3	4	4	3	2	4	2	4	6	3	6	4	5	4	5	4	4	3	2	3	4	41	32	25
GSA18_COISPA_MB-29	195	F	25/04/2024	18	5	3	1	2	-	0	1	-	2	2	-	4	5	-	5	-	5	-	3	2	3	2	2	31	57	47
GSA18_COISPA_MB-30	165	M	25/04/2024	18	4	-	1	2	-	0	1	-	1	2	8	2	1	-	5	-	-	-	2	2	3	2	2	40	83	58
GSA18_COISPA_MB-31	155	M	25/04/2024	18	3	2	1	2	3	0	2	2	1	3	-	3	4	-	4	-	4	-	2	2	2	1	2	39	49	39
GSA19_MULLBAR_01	175	F	13/09/2023	19	2	2	2	1	2	2	2	2	2	2	4	2	2	2	2	1	4	2	2	2	2	2	2	82	33	17
GSA19_MULLBAR_02	205	F	14/09/2023	19	2	2	2	1	2	3	2	2	3	2	3	3	3	-	3	2	4	2	2	2	1	1	2	52	34	27
GSA19_MULLBAR_03	233	F	29/08/2023	19	3	2	4	2	3	3	4	3	4	3	4	3	4	4	4	3	6	3	3	3	2	3	3	50	27	20
GSA19_MULLBAR_04	124	M	25/08/2023	19	0	2	1	2	1	2	3	2	1	1	4	1	3	2	3	1	5	1	1	1	1	0	1	45	72	56
GSA19_MULLBAR_05	231	F	12/09/2023	19	3	2	1	3	2	2	6	-	4	2	3	2	1	-	3	-	5	-	2	2	2	2	2	50	49	37
GSA19_MULLBAR_06	130	F	25/08/2023	19	0	1	1	2	1	1	2	3	1	1	4	2	4	1	2	1	4	1	1	1	1	0	1	55	74	59
GSA19_MULLBAR_07	210	F	29/08/2023	19	3	3	3	3	4	1	6	6	4	3	7	2	6	-	4	5	6	5	4	2	2	3	3	29	42	34
GSA19_MULLBAR_08	201	F	29/08/2023	19	3	2	3	2	2	2	3	5	4	2	5	1	6	5	3	4	6	4	2	2	1	2	2	36	48	40
GSA19_MULLBAR_09	224	F	13/09/2021	19	3	3	3	2	2	2	2	2	3	2	4	2	3	-	3	3	6	3	3	2	1	3	3	48	37	26
GSA19_MULLBAR_10	212	F	13/09/2021	19	2	2	3	3	2	1	5	5	3	2	5	3	3	4	4	2	5	3	2	3	2	3	3	36	39	29
GSA19_MULLBAR_11	210	F	01/09/2021	19	4	-	3	4	3	2	5	4	4	2	5	4	4	5	4	3	6	4	3	4	1	4	4	48	31	23
GSA19_MULLBAR_12	107	M	02/09/2021	19	1	1	0	3	1	0	1	-	1	0	-	1	1	1	2	1	-	1	1	1	1	0	1	68	74	42
GSA19_MULLBAR_13	230	F	14/09/2021	19	5	-	4	3	4	2	6	5	4	3	-	5	5	5	4	3	7	3	3	3	2	3	3	35	33	27
GSA19_MULLBAR_14	225	F	14/09/2021	19	3	2	2	3	2	2	2	3	1	2	6	2	4	4	4	2	6	2	3	3	2	2	2	50	46	35
GSA19_MULLBAR_15	113	M	11/09/2021	19	1	1	1	1	1	2	2	2	1	1	7	2	5	1	3	1	3	1	2	1	1	1	1	59	82	55
GSA19_MULLBAR_16	162	F	13/09/2023	19	2	-	1	2	1	1	2	3	1	1	-	1	3	4	3	2	4	2	2	2	1	2	2	40	49	35
GSA19_MULLBAR_17	151	F	13/09/2023	19	3	1	2	2	3	2	3	4	4	2	6	4	3	4	4	2	4	2	2	2	2	2	2	45	41	33

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
GSA19_MULLBAR_18	145	F	13/09/2023	19	2	3	1	2	3	3	3	4	4	2	6	5	5	4	3	2	5	2	1	3	2	2	2	32	45	35
GSA19_MULLBAR_19	128	M	13/09/2023	19	1	2	1	2	2	2	2	3	2	2	4	2	2	1	2	1	4	1	-	2	1	2	2	57	44	28
GSA19_MULLBAR_20	140	F	13/09/2023	19	2	-	1	2	2	1	2	3	1	2	-	2	1	2	3	1	-	1	2	1	1	1	1	47	42	37
GSA19_MULLBAR_21	118	M	13/09/2023	19	1	1	1	1	2	1	2	2	1	1	-	1	3	1	2	1	3	1	1	1	2	1	1	67	47	40
GSA19_MULLBAR_22	188	F	13/09/2023	19	3	3	3	2	3	3	4	4	4	3	8	4	5	4	4	4	5	4	3	1	2	3	3	36	38	27
GSA19_MULLBAR_23	157	F	13/09/2023	19	2	1	1	1	1	1	2	3	1	2	6	1	4	4	2	2	-	2	2	2	1	1	1	43	65	43
GSA19_MULLBAR_24	137	M	13/09/2023	19	1	1	1	1	2	2	1	2	2	2	2	3	4	2	2	1	-	1	2	2	1	1	2	48	46	36
GSA19_MULLBAR_25	168	F	13/09/2023	19	2	2	2	2	3	3	4	5	-	3	7	5	4	3	4	2	4	2	2	2	2	2	2	48	44	35
GSA19_MULLBAR_26	198	F	14/09/2023	19	2	3	3	3	3	4	3	3	3	3	6	4	3	4	4	3	4	3	3	2	2	4	3	55	27	20
GSA19_MULLBAR_27	172	F	13/09/2023	19	2	2	1	2	2	2	3	2	2	2	4	2	4	4	3	2	-	2	2	2	1	1	2	62	40	29
GSA19_MULLBAR_28	217	F	13/09/2023	19	3	-	3	4	4	2	4	5	-	3	10	2	7	5	4	3	-	3	3	2	2	3	3	37	52	35
GSA19_MULLBAR_29	182	F	13/09/2023	19	2	2	2	3	2	2	2	4	2	2	5	3	6	4	3	2	5	2	3	2	2	2	2	59	43	34
GSA19_MULLBAR_30	191	F	13/09/2023	19	2	-	2	2	2	2	2	2	-	2	4	3	2	3	3	2	-	2	3	2	1	3	2	63	29	23
GSA20_Mulbar_01	120	M	17/05/2024	20	1	1	1	5	2	3	3	1	3	2	7	2	2	4	3	3	5	3	-	2	4	1	3	29	57	44
GSA20_Mulbar_02	130	M	17/05/2024	20	1	1	1	3	2	2	3	1	2	1	4	2	2	4	3	2	4	2	-	2	2	1	2	43	47	36
GSA20_Mulbar_03	145	M	29/03/2024	20	3	3	3	3	3	3	3	2	3	2	4	4	4	4	3	3	4	3	-	2	3	1	3	57	26	16
GSA20_Mulbar_04	126	F	25/05/2024	20	1	2	1	2	2	-	3	2	2	2	3	2	4	-	3	2	4	2	-	1	2	1	2	53	42	30
GSA20_Mulbar_05	162	F	19/06/2024	20	3	3	2	3	3	3	2	2	2	3	3	1	2	1	3	2	5	2	-	2	2	1	2	43	39	30
GSA20_Mulbar_06	158	F	17/04/2024	20	4	2	1	4	4	3	3	-	2	2	5	1	3	-	5	3	-	2	-	2	3	2	2	33	42	34
GSA20_Mulbar_07	181	M	17/04/2024	20	3	3	1	4	3	3	2	2	3	2	3	2	8	-	4	2	-	2	-	3	2	1	3	37	54	34
GSA20_Mulbar_08	188	F	17/04/2024	20	5	2	2	3	3	4	3	-	2	3	4	3	5	4	3	3	-	3	-	3	3	2	3	53	28	21
GSA20_Mulbar_09	158	F	29/03/2024	20	5	2	2	4	2	2	2	2	2	2	3	1	2	3	4	3	-	3	-	2	2	2	2	60	38	30

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
GSA20_Mulbar_10	191	F	17/04/2024	20	4	3	2	3	3	3	2	3	2	3	3	2	3	3	4	3	-	3	-	3	2	3	3	65	21	15
GSA20_Mulbar_11	156	F	17/05/2024	20	4	2	2	2	3	2	2	-	2	3	-	3	5	4	3	4	-	4	-	3	2	2	2	44	33	27
GSA20_Mulbar_12	216	F	17/04/2024	20	5	4	2	3	4	4	5	2	4	3	4	3	5	4	4	4	-	4	-	4	2	4	4	55	25	19
GSA20_Mulbar_13	164	F	29/03/2024	20	4	2	2	3	3	2	1	2	2	2	4	2	6	-	4	3	-	3	-	2	1	2	2	47	46	36
GSA20_Mulbar_14	180	F	29/03/2024	20	4	2	2	3	3	4	4	3	3	2	4	3	6	4	4	3	-	-	-	3	1	2	3	37	35	26
GSA20_Mulbar_15	200	F	29/03/2024	20	4	-	4	3	3	-	5	3	4	3	-	3	5	5	5	-	-	-	-	3	2	2	3	40	29	25
GSA20_Mulbar_16	174	M	30/09/2024	20	3	3	2	2	3	3	2	2	3	2	3	3	6	-	4	2	-	2	-	3	2	1	3	42	39	28
GSA20_Mulbar_17	200	F	23/08/2024	20	2	2	2	1	2	3	1	2	1	1	3	2	3	3	3	-	-	2	-	3	2	2	2	47	35	27
GSA20_Mulbar_18	168	M	30/09/2024	20	2	2	2	2	2	3	2	2	2	1	3	2	4	3	3	-	-	-	1	2	2	2	2	63	32	24
GSA20_Mulbar_19	181	F	30/09/2024	20	6	3	2	6	3	-	4	5	3	2	7	3	4	-	6	-	-	-	-	4	2	3	3	31	41	33
GSA20_Mulbar_20	181	M	30/09/2024	20	3	2	2	3	3	-	2	2	2	1	4	2	3	-	4	-	-	3	2	3	1	1	2	39	38	32
GSA20_Mulbar_21	175	F	30/09/2024	20	3	2	2	2	3	3	3	3	2	2	4	2	3	-	4	-	-	-	2	3	2	1	2	44	31	26
GSA20_Mulbar_22	196	M	30/09/2024	20	5	3	2	2	2	3	3	2	3	2	4	3	3	4	4	-	-	3	2	3	3	3	3	50	28	19
GSA20_Mulbar_23	191	M	30/09/2024	20	5	-	2	2	3	3	2	5	2	1	-	4	4	4	4	-	-	-	-	3	1	2	2	31	44	36
GSA20_Mulbar_24	204	M	11/10/2024	20	3	1	1	1	2	2	1	-	2	1	3	3	4	4	3	-	-	-	-	2	2	3	1	29	46	39
GSA20_Mulbar_25	147	M	11/10/2024	20	3	2	2	2	2	3	3	2	2	1	4	3	3	-	3	-	-	-	2	2	1	1	2	44	36	30
GSA20_Mulbar_26	150	M	11/10/2024	20	3	1	1	2	-	-	1	1	1	1	-	2	3	-	3	-	-	-	-	2	1	1	1	57	51	45
GSA20_Mulbar_27	160	F	11/10/2024	20	4	2	1	3	2	3	3	1	2	1	5	1	4	3	3	3	-	3	-	2	1	1	3	35	49	42
GSA20_Mulbar_28	168	F	11/10/2024	20	3	1	2	2	3	3	2	1	3	1	6	1	3	4	4	-	-	-	-	2	2	2	2	33	52	40
GSA20_Mulbar_29	155	F	02/11/2024	20	5	-	2	3	-	-	2	1	2	1	-	3	2	-	4	-	-	-	-	1	2	1	2	38	55	42
GSA20_Mulbar_30	207	M	02/11/2024	20	4	1	1	2	-	2	3	1	1	2	5	2	2	-	3	-	-	-	-	1	1	3	1	38	57	43
GSA9_MB_01	110	M	11/03/2019	9	1	2	2	2	2	2	1	2	1	1	2	1	2	-	2	2	3	1	-	2	1	1	2	55	36	32

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
GSA9_MB_02	120	M	14/02/2019	9	0	2	0	0	1	0	1	1	1	0	2	1	1	-	3	-	-	-	1	1	0	1	1	50	94	67
GSA9_MB_03	130	M	14/02/2019	9	0	1	0	1	1	2	1	1	1	1	-	2	2	2	3	-	3	-	1	2	0	1	1	47	67	54
GSA9_MB_04	140	F	19/02/2019	9	1	2	1	1	2	-	2	2	1	1	2	2	2	-	3	-	4	1	1	1	1	1	1	53	51	41
GSA9_MB_05	150	F	10/04/2019	9	1	2	1	1	3	2	1	-	1	1	-	1	2	-	3	-	4	2	1	2	2	1	1	50	52	42
GSA9_MB_06	160	F	11/03/2019	9	1	1	0	0	2	2	1	1	1	0	-	1	3	-	4	1	3	1	1	1	0	-	1	53	87	64
GSA9_MB_07	115	M	11/03/2019	9	1	2	1	1	2	1	2	2	2	2	2	2	3	3	4	1	4	2	-	1	1	1	2	43	50	36
GSA9_MB_08	150	F	11/03/2019	9	1	-	1	1	2	2	2	3	2	1	2	2	5	3	3	-	4	1	1	2	1	1	1	40	56	40
GSA9_MB_09	205	F	11/03/2019	9	2	3	1	1	3	3	2	3	3	2	3	2	4	-	4	2	6	2	-	3	2	2	2	40	43	32
GSA9_MB_10	195	F	11/03/2019	9	3	3	2	2	2	2	2	2	2	2	2	2	6	4	3	3	6	3	2	2	1	2	2	59	48	34
GSA9_MB_11	225	F	10/04/2019	9	3	3	2	2	3	2	2	2	3	2	3	2	3	3	4	3	5	3	2	2	1	3	3	45	32	25
GSA9_MB_12	235	F	30/05/2019	9	4	3	2	2	3	2	2	-	-	2	3	2	3	-	4	2	5	3	3	2	2	3	2	47	32	26
GSA9_MB_13	185	F	17/06/2019	9	2	2	2	1	2	2	1	2	2	2	2	1	2	2	3	1	4	1	2	2	1	2	2	64	38	25
GSA9_MB_14	225	F	27/06/2019	9	6	2	2	3	3	2	2	-	2	3	3	1	4	4	4	2	6	3	3	2	2	3	2	38	43	31
GSA9_MB_15	130	F	10/04/2019	9	2	1	1	1	1	1	1	1	1	1	-	1	2	-	3	1	3	1	-	1	0	1	1	74	58	41
GSA9_MB_16	125	M	26/07/2019	9	2	1	1	2	2	1	1	3	2	1	3	1	3	2	4	2	3	2	1	2	1	1	1	41	48	38
GSA9_MB_17	150	F	26/07/2019	9	2	1	1	1	2	1	1	2	2	0	2	1	4	1	3	1	3	1	2	2	1	1	1	50	57	46
GSA9_MB_18	185	M	26/07/2019	9	3	2	2	2	3	2	2	2	2	2	3	2	5	3	5	-	4	-	-	2	2	2	2	63	38	30
GSA9_MB_19	210	F	26/07/2019	9	2	2	1	2	2	2	1	2	2	2	2	1	5	2	3	2	6	2	-	2	2	2	2	71	53	31
GSA9_MB_20	125	M	30/08/2019	9	1	1	1	2	2	2	1	3	1	2	2	1	3	3	4	2	5	2	2	2	1	1	2	41	53	36
GSA9_MB_21	135	F	10/09/2019	9	1	2	1	2	2	2	2	-	1	1	2	1	3	3	4	-	5	2	2	2	1	0	2	45	59	39
GSA9_MB_22	165	M	10/09/2019	9	2	3	2	2	3	2	3	-	2	2	3	2	4	4	3	3	5	3	-	3	2	2	2	45	31	25
GSA9_MB_23	110	M	13/11/2019	9	1	1	0	1	1	2	1	-	1	0	3	1	4	-	3	1	4	-	1	1	0	0	1	53	92	70
GSA9_MB_24	160	M	13/11/2019	9	1	2	1	1	2	1	1	1	1	1	3	1	5	-	4	2	4	2	1	1	1	1	1	62	69	54
GSA9_MB_25	115	M	13/11/2019	9	1	1	1	1	1	1	1	1	1	1	3	2	2	3	3	2	3	1	1	1	0	0	1	59	64	52
GSA9_MB_26	125	M	13/11/2019	9	1	1	1	1	2	2	1	2	2	0	2	1	2	2	3	1	3	1	-	2	1	1	1	48	49	42
GSA9_MB_27	225	F	13/11/2019	9	4	3	2	2	4	3	2	4	-	2	3	2	4	-	4	4	7	4	3	3	2	4	4	40	37	28
GSA9_MB_28	200	F	13/11/2019	9	4	3	2	2	4	2	2	3	2	2	3	2	4	5	5	4	6	4	-	3	1	3	2	33	41	33
GSA9_MB_29	225	F	27/12/2019	9	5	2	2	2	3	2	1	-	1	2	-	1	2	-	4	-	6	-	-	3	2	3	2	44	55	42
GSA9_MB_30	155	M	27/12/2019	9	4	2	2	2	2	-	1	-	1	2	-	1	3	-	3	-	-	-	-	2	1	1	2	43	48	34
MBAR_DCF23_01	157	M	29/03/2023	22	3	2	2	2	2	2	2	2	2	2	3	2	4	-	3	2	3	3	2	3	1	2	2	62	28	23

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
MBAR_DCF23_02	158	F	27/03/2023	22	1	2	1	1	2	2	2	1	1	1	3	2	4	5	3	1	3	1	2	3	1	1	1	45	58	44
MBAR_DCF23_03	196	F	30/03/2023	22	4	3	2	2	3	3	2	3	3	3	3	3	4	-	4	2	4	3	3	3	1	3	3	57	26	18
MBAR_DCF23_04	235	F	28/03/2023	22	5	4	4	4	4	4	5	4	3	5	6	3	5	-	6	5	5	5	-	5	4	4	4	40	18	16
MBAR_DCF23_05	134	M	01/05/2023	22	1	2	1	1	2	1	1	1	1	1	3	1	3	2	2	0	2	0	1	2	0	1	1	50	64	51
MBAR_DCF23_06	141	M	04/05/2023	22	2	4	2	3	4	3	2	3	3	2	4	3	3	-	4	3	4	3	3	4	2	1	3	43	29	22
MBAR_DCF23_07	165	M	29/04/2023	22	2	-	2	3	3	3	4	5	3	3	4	3	2	4	4	2	-	2	3	3	2	3	3	45	29	20
MBAR_DCF23_08	175	F	28/04/2023	22	2	3	3	2	3	3	3	2	3	3	4	3	3	4	4	3	4	3	2	3	2	3	3	59	22	15
MBAR_DCF23_09	179	M	27/04/2023	22	2	2	2	2	2	2	3	2	2	3	4	3	3	-	3	2	3	2	2	3	2	2	2	62	25	22
MBAR_DCF23_10	182	F	03/05/2023	22	2	2	2	2	2	2	2	2	2	2	3	3	3	-	2	2	3	2	2	3	2	2	2	76	20	16
MBAR_DCF23_11	202	F	02/05/2023	22	2	3	2	1	3	3	2	2	3	2	3	3	2	3	3	2	4	2	3	3	1	2	3	45	30	26
MBAR_DCF23_12	217	F	30/04/2023	22	3	2	1	1	3	2	2	2	2	2	3	2	2	-	3	2	-	2	2	3	1	2	2	60	31	21
MBAR_DCF23_13	222	F	05/05/2023	22	5	5	5	4	5	5	5	5	5	5	7	5	4	5	6	5	8	6	4	6	5	5	5	64	18	12
MBAR_DCF23_14	143	F	25/05/2023	22	1	2	1	2	2	3	2	1	3	2	3	2	3	-	4	2	4	1	2	3	2	1	2	43	42	33
MBAR_DCF23_15	167	F	24/05/2023	22	2	3	2	1	3	2	2	2	3	3	4	3	2	-	3	1	3	1	2	3	1	1	3	38	40	33
MBAR_DCF23_16	134	M	10/07/2023	22	2	2	2	2	2	2	2	2	1	2	3	2	4	3	3	1	3	1	1	3	1	1	2	45	41	30
MBAR_DCF23_17	141	M	11/07/2023	22	1	2	1	3	2	2	2	-	2	2	3	1	2	-	4	1	3	1	-	2	1	1	2	42	46	35
MBAR_DCF23_18	164	F	07/07/2023	22	1	-	1	3	1	-	2	1	1	2	2	2	3	-	-	1	4	1	2	2	1	1	1	50	52	42
MBAR_DCF23_19	167	M	09/07/2023	22	2	2	2	2	3	3	3	3	3	3	4	3	4	4	4	2	3	2	2	4	2	2	2	41	28	24
MBAR_DCF23_20	176	F	12/07/2023	22	4	4	5	3	5	3	4	4	4	3	5	3	5	-	5	4	5	4	-	5	3	2	4	35	23	18
MBAR_DCF23_21	188	F	08/07/2023	22	2	2	3	2	3	3	3	2	4	3	4	3	4	-	4	2	3	2	2	4	2	3	3	38	28	23
MBAR_DCF23_22	199	F	06/07/2023	22	3	4	3	3	3	3	3	3	4	3	4	4	4	-	6	3	5	4	3	4	2	3	3	52	25	20
MBAR_DCF23_23	213	F	19/10/2023	22	3	4	4	3	3	4	2	3	3	3	4	4	3	4	4	3	4	3	3	4	2	3	3	50	19	17

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
MBAR_DCF23_24	224	F	19/10/2023	22	4	5	5	5	6	4	5	5	5	4	5	5	5	5	5	5	6	4	-	6	5	5	5	67	12	7
MBAR_DCF23_25	96	M	25/11/2023	22	1	1	0	1	1	1	1	1	1	0	2	2	3	3	3	0	2	0	1	2	1	0	1	45	79	62
MBAR_DCF23_26	109	M	24/11/2023	22	0	1	0	2	1	-	1	1	1	1	-	1	3	-	3	1	-	0	1	2	1	0	1	56	81	56
MBAR_DCF23_27	119	F	23/11/2023	22	0	1	0	1	1	2	1	1	1	0	-	2	4	2	3	0	2	0	1	2	0	0	1	33	-	-
MBAR_DCF23_28	126	F	22/11/2023	22	0	-	0	2	1	2	2	0	1	1	-	2	2	-	3	1	3	0	1	2	1	0	2	32	78	66
MBAR_DCF23_29	231	F	12/12/2023	22	4	4	4	4	4	4	4	4	4	4	5	3	4	-	5	3	5	3	-	5	4	4	4	65	15	9
MBAR_DCF23_30	269	F	12/12/2023	22	7	-	9	8	-	-	6	6	-	6	11	2	5	9	-	7	-	5	-	7	6	-	6	29	32	23
MULLBARGSA16_01	110		30/05/2017	16	1	2	1	1	2	2	1	2	2	1	2	1	2	2	2	1	2	1	2	2	2	1	2	59	32	30
MULLBARGSA16_02	120		15/02/2017	16	1	2	0	2	1	2	1	1	1	0	2	1	2	2	2	2	3	2	-	2	2	1	2	52	49	42
MULLBARGSA16_03	140		15/02/2017	16	1	-	0	2	-	-	1	-	1	-	-	1	1	-	1	-	3	-	-	-	1	-	1	70	66	43
MULLBARGSA16_04	150		18/05/2017	16	2	2	0	2	2	3	3	2	2	1	3	1	2	3	2	2	4	2	-	2	1	2	2	57	42	27
MULLBARGSA16_05	160		28/03/2017	16	4	3	1	3	2	3	3	4	3	2	4	2	4	4	3	2	4	3	-	3	1	3	3	43	32	24
MULLBARGSA16_06	170		28/03/2017	16	2	2	1	2	2	2	3	3	2	1	5	1	4	4	2	2	3	2	1	-	1	1	2	43	51	39
MULLBARGSA16_07	180		28/03/2017	16	2	3	1	2	3	3	3	3	3	2	4	2	3	3	3	2	4	2	1	3	3	2	3	50	31	26
MULLBARGSA16_08	190		16/05/2017	16	3	2	1	2	2	2	4	3	2	2	2	2	3	4	2	-	-	-	2	2	3	2	2	63	32	26
MULLBARGSA16_09	200		16/05/2017	16	0	1	0	0	-	1	1	-	1	0	-	1	2	-	1	-	2	-	-	0	2	0	1	40	-	-
MULLBARGSA16_10	210		16/05/2017	16	1	1	0	0	-	1	1	-	1	0	-	0	2	-	1	-	2	-	-	0	3	0	1	40	-	-
MULLBARGSA16_11	235		22/03/2017	16	2	1	0	1	2	-	2	-	1	1	-	0	5	-	1	-	3	-	-	-	3	1	1	43	81	62
MULLBARGSA16_12	100		19/11/2027	16	3	4	1	2	1	3	3	3	1	1	-	1	3	3	1	3	4	3	-	1	3	3	3	50	46	42
MULLBARGSA16_13	110		11/11/2017	16	0	1	0	0	0	1	-	-	0	0	-	0	1	-	0	-	1	-	1	0	1	0	0	62	-	-
MULLBARGSA16_14	120		10/11/2017	16	1	2	1	2	2	2	2	2	2	0	-	1	2	3	2	3	3	3	1	2	2	1	2	52	43	32
MULLBARGSA16_15	130		16/11/2017	16	1	1	0	1	1	1	3	-	2	1	3	0	2	2	0	1	2	1	1	1	2	1	1	52	66	52

Sample ID	Total Length	sex	Catch date	ICES/GSA area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	Modal age	PA %	CV %	APE %
MULLBARGSA16_16	140		12/11/2017	16	0	1	0	1	0	1	1	-	1	0	2	1	3	2	1	-	2	-	0	0	2	1	1	42	88	63
MULLBARGSA16_17	150		15/11/2017	16	1	1	0	1	1	-	2	2	1	0	3	1	2	2	1	-	3	-	1	1	0	0	1	47	76	59
MULLBARGSA16_18	160		10/11/2017	16	1	1	0	1	2	1	2	1	1	0	2	1	1	-	2	-	2	-	1	1	0	-	1	56	61	44
MULLBARGSA16_19	170		11/11/2017	16	2	2	0	2	2	3	3	2	4	1	3	2	4	3	3	3	3	3	2	2	3	1	3	41	40	32
MULLBARGSA16_20	180		15/11/2017	16	1	2	0	2	2	2	4	-	2	1	3	1	2	4	-	-	-	-	2	2	2	2	2	59	50	29
MULLBARGSA16_21	190		10/11/2017	16	3	3	1	3	2	3	4	3	2	1	4	1	3	-	4	3	4	4	-	3	2	2	3	40	37	30
MULLBARGSA16_22	200		10/11/2017	16	4	-	1	4	2	3	5	3	4	1	5	1	3	4	4	4	5	4	-	4	3	2	4	40	39	32
MULLBARGSA16_23	210		10/11/2017	16	3	3	1	3	2	2	3	2	3	1	3	2	3	4	3	2	4	3	2	2	2	2	3	41	32	27
MULLBARGSA16_24	220		12/11/2017	16	2	2	1	2	2	2	4	2	-	1	2	1	3	3	2	3	-	2	2	2	1	1	2	55	40	25
MULLBARGSA16_25	235		10/11/2017	16	1	2	1	2	2	2	3	-	2	1	2	1	2	-	2	3	-	3	2	-	1	1	2	50	39	30
MULLBARGSA16_26	250		11/11/2017	16	2	2	0	2	2	1	3	2	2	0	2	1	2	4	3	2	3	2	2	2	1	1	2	55	50	35

Number of age readings by modal age

Table 6.3: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings by modal age and by reader are also presented.

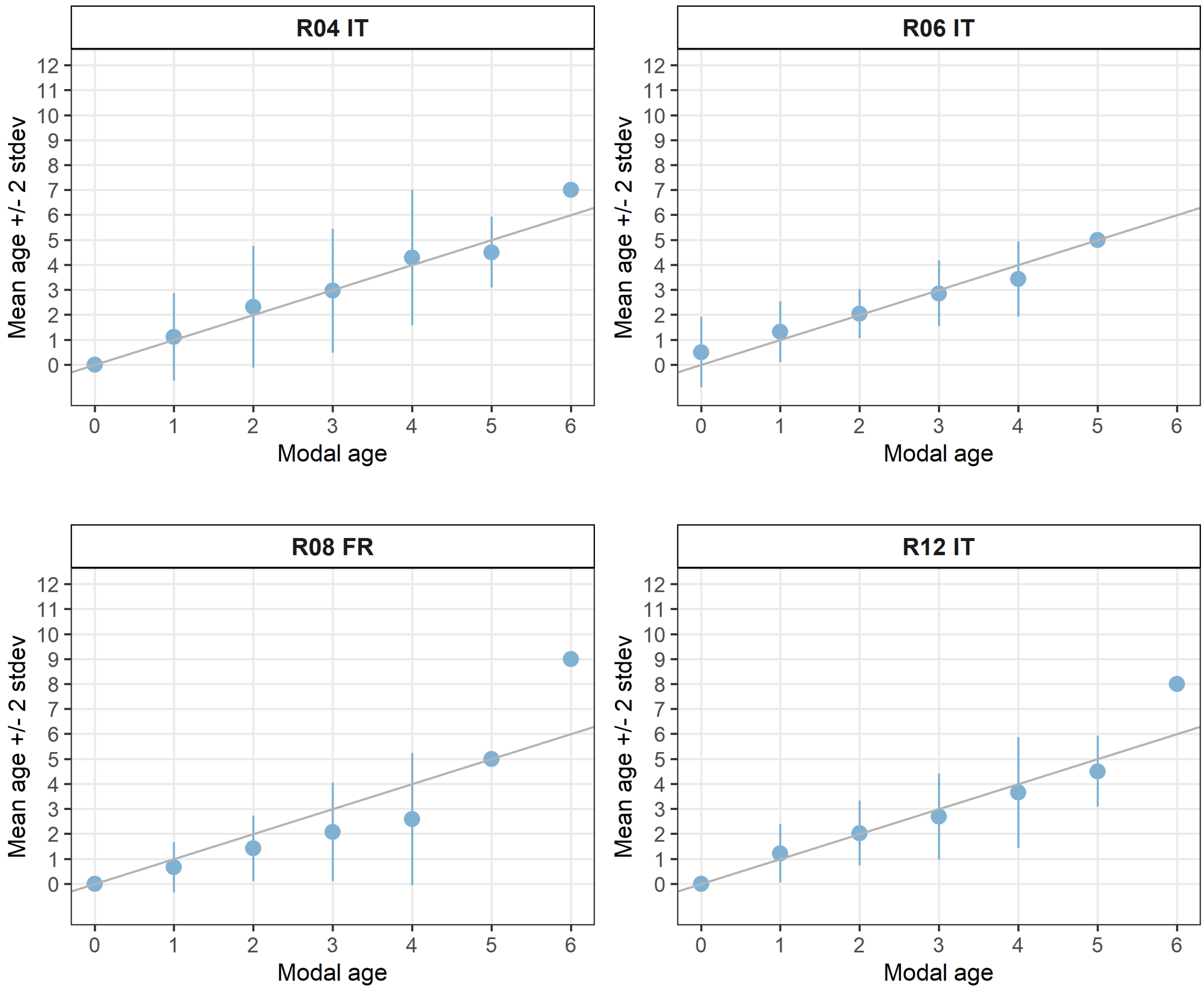
Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	total
0	2	2	2	2	1	2	0	1	2	2	0	2	2	0	2	1	1	1	1	2	2	2	32
1	79	69	82	83	73	71	75	67	78	80	63	82	83	39	75	54	54	57	51	80	83	80	1558
2	99	88	99	99	95	93	99	82	94	99	87	99	99	64	96	74	67	76	69	97	99	99	1973
3	53	47	54	54	52	51	53	52	52	54	49	54	53	39	54	49	40	47	35	54	54	54	1104
4	17	14	17	17	15	15	17	15	14	17	16	17	17	12	17	15	15	15	10	17	17	16	342
5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	43
6	1	0	1	1	0	0	1	1	0	1	1	1	1	1	0	1	0	1	0	1	1	0	14
Total	**253**	**222**	**257**	**258**	**238**	**234**	**247**	**220**	**242**	**255**	**218**	**257**	**257**	**157**	**246**	**196**	**179**	**199**	**167**	**253**	**258**	**253**	**5066**

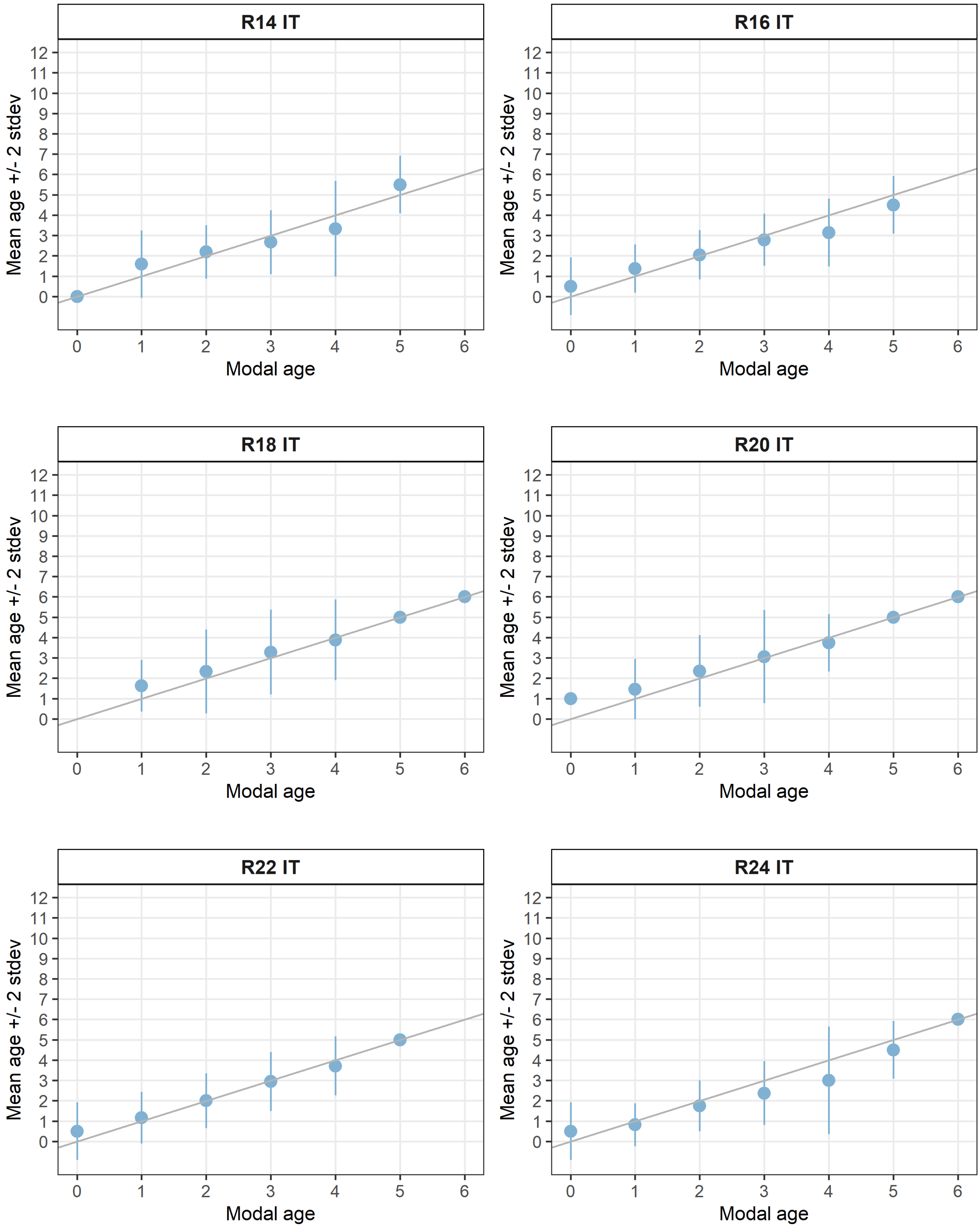
Number of age readings by age

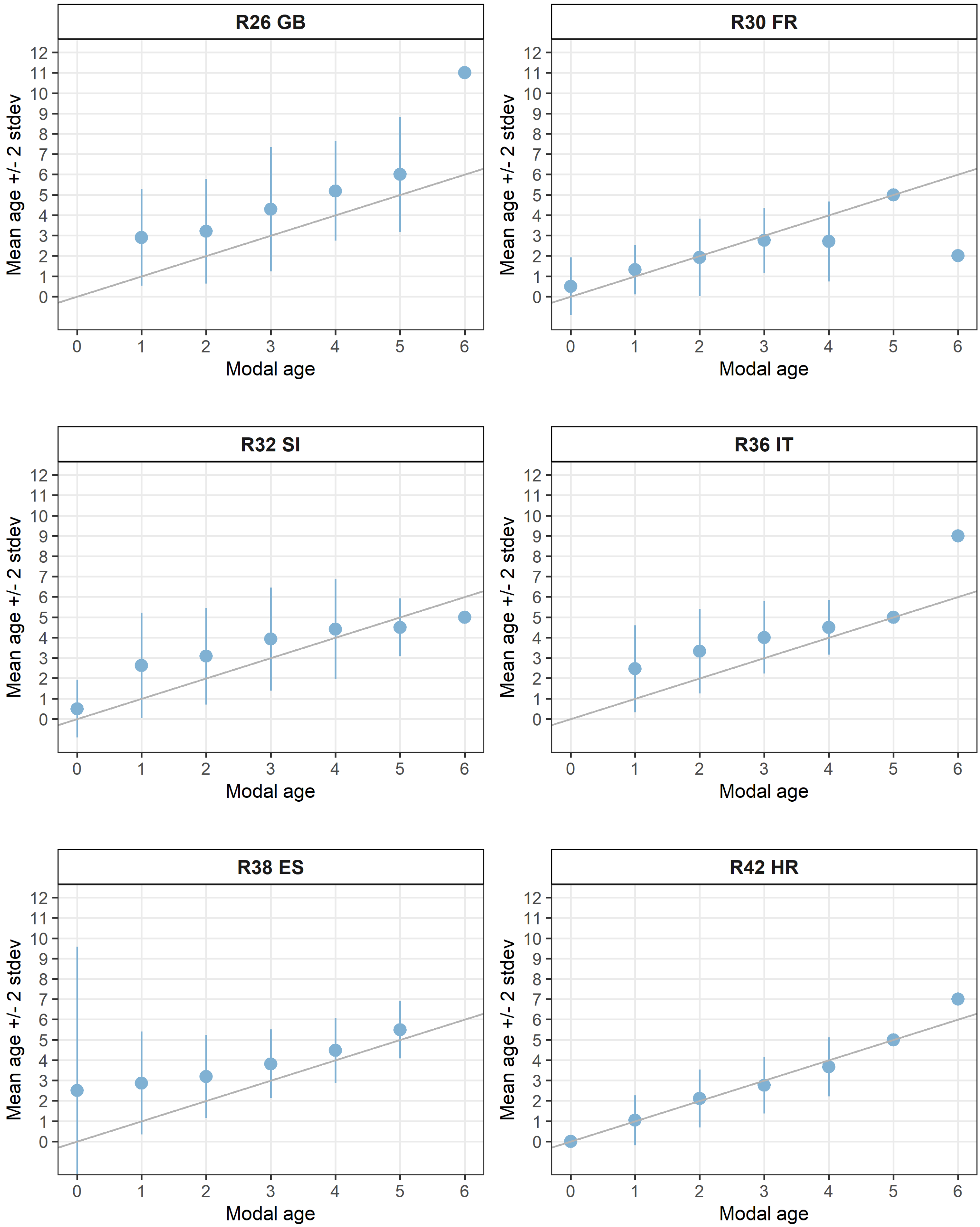
Table 6.4: Age composition by reader gives a summary of number of readings per reader and age. The total numbers of readings by age and by reader are also presented.

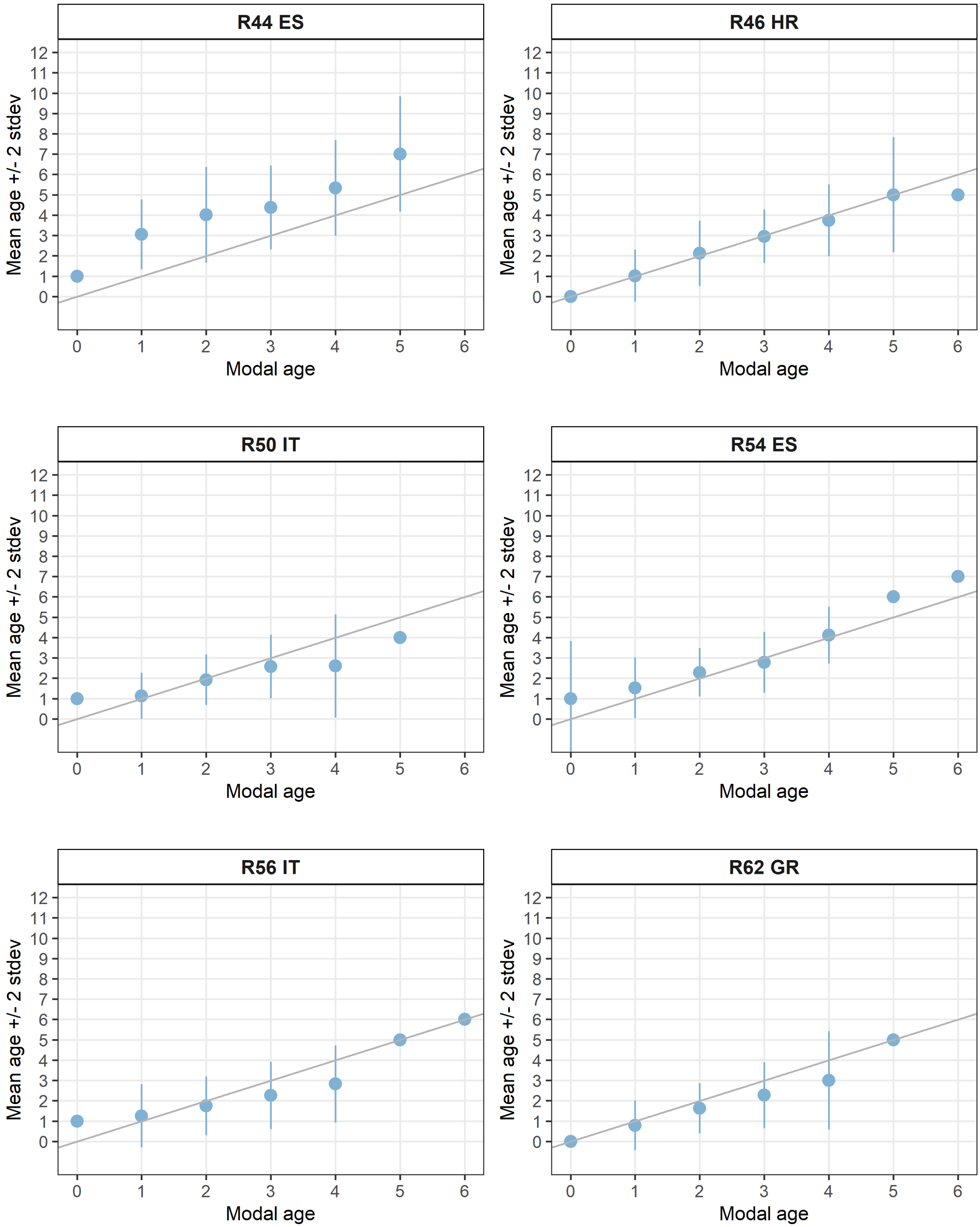
Age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR	total
0	23	2	43	6	3	6	0	5	7	24	0	4	2	0	2	10	0	12	7	4	13	27	200
1	71	60	109	80	56	52	52	42	76	93	1	98	24	10	10	45	1	50	51	48	91	104	1224
2	63	95	74	101	93	107	97	91	88	91	57	81	58	27	46	78	20	63	73	105	105	78	1691
3	46	49	20	52	66	57	51	46	44	35	70	55	73	39	81	41	52	49	29	69	37	34	1095
4	31	14	7	12	17	11	29	21	24	8	45	14	54	56	69	17	53	20	7	19	8	7	543
5	12	2	3	4	2	1	14	13	3	3	20	5	33	20	29	4	29	4	0	5	3	3	212
6	5	0	0	2	1	0	4	2	0	1	12	0	11	4	9	0	20	1	0	2	1	0	75
7	2	0	0	0	0	0	0	0	0	0	8	0	1	0	0	1	2	0	0	1	0	0	15
8	0	0	0	1	0	0	0	0	0	0	3	0	1	0	0	0	2	0	0	0	0	0	7
9	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	**253**	**222**	**257**	**258**	**238**	**234**	**247**	**220**	**242**	**255**	**218**	**257**	**257**	**157**	**246**	**196**	**179**	**199**	**167**	**253**	**258**	**253**	**5066**

Separate age bias plots by reader




R14 IT
R16 IT
R18 IT
R20 IT
R22 IT
R24 IT
Mean age +/- 2 stdev
Modal age


R26 GB
R30 FR
R32 SI
R36 IT
R38 ES
R42 HR
Mean age +/- 2 stdev
Modal age


R44 ES
R46 HR
R50 IT
R54 ES
R56 IT
R62 GR
Mean age +/- 2 stdev
Modal age
0 1 2 3 4 5 6 7 8 9 10 11 12
0 1 2 3 4 5 6

Statistics by modal age plot (STDEV, CV and PA)

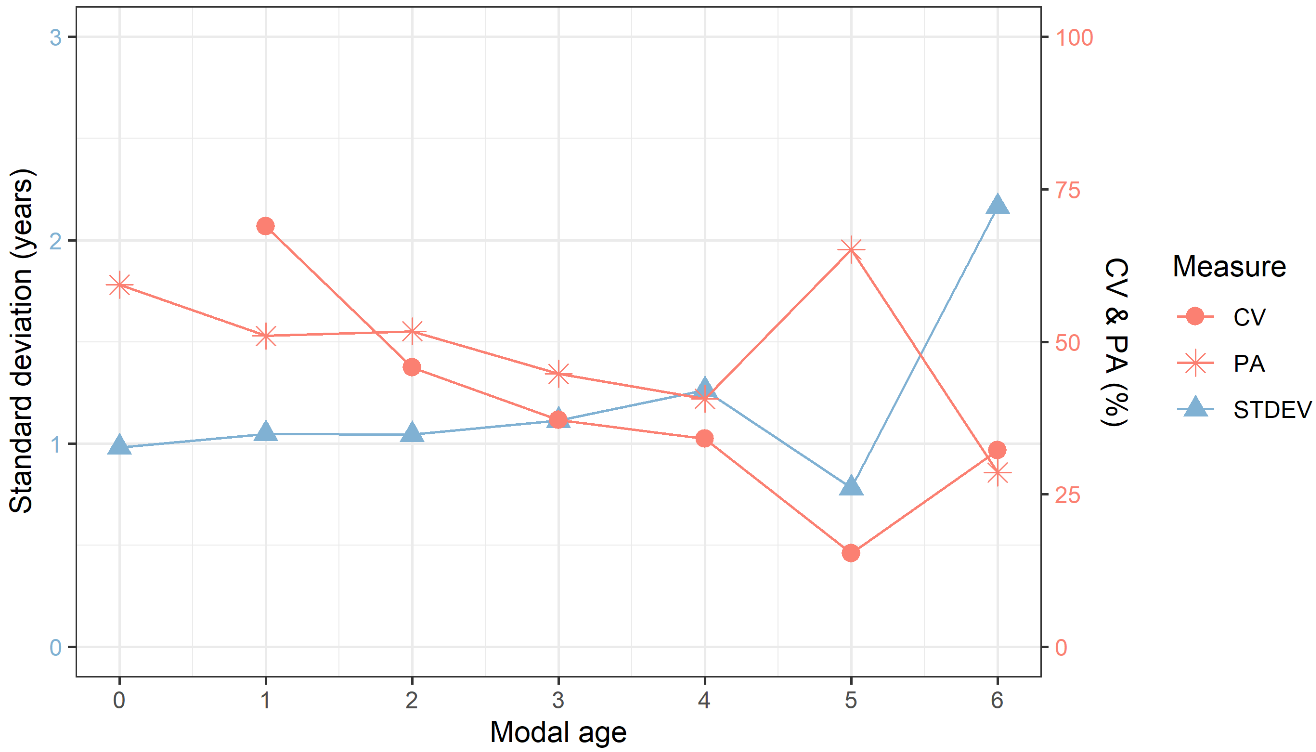


Figure 6.1: CV, PA and (STDEV (standard deviation) are plotted against modal age

Distribution of age reading errors

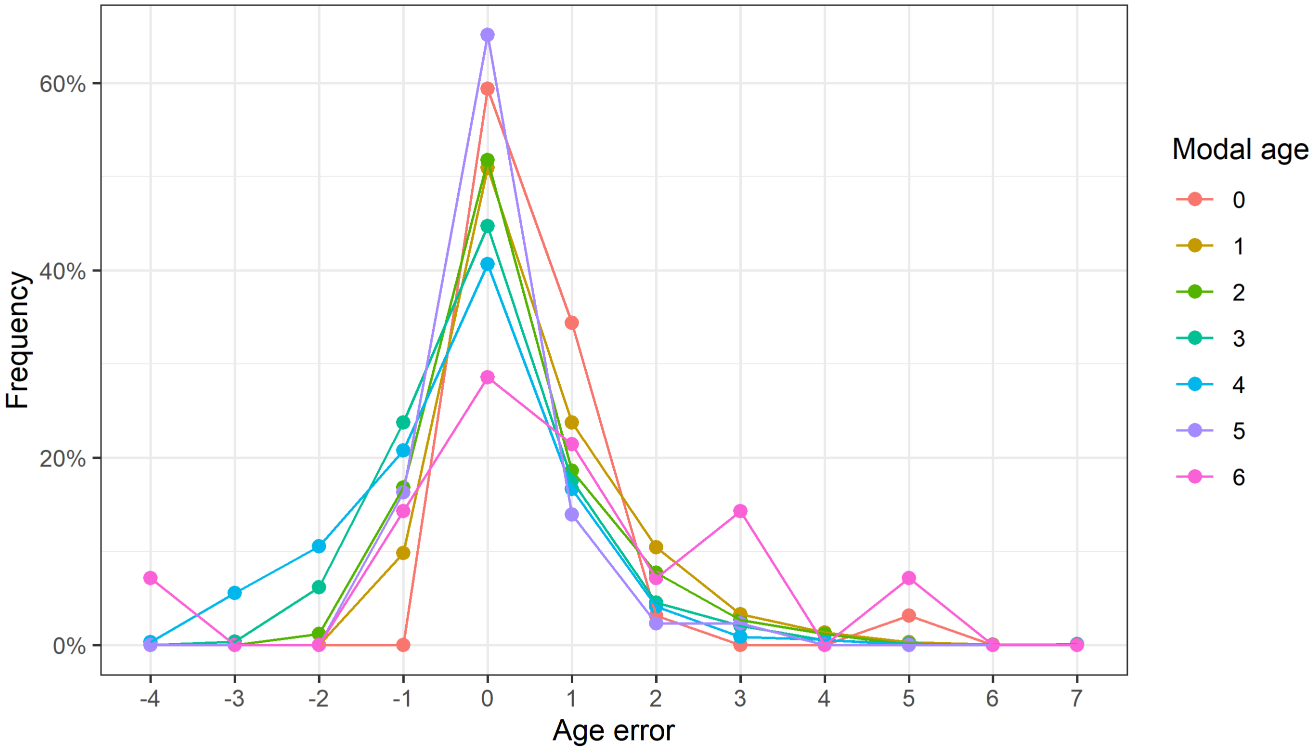


Figure 6.2: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

Relative bias for all readers

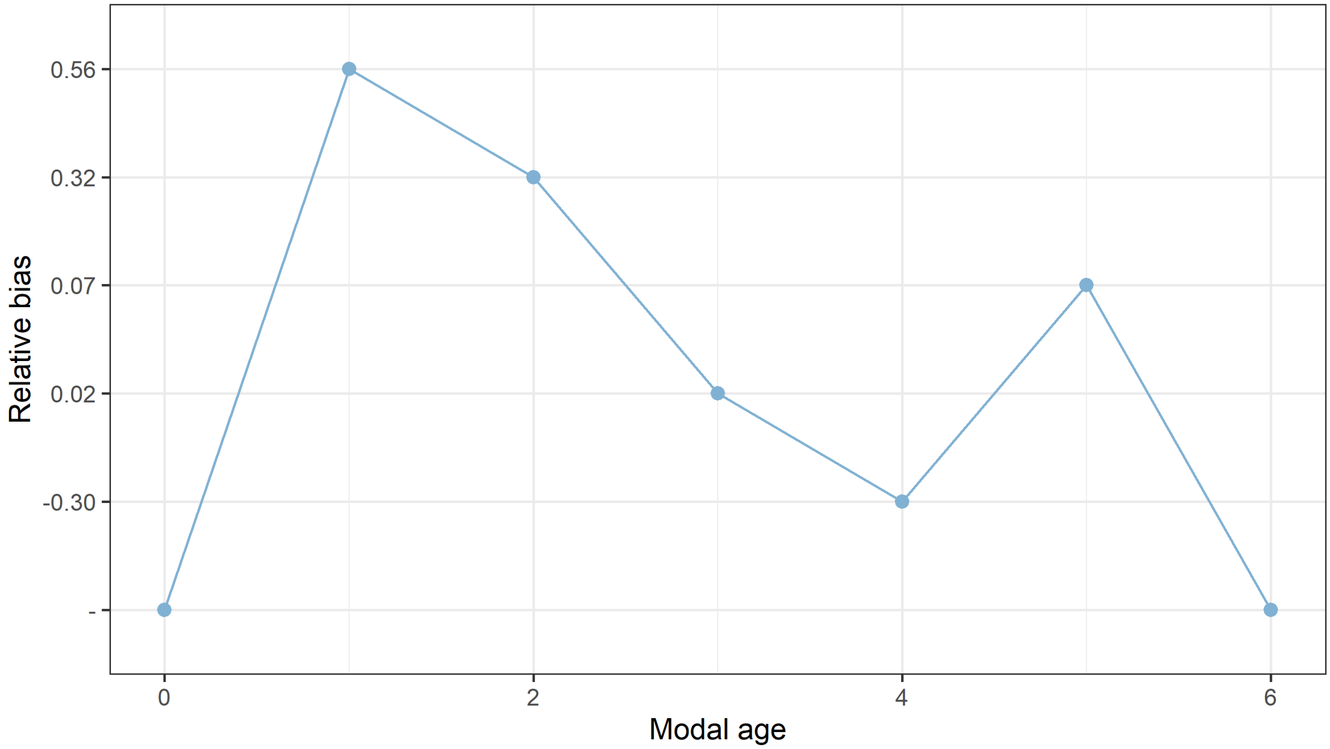


Figure 6.3: The relative bias by modal age as estimated by all age readers combined.

Mean length at age by reader

Table 6.5: Mean fish length (mm) at age per reader is calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R20 IT	R22 IT	R24 GR	R26 GB	R30 FR	R32 SI	R36 IT	R38 ES	R42 HR	R44 ES	R46 HR	R50 IT	R54 ES	R56 IT	R62 GR
0	130	120	144	150	119	140	-	128	114	139	-	171	126	-	120	109	-	111	141	165	135	123
1	146	141	155	146	145	144	146	135	146	150	154	152	148	133	160	139	110	140	143	134	153	151
2	171	171	182	170	170	171	165	166	170	178	156	171	158	148	155	171	149	169	174	164	176	182
3	183	187	208	184	174	180	172	178	184	191	172	183	167	162	165	185	159	185	200	184	180	203
4	192	190	225	205	207	198	194	192	188	222	172	186	173	180	182	203	163	201	221	189	194	220
5	203	223	207	204	199	222	206	205	222	234	185	198	186	200	167	223	181	240	-	217	204	230
6	218	-	-	213	224	-	235	240	-	269	177	-	194	198	187	-	210	222	-	223	269	-
7	257	-	-	-	-	-	-	-	-	-	174	-	217	-	-	269	228	-	-	269	-	-
8	-	-	-	269	-	-	-	-	-	-	199	-	181	-	-	-	226	-	-	-	-	-
9	-	-	269	-	-	-	-	-	-	-	-	-	-	269	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	217	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	269	-	-	-	-	-	-	-	-	-	-	-
Weighted Mean	**168**	**168**	**168**	**168**	**167**	**168**	**169**	**167**	**166**	**168**	**170**	**168**	**168**	**171**	**168**	**168**	**170**	**167**	**170**	**168**	**168**	**167**

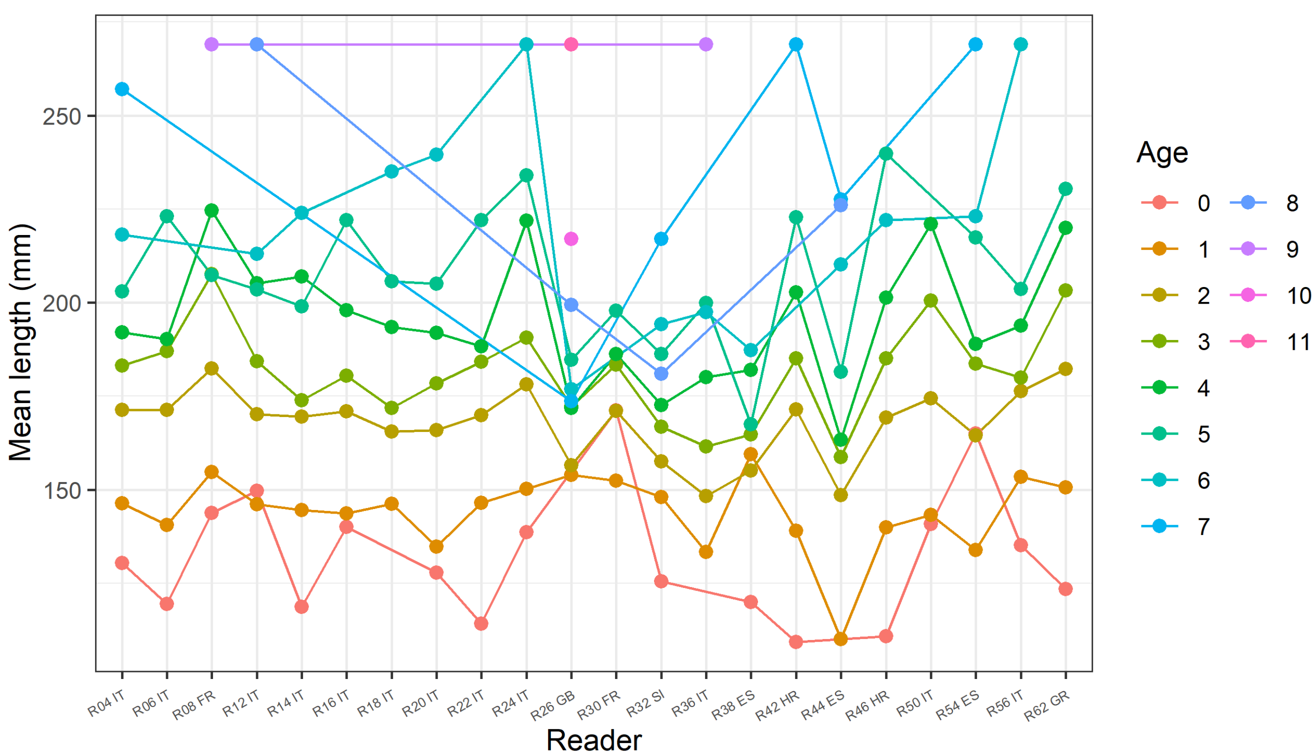


Figure 6.4: The mean fish length at age as estimated by each age reader.

6.1.2 Advanced readers

All samples included

Summary statistics

Table 6.6: Summary of statistics; PA (%), CV (%) and APE (%).

NSample	CV	PA	APE
258	44 %	59 %	32 %

Data overview

Table 6.7: Data overview including modal age and statistics per sample.

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R50 IT	Modal age	PA %	CV %	APE %
10mb113_11_24	187	F	25/09/2024	11.1	1	2	1	2	2	2	2	2	2	2	78	25	19
13mb111_11_24	151	M	23/09/2024	11.1	1	1	0	1	1	1	2	2	0	1	56	71	44
14mb111_11_24	141	M	23/09/2024	11.1	1	2	1	2	2	1	1	2	0	1	44	53	44
16mb104_11_24	159	F	16/07/2024	11.1	1	2	1	1	1	1	2	2	1	1	67	38	33
17mb10_11_24	168	F	18/03/2024	11.1	3	4	0	3	3	4	4	4	1	4	44	50	37
19mb111_11_24	146	M	23/09/2024	11.1	1	1	0	1	1	1	1	1	1	1	89	38	22
1mb113_11_24	188	F	25/09/2024	11.1	2	-	2	2	2	2	2	2	2	2	100	0	0
1mb14_11_24	193	F	26/03/2024	11.1	1	3	1	3	2	2	5	2	2	2	44	52	38
1mb16_11_24	202	F	08/04/2024	11.1	1	1	1	2	1	2	2	2	2	2	56	34	32
1mb9_11_24	106	M	12/03/2024	11.1	0	1	0	1	0	1	1	2	0	1	44	-	-
21mb104_11_24	182	F	16/07/2024	11.1	1	2	1	2	1	2	2	2	1	2	56	34	32
22mb14_11_24	137	F	26/03/2024	11.1	1	1	0	2	1	1	1	1	1	1	78	50	22
22mb40_11_24	141	M	12/06/2024	11.1	1	0	0	1	1	1	2	1	1	1	67	68	44
24MULLBAR501-0003	195	F	10/01/2024	7	1	2	2	2	2	2	2	2	2	2	89	18	10
24MULLBAR501-0005	200	F	10/01/2024	7	3	2	1	1	2	2	4	2	2	2	56	44	29
24MULLBAR501-0011	170	F	10/01/2024	7	3	2	2	2	2	2	4	3	2	2	67	30	24
24MULLBAR501-0023	190	F	10/01/2024	7	1	2	1	2	2	2	3	2	2	2	67	32	21
24MULLBAR501-0034	175	F	10/01/2024	7	1	3	1	2	1	-	3	1	-	1	57	55	48
24MULLBAR501-0039	165	F	10/01/2024	7	1	3	1	1	2	3	4	3	2	1	33	49	41
24MULLBAR501-0056	150	M	27/03/2024	7	1	2	1	2	2	2	2	2	2	2	78	25	19
24MULLBAR501-0072	115	F	27/03/2024	7	0	1	0	1	1	2	2	1	-	1	50	76	50
24MULLBAR501-0084	110	M	27/03/2024	7	0	2	1	1	1	2	3	2	-	1	38	62	50
24MULLBAR501-0091	165	M	03/09/2024	7	1	3	1	1	1	3	3	3	1	1	56	56	52
24MULLBAR501-0098	140	M	03/09/2024	7	0	2	1	2	1	2	2	1	-	2	50	54	45

24MULLBAR501-0099	165	F	03/09/2024	7	1	4	1	2	1	4	3	4	1	1	44	61	54
24MULLBAR501-0114	130	M	03/09/2024	7	2	3	1	1	1	2	2	4	1	1	44	56	42
24MULLBAR501-0126	165	F	03/09/2024	7	2	2	1	1	1	1	2	1	1	1	67	38	33
24MULLBAR501-0130	200	F	03/09/2024	7	3	4	2	3	3	3	3	3	3	3	78	17	7
24MULLBAR501-0164	175	F	11/09/2024	7	2	3	1	1	1	1	-	1	-	1	71	55	43
24MULLBAR501-0172	215	F	02/12/2024	7	3	-	2	2	2	3	4	2	-	2	57	31	25
24MULLBAR501-0174	215	F	02/12/2024	7	6	4	2	3	2	3	3	2	-	2	38	43	30
24MULLBAR501-0180	195	F	02/12/2024	7	2	2	1	1	2	1	2	2	-	2	62	32	29
24MULLBAR501-0189	175	F	02/12/2024	7	3	-	1	3	1	2	5	1	2	1	38	62	47
24MULLBAR501-0200	165	M	02/12/2024	7	3	2	0	1	1	-	2	1	-	1	43	68	54
24MULLBAR501-0231	120	F	04/12/2024	7	2	1	1	1	1	1	2	1	1	1	78	36	28
24MULLBAR501-0234	115	M	04/12/2024	7	1	2	0	1	1	1	2	1	1	1	67	54	36
24MULLBAR501-0245	160	M	05/12/2024	7	4	4	2	3	3	4	4	4	-	4	62	22	18
24MULLBAR551-0026	192	F	28/05/2024	7	2	2	2	2	2	2	2	2	2	2	100	0	0
24MULLBAR551-0056	180	F	29/05/2024	7	3	2	1	1	2	2	2	2	2	2	67	32	21
24MULLBAR551-0091	151	F	06/06/2024	7	1	2	1	2	2	2	1	2	2	2	67	30	27
24MULLBAR551-0111	161	F	06/06/2024	7	2	2	1	1	2	2	3	2	1	2	56	38	29
24MULLBAR551-0176	205	F	09/06/2024	7	0	2	2	2	2	3	4	3	2	2	56	49	33
24MULLBAR551-0180	220	F	09/06/2024	7	3	3	2	3	2	3	4	3	3	3	67	21	14
24mb104_11_24	154	M	16/07/2024	11.1	0	1	1	1	1	1	1	1	0	1	78	57	44
29mb113_11_24	141	M	25/09/2024	11.1	0	-	0	3	1	1	2	1	1	1	50	88	61
2mb18_11_24	175	M	15/04/2024	11.1	2	2	1	3	1	3	4	3	-	3	38	45	37
31mb104_11_24	186	M	16/07/2024	11.1	1	3	1	2	2	-	3	1	-	1	43	48	40
33mb40_11_24	121	M	12/06/2024	11.1	1	1	0	2	1	2	2	2	1	2	44	53	44
36mb104_11_24	157	M	16/07/2024	11.1	0	1	1	1	1	2	2	1	1	1	67	54	36
3mb10_11_24	211	F	18/03/2024	11.1	1	-	2	3	1	2	5	2	1	2	38	64	44
4mb21_11_24	180	F	29/04/2024	11.1	2	1	1	2	1	2	2	2	2	2	67	30	27
55mb104_11_24	150	M	16/07/2024	11.1	0	1	1	1	2	1	2	1	0	1	56	71	44
5mb104_11_24	182	F	16/07/2024	11.1	2	-	0	2	1	2	3	3	-	2	43	58	42
5mb111_11_24	144	F	23/09/2024	11.1	1	1	0	1	1	2	3	2	0	1	44	80	61
5mb22_11_24	152	F	15/05/2024	11.1	1	2	0	1	1	1	1	1	-	1	75	53	25
5mb40_11_24	138	M	12/06/2024	11.1	3	3	1	2	1	-	3	4	1	3	38	52	44
6mb8_11_24	179	F	11/03/2024	11.1	1	2	0	2	1	2	1	2	1	2	44	53	44
7mb104_11_24	160	F	16/07/2024	11.1	1	2	1	1	1	2	2	1	1	1	67	38	33
7mb22_11_24	165	F	15/05/2024	11.1	1	3	0	3	2	2	3	3	1	3	44	56	44
7mb8_11_24	192	F	11/03/2024	11.1	2	3	2	3	1	2	5	2	1	2	44	52	38
GSA17-32115	172	F	11/08/2015	17	2	-	-	2	-	-	-	-	-	2	100	0	0
GSA17-32116	168	F	11/08/2015	17	3	-	2	2	3	1	1	-	-	3	33	45	33

GSA17-32117	166	F	11/08/2015	17	4	2	2	2	3	2	1	-	-	2	57	42	30
GSA17-32118	158	U	11/08/2015	17	-	1	1	1	3	1	1	2	-	1	71	55	43
GSA17-32119	153	U	11/08/2015	17	-	-	1	2	-	2	-	-	-	2	67	35	27
GSA17-32120	150	U	11/08/2015	17	2	1	1	1	2	1	1	1	-	1	75	37	30
GSA17-32121	139	U	11/08/2015	17	3	2	2	2	2	2	3	2	-	2	75	21	17
GSA17-32122	140	U	11/08/2015	17	2	1	1	1	3	2	-	-	-	1	50	49	40
GSA17-32123	137	U	11/08/2015	17	2	1	1	1	2	1	1	1	-	1	75	37	30
GSA17-32124	121	U	11/08/2015	17	0	-	1	1	-	-	-	0	-	1	50	-	-
GSA17-32125	135	U	11/08/2015	17	1	1	1	1	3	2	1	2	2	1	56	47	40
GSA17-32129	109	U	11/08/2015	17	1	-	1	1	-	1	1	0	-	1	83	49	33
GSA17-32130	98	U	11/08/2015	17	0	0	0	0	-	0	-	1	-	0	83	-	-
GSA17-32131	116	U	11/08/2015	17	2	-	1	1	4	-	-	1	-	1	60	72	53
GSA17-32132	119	U	11/08/2015	17	-	1	1	1	3	1	1	0	-	1	71	79	46
GSA17-32133	111	U	11/08/2015	17	-	1	1	1	2	1	1	0	-	1	71	58	29
GSA17-32134	111	U	11/08/2015	17	1	1	1	1	3	1	2	0	-	1	62	71	50
GSA17-32135	118	U	11/08/2015	17	1	1	0	1	1	1	-	0	-	1	71	68	57
GSA17-32136	116	U	11/08/2015	17	1	-	0	1	3	1	2	-	-	1	50	77	58
GSA17-32137	94	U	11/08/2015	17	0	1	1	2	3	1	2	2	-	1	38	62	50
GSA17-32138	99	U	11/08/2015	17	0	-	0	1	-	1	2	1	-	1	50	90	67
GSA18_COISPA_MB-01	215	F	20/09/2024	18	2	3	2	3	4	3	2	4	2	2	44	30	25
GSA18_COISPA_MB-02	200	F	20/09/2024	18	2	2	2	2	3	2	2	2	2	2	89	16	9
GSA18_COISPA_MB-03	175	M	20/09/2024	18	2	-	2	2	2	2	4	3	2	2	75	31	24
GSA18_COISPA_MB-04	170	M	20/09/2024	18	3	2	2	3	3	2	4	3	2	3	44	27	22
GSA18_COISPA_MB-05	165	M	20/09/2024	18	3	2	2	2	3	3	4	4	3	3	44	27	21
GSA18_COISPA_MB-06	165	M	20/09/2024	18	2	3	2	2	3	3	2	3	3	3	56	21	19
GSA18_COISPA_MB-07	130	M	07/08/2024	18	1	-	1	1	2	2	2	1	2	1	50	36	33
GSA18_COISPA_MB-08	135	M	07/08/2024	18	2	1	1	1	3	1	2	1	2	1	56	47	40
GSA18_COISPA_MB-09	135	F	07/08/2024	18	2	3	1	3	3	3	-	3	3	3	75	28	21
GSA18_COISPA_MB-10	135	F	07/08/2024	18	1	1	1	1	2	2	-	1	2	1	62	38	34
GSA18_COISPA_MB-11	140	F	07/08/2024	18	2	2	1	1	3	3	2	1	2	2	44	41	31
GSA18_COISPA_MB-12	140	M	07/08/2024	18	2	1	1	1	3	2	2	2	2	2	56	38	29
GSA18_COISPA_MB-13	145	F	07/08/2024	18	1	1	1	1	1	1	2	1	2	1	78	36	28
GSA18_COISPA_MB-14	145	M	07/08/2024	18	4	3	2	3	3	2	5	2	2	2	44	36	27
GSA18_COISPA_MB-15	150	F	07/08/2024	18	3	-	2	1	-	-	2	1	-	2	40	46	36
GSA18_COISPA_MB-16	225	F	23/05/2024	18	5	-	3	4	-	2	4	3	2	4	29	34	27
GSA18_COISPA_MB-17	220	F	23/05/2024	18	4	3	3	4	4	2	3	5	3	3	44	26	21
GSA18_COISPA_MB-18	210	F	23/05/2024	18	4	3	3	2	3	3	4	3	4	3	56	21	16
GSA18_COISPA_MB-19	210	F	23/05/2024	18	4	2	2	3	2	2	3	2	3	2	56	28	24

GSA18_COISPA_MB-20	190	F	23/05/2024	18	4	-	1	3	3	2	2	2	3	2	38	37	30
GSA18_COISPA_MB-21	180	F	23/05/2024	18	-	3	2	2	3	2	2	3	-	2	57	22	20
GSA18_COISPA_MB-22	245	F	25/04/2024	18	7	4	3	6	4	3	5	-	4	4	38	31	25
GSA18_COISPA_MB-23	240	F	25/04/2024	18	6	2	3	5	-	-	4	-	-	6	20	40	30
GSA18_COISPA_MB-24	230	F	25/04/2024	18	6	3	4	5	4	2	4	3	4	4	44	30	21
GSA18_COISPA_MB-25	225	F	25/04/2024	18	4	3	3	3	4	3	2	-	4	3	50	22	17
GSA18_COISPA_MB-26	215	F	25/04/2024	18	4	2	3	3	-	-	3	1	-	3	50	39	29
GSA18_COISPA_MB-27	215	F	25/04/2024	18	4	3	2	3	-	3	3	2	3	3	62	22	15
GSA18_COISPA_MB-28	205	F	25/04/2024	18	4	2	3	4	4	3	2	2	4	4	44	30	25
GSA18_COISPA_MB-29	195	F	25/04/2024	18	5	3	1	2	-	0	1	2	3	1	25	73	54
GSA18_COISPA_MB-30	165	M	25/04/2024	18	4	-	1	2	-	0	1	1	2	1	43	81	60
GSA18_COISPA_MB-31	155	M	25/04/2024	18	3	2	1	2	3	0	2	1	2	2	44	55	42
GSA19_MULLBAR_01	175	F	13/09/2023	19	2	2	2	1	2	2	2	2	2	2	89	18	10
GSA19_MULLBAR_02	205	F	14/09/2023	19	2	2	2	1	2	3	2	3	2	2	67	28	19
GSA19_MULLBAR_03	233	F	29/08/2023	19	3	2	4	2	3	3	4	4	3	3	44	25	19
GSA19_MULLBAR_04	124	M	25/08/2023	19	0	2	1	2	1	2	3	1	1	1	44	61	50
GSA19_MULLBAR_05	231	F	12/09/2023	19	3	2	1	3	2	2	6	4	2	2	44	53	39
GSA19_MULLBAR_06	130	F	25/08/2023	19	0	1	1	2	1	1	2	1	1	1	67	54	36
GSA19_MULLBAR_07	210	F	29/08/2023	19	3	3	3	3	4	1	6	4	4	3	44	39	27
GSA19_MULLBAR_08	201	F	29/08/2023	19	3	2	3	2	2	2	3	4	2	2	56	28	24
GSA19_MULLBAR_09	224	F	13/09/2021	19	3	3	3	2	2	2	2	3	3	3	56	21	19
GSA19_MULLBAR_10	212	F	13/09/2021	19	2	2	3	3	2	1	5	3	2	2	44	44	33
GSA19_MULLBAR_11	210	F	01/09/2021	19	4	-	3	4	3	2	5	4	3	4	38	26	21
GSA19_MULLBAR_12	107	M	02/09/2021	19	1	1	0	3	1	0	1	1	1	1	67	87	44
GSA19_MULLBAR_13	230	F	14/09/2021	19	5	-	4	3	4	2	6	4	3	4	38	32	23
GSA19_MULLBAR_14	225	F	14/09/2021	19	3	2	2	3	2	2	2	1	3	2	56	30	23
GSA19_MULLBAR_15	113	M	11/09/2021	19	1	1	1	1	1	2	2	1	2	1	67	38	33
GSA19_MULLBAR_16	162	F	13/09/2023	19	2	-	1	2	1	1	2	1	2	1	50	36	33
GSA19_MULLBAR_17	151	F	13/09/2023	19	3	1	2	2	3	2	3	4	2	2	44	36	29
GSA19_MULLBAR_18	145	F	13/09/2023	19	2	3	1	2	3	3	3	4	1	3	44	41	34
GSA19_MULLBAR_19	128	M	13/09/2023	19	1	2	1	2	2	2	2	2	-	2	75	26	21
GSA19_MULLBAR_20	140	F	13/09/2023	19	2	-	1	2	2	1	2	1	2	2	62	32	29

GSA19_MULLBAR_21	118	M	13/09/2023	19	1	1	1	1	2	1	2	1	1	1	78	36	28
GSA19_MULLBAR_22	188	F	13/09/2023	19	3	3	3	2	3	3	4	4	3	3	67	19	13
GSA19_MULLBAR_23	157	F	13/09/2023	19	2	1	1	1	1	1	2	1	2	1	67	38	33
GSA19_MULLBAR_24	137	M	13/09/2023	19	1	1	1	1	2	2	1	2	2	1	56	36	34
GSA19_MULLBAR_25	168	F	13/09/2023	19	2	2	2	2	3	3	4	-	2	2	62	30	25
GSA19_MULLBAR_26	198	F	14/09/2023	19	2	3	3	3	3	4	3	3	3	3	78	17	7
GSA19_MULLBAR_27	172	F	13/09/2023	19	2	2	1	2	2	2	3	2	2	2	78	25	11
GSA19_MULLBAR_28	217	F	13/09/2023	19	3	-	3	4	4	2	4	-	3	4	43	23	19
GSA19_MULLBAR_29	182	F	13/09/2023	19	2	2	2	3	2	2	2	2	3	2	78	20	16
GSA19_MULLBAR_30	191	F	13/09/2023	19	2	-	2	2	2	2	2	-	3	2	86	18	11
GSA20_Mulbar_01	120	M	17/05/2024	20	1	1	1	5	2	3	3	3	-	1	38	59	47
GSA20_Mulbar_02	130	M	17/05/2024	20	1	1	1	3	2	2	3	2	-	1	38	45	35
GSA20_Mulbar_03	145	M	29/03/2024	20	3	3	3	3	3	3	3	3	-	3	100	0	0
GSA20_Mulbar_04	126	F	25/05/2024	20	1	2	1	2	2	-	3	2	-	2	57	37	26
GSA20_Mulbar_05	162	F	19/06/2024	20	3	3	2	3	3	3	2	2	-	3	62	20	18
GSA20_Mulbar_06	158	F	17/04/2024	20	4	2	1	4	4	3	3	2	-	4	38	39	32
GSA20_Mulbar_07	181	M	17/04/2024	20	3	3	1	4	3	3	2	3	-	3	62	32	23
GSA20_Mulbar_08	188	F	17/04/2024	20	5	2	2	3	3	4	3	2	-	2	38	36	25
GSA20_Mulbar_09	158	F	29/03/2024	20	5	2	2	4	2	2	2	2	-	2	75	45	36
GSA20_Mulbar_10	191	F	17/04/2024	20	4	3	2	3	3	3	2	2	-	3	50	26	20
GSA20_Mulbar_11	156	F	17/05/2024	20	4	2	2	2	3	2	2	2	-	2	75	31	24
GSA20_Mulbar_12	216	F	17/04/2024	20	5	4	2	3	4	4	5	4	-	4	50	26	18
GSA20_Mulbar_13	164	F	29/03/2024	20	4	2	2	3	3	2	1	2	-	2	50	39	30
GSA20_Mulbar_14	180	F	29/03/2024	20	4	2	2	3	3	4	4	3	-	4	38	27	21
GSA20_Mulbar_15	200	F	29/03/2024	20	4	-	4	3	3	-	5	4	-	4	50	20	14
GSA20_Mulbar_16	174	M	30/09/2024	20	3	3	2	2	3	3	2	3	-	3	62	20	18
GSA20_Mulbar_17	200	F	23/08/2024	20	2	2	2	1	2	3	1	1	-	2	50	40	32
GSA20_Mulbar_18	168	M	30/09/2024	20	2	2	2	2	2	3	2	2	1	2	78	25	11
GSA20_Mulbar_19	181	F	30/09/2024	20	6	3	2	6	3	-	4	3	-	3	43	41	33
GSA20_Mulbar_20	181	M	30/09/2024	20	3	2	2	3	3	-	2	2	2	2	62	22	20
GSA20_Mulbar_21	175	F	30/09/2024	20	3	2	2	2	3	3	3	2	2	2	56	22	20
GSA20_Mulbar_22	196	M	30/09/2024	20	5	3	2	2	2	3	3	3	2	3	44	35	25
GSA20_Mulbar_23	191	M	30/09/2024	20	5	-	2	2	3	3	2	2	-	2	57	41	30
GSA20_Mulbar_24	204	M	11/10/2024	20	3	1	1	1	2	2	1	2	-	1	50	46	38
GSA20_Mulbar_25	147	M	11/10/2024	20	3	2	2	2	2	3	3	2	2	2	67	21	19
GSA20_Mulbar_26	150	M	11/10/2024	20	3	1	1	2	-	-	1	1	-	1	67	56	44
GSA20_Mulbar_27	160	F	11/10/2024	20	4	2	1	3	2	3	3	2	-	2	38	37	30
GSA20_Mulbar_28	168	F	11/10/2024	20	3	1	2	2	3	3	2	3	-	3	50	31	26
GSA20_Mulbar_29	155	F	02/11/2024	20	5	-	2	3	-	-	2	2	-	2	60	47	34
GSA20_Mulbar_30	207	M	02/11/2024	20	4	1	1	2	-	2	3	1	-	1	43	58	43
GSA9_MB_01	110	M	11/03/2019	9	1	2	2	2	2	2	1	1	-	2	62	32	29
GSA9_MB_02	120	M	14/02/2019	9	0	2	0	0	1	0	1	1	1	0	44	-	-

GSA9_MB_03	130	M	14/02/2019	9	0	1	0	1	1	2	1	1	1	1	67	68	44
GSA9_MB_04	140	F	19/02/2019	9	1	2	1	1	2	-	2	1	1	1	62	38	34
GSA9_MB_05	150	F	10/04/2019	9	1	2	1	1	3	2	1	1	1	1	67	50	41
GSA9_MB_06	160	F	11/03/2019	9	1	1	0	0	2	2	1	1	1	1	56	71	44
GSA9_MB_07	115	M	11/03/2019	9	1	2	1	1	2	1	2	2	-	1	50	36	33
GSA9_MB_08	150	F	11/03/2019	9	1	-	1	1	2	2	2	2	1	1	50	36	33
GSA9_MB_09	205	F	11/03/2019	9	2	3	1	1	3	3	2	3	-	3	50	39	33
GSA9_MB_10	195	F	11/03/2019	9	3	3	2	2	2	2	2	2	2	2	78	20	16
GSA9_MB_11	225	F	10/04/2019	9	3	3	2	2	3	2	2	3	2	2	56	22	20
GSA9_MB_12	235	F	30/05/2019	9	4	3	2	2	3	2	2	-	3	2	50	28	24
GSA9_MB_13	185	F	17/06/2019	9	2	2	2	1	2	2	1	2	2	2	78	25	19
GSA9_MB_14	225	F	27/06/2019	9	6	2	2	3	3	2	2	2	3	2	56	47	31
GSA9_MB_15	130	F	10/04/2019	9	2	1	1	1	1	1	1	1	-	1	88	31	19
GSA9_MB_16	125	M	26/07/2019	9	2	1	1	2	2	1	1	2	1	1	56	36	34
GSA9_MB_17	150	F	26/07/2019	9	2	1	1	1	2	1	1	2	2	1	56	36	34
GSA9_MB_18	185	M	26/07/2019	9	3	2	2	2	3	2	2	2	-	2	75	21	17
GSA9_MB_19	210	F	26/07/2019	9	2	2	1	2	2	2	1	2	-	2	75	26	21
GSA9_MB_20	125	M	30/08/2019	9	1	1	1	2	2	2	1	1	2	1	56	36	34
GSA9_MB_21	135	F	10/09/2019	9	1	2	1	2	2	2	2	1	2	2	67	30	27
GSA9_MB_22	165	M	10/09/2019	9	2	3	2	2	3	2	3	2	-	2	62	22	20
GSA9_MB_23	110	M	13/11/2019	9	1	1	0	1	1	2	1	1	1	1	78	50	22
GSA9_MB_24	160	M	13/11/2019	9	1	2	1	1	2	1	1	1	1	1	78	36	28
GSA9_MB_25	115	M	13/11/2019	9	1	1	1	1	1	1	1	1	1	1	100	0	0
GSA9_MB_26	125	M	13/11/2019	9	1	1	1	1	2	2	1	2	-	1	62	38	34
GSA9_MB_27	225	F	13/11/2019	9	4	3	2	2	4	3	2	-	3	2	38	29	23
GSA9_MB_28	200	F	13/11/2019	9	4	3	2	2	4	2	2	2	-	2	62	35	30
GSA9_MB_29	225	F	27/12/2019	9	5	2	2	2	3	2	1	1	-	2	50	57	39
GSA9_MB_30	155	M	27/12/2019	9	4	2	2	2	2	-	1	1	-	2	57	50	29
MBAR_DCF23_01	157	M	29/03/2023	22	3	2	2	2	2	2	2	2	2	2	89	16	9
MBAR_DCF23_02	158	F	27/03/2023	22	1	2	1	1	2	2	2	1	2	2	56	34	32
MBAR_DCF23_03	196	F	30/03/2023	22	4	3	2	2	3	3	2	3	3	3	56	24	19
MBAR_DCF23_04	235	F	28/03/2023	22	5	4	4	4	4	4	5	3	-	4	62	16	11
MBAR_DCF23_05	134	M	01/05/2023	22	1	2	1	1	2	1	1	1	1	1	78	36	28
MBAR_DCF23_06	141	M	04/05/2023	22	2	4	2	3	4	3	2	3	3	3	44	27	21
MBAR_DCF23_07	165	M	29/04/2023	22	2	-	2	3	3	3	4	3	3	3	62	22	15
MBAR_DCF23_08	175	F	28/04/2023	22	2	3	3	2	3	3	3	3	2	3	67	19	17
MBAR_DCF23_09	179	M	27/04/2023	22	2	2	2	2	2	2	3	2	2	2	89	16	9
MBAR_DCF23_10	182	F	03/05/2023	22	2	2	2	2	2	2	2	2	2	2	100	0	0
MBAR_DCF23_11	202	F	02/05/2023	22	2	3	2	1	3	3	2	3	3	3	56	30	25
MBAR_DCF23_12	217	F	30/04/2023	22	3	2	1	1	3	2	2	2	2	2	56	35	22
MBAR_DCF23_13	222	F	05/05/2023	22	5	5	5	4	5	5	5	5	4	5	78	9	7
MBAR_DCF23_14	143	F	25/05/2023	22	1	2	1	2	2	3	2	3	2	2	56	35	22
MBAR_DCF23_15	167	F	24/05/2023	22	2	3	2	1	3	2	2	3	2	2	56	30	23
MBAR_DCF23_16	134	M	10/07/2023	22	2	2	2	2	2	2	2	1	1	2	78	25	19
MBAR_DCF23_17	141	M	11/07/2023	22	1	2	1	3	2	2	2	2	-	2	62	34	23
MBAR_DCF23_18	164	F	07/07/2023	22	1	-	1	3	1	-	2	1	2	1	57	50	42

MBAR_DCF23_19	167	M	09/07/2023	22	2	2	2	2	3	3	3	3	2	2	56	22	20
MBAR_DCF23_20	176	F	12/07/2023	22	4	4	5	3	5	3	4	4	-	4	50	19	12
MBAR_DCF23_21	188	F	08/07/2023	22	2	2	3	2	3	3	3	4	2	3	44	27	22
MBAR_DCF23_22	199	F	06/07/2023	22	3	4	3	3	3	3	3	4	3	3	78	14	11
MBAR_DCF23_23	213	F	19/10/2023	22	3	4	4	3	3	4	2	3	3	3	56	21	16
MBAR_DCF23_24	224	F	19/10/2023	22	4	5	5	5	6	4	5	5	-	5	62	13	9
MBAR_DCF23_25	96	M	25/11/2023	22	1	1	0	1	1	1	1	1	1	1	89	38	22
MBAR_DCF23_26	109	M	24/11/2023	22	0	1	0	2	1	-	1	1	1	1	62	73	50
MBAR_DCF23_27	119	F	23/11/2023	22	0	1	0	1	1	2	1	1	1	1	67	68	44
MBAR_DCF23_28	126	F	22/11/2023	22	0	-	0	2	1	2	2	1	1	2	38	74	58
MBAR_DCF23_29	231	F	12/12/2023	22	4	4	4	4	4	4	4	4	-	4	100	0	0
MBAR_DCF23_30	269	F	12/12/2023	22	7	-	9	8	-	-	6	-	-	7	25	17	13
MULLBARGSA16_01	110		30/05/2017	16	1	2	1	1	2	2	1	2	2	2	56	34	32
MULLBARGSA16_02	120		15/02/2017	16	1	2	0	2	1	2	1	1	-	1	50	57	45
MULLBARGSA16_03	140		15/02/2017	16	1	-	0	2	-	-	1	1	-	1	60	71	40
MULLBARGSA16_04	150		18/05/2017	16	2	2	0	2	2	3	3	2	-	2	62	46	25
MULLBARGSA16_05	160		28/03/2017	16	4	3	1	3	2	3	3	3	-	3	62	32	23
MULLBARGSA16_06	170		28/03/2017	16	2	2	1	2	2	2	3	2	1	2	67	32	21
MULLBARGSA16_07	180		28/03/2017	16	2	3	1	2	3	3	3	3	1	3	56	37	32
MULLBARGSA16_08	190		16/05/2017	16	3	2	1	2	2	2	4	2	2	2	67	38	26
MULLBARGSA16_09	200		16/05/2017	16	0	1	0	0	-	1	1	1	-	1	57	94	86
MULLBARGSA16_10	210		16/05/2017	16	1	1	0	0	-	1	1	1	-	1	71	68	57
MULLBARGSA16_11	235		22/03/2017	16	2	1	0	1	2	-	2	1	-	2	43	59	48
MULLBARGSA16_12	100		19/11/2027	16	3	4	1	2	1	3	3	1	-	3	38	52	44
MULLBARGSA16_13	110		11/11/2017	16	0	1	0	0	0	1	-	0	1	0	62	-	-
MULLBARGSA16_14	120		10/11/2017	16	1	2	1	2	2	2	2	2	1	2	67	30	27
MULLBARGSA16_15	130		16/11/2017	16	1	1	0	1	1	1	3	2	1	1	67	68	46
MULLBARGSA16_16	140		12/11/2017	16	0	1	0	1	0	1	1	1	0	1	56	95	89
MULLBARGSA16_17	150		15/11/2017	16	1	1	0	1	1	-	2	1	1	1	75	53	25
MULLBARGSA16_18	160		10/11/2017	16	1	1	0	1	2	1	2	1	1	1	67	54	36
MULLBARGSA16_19	170		11/11/2017	16	2	2	0	2	2	3	3	4	2	2	56	49	33
MULLBARGSA16_20	180		15/11/2017	16	1	2	0	2	2	2	4	2	2	2	67	56	33
MULLBARGSA16_21	190		10/11/2017	16	3	3	1	3	2	3	4	2	-	3	50	35	27
MULLBARGSA16_22	200		10/11/2017	16	4	-	1	4	2	3	5	4	-	4	43	42	34
MULLBARGSA16_23	210		10/11/2017	16	3	3	1	3	2	2	3	3	2	3	56	30	25
MULLBARGSA16_24	220		12/11/2017	16	2	2	1	2	2	2	4	-	2	2	75	39	22
MULLBARGSA16_25	235		10/11/2017	16	1	2	1	2	2	2	3	2	2	2	67	32	21
MULLBARGSA16_26	250		11/11/2017	16	2	2	0	2	2	1	3	2	2	2	67	47	32

List of multimodal cases

Table 6.8: List of cases for which multiple modes where obtained when all readers are considered. The column NModes_trad shows the number of multiple modes for each FishID or SampleID when all readers are given the same expertise weight.

NModes_trad	SampleID
2	17mb10_11_24
3	1mb14_11_24
2	24MULLBAR501-0114
2	24MULLBAR501-0189
2	24MULLBAR501-0200
2	29mb113_11_24
3	2mb18_11_24
3	31mb104_11_24
2	33mb40_11_24
2	3mb10_11_24
2	6mb8_11_24
3	GSA17-32116
2	GSA17-32138
2	GSA18_COISPA_MB-01
2	GSA18_COISPA_MB-04
2	GSA18_COISPA_MB-05
2	GSA18_COISPA_MB-07
2	GSA18_COISPA_MB-12
2	GSA18_COISPA_MB-17
2	GSA18_COISPA_MB-20
2	GSA18_COISPA_MB-22
5	GSA18_COISPA_MB-23
2	GSA19_MULLBAR_11
2	GSA19_MULLBAR_16
2	GSA19_MULLBAR_17
2	GSA20_Mulbar_15
2	GSA20_Mulbar_19
2	GSA20_Mulbar_20
2	GSA20_Mulbar_22
2	GSA20_Mulbar_28
2	GSA20_Mulbar_30
2	GSA9_MB_04
2	GSA9_MB_08
2	MBAR_DCF23_03
2	MBAR_DCF23_11
2	MBAR_DCF23_23
4	MBAR_DCF23_30
2	MULLBARGSA16_02
2	MULLBARGSA16_09

Number of age readings by modal age

Table 6.9: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings by modal age and by reader are also presented.

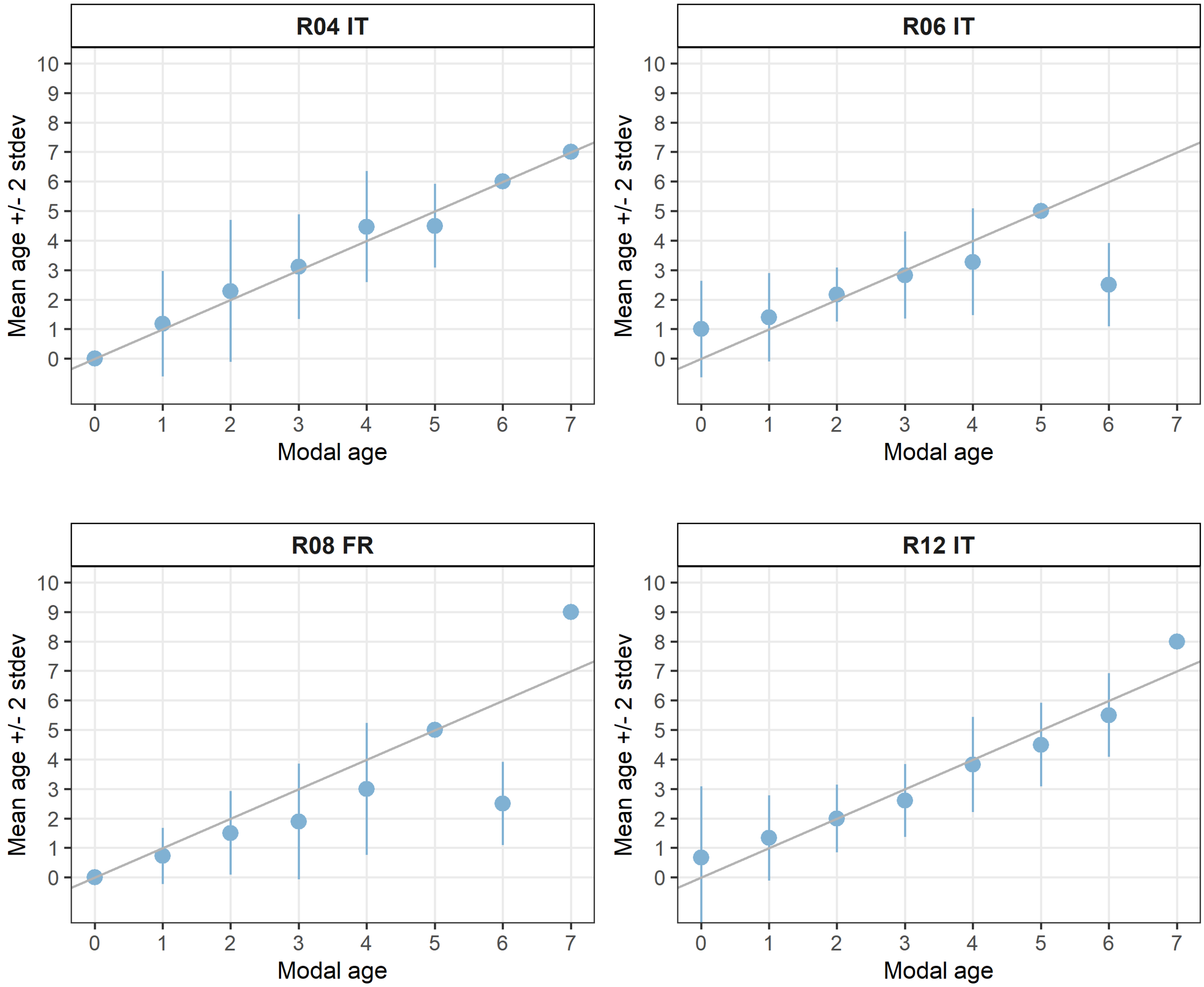
Modal age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R50 IT	total
0	3	3	3	3	2	3	1	3	2	23
1	86	76	89	89	79	78	83	87	56	723
2	100	88	101	102	98	95	100	94	71	849
3	43	41	43	43	41	40	42	41	29	363
4	17	11	17	17	16	16	17	15	8	134
5	2	2	2	2	2	2	2	2	1	17
6	1	1	1	1	0	0	1	0	0	5
7	1	0	1	1	0	0	1	0	0	4
Total	**253**	**222**	**257**	**258**	**238**	**234**	**247**	**242**	**167**	**2118**

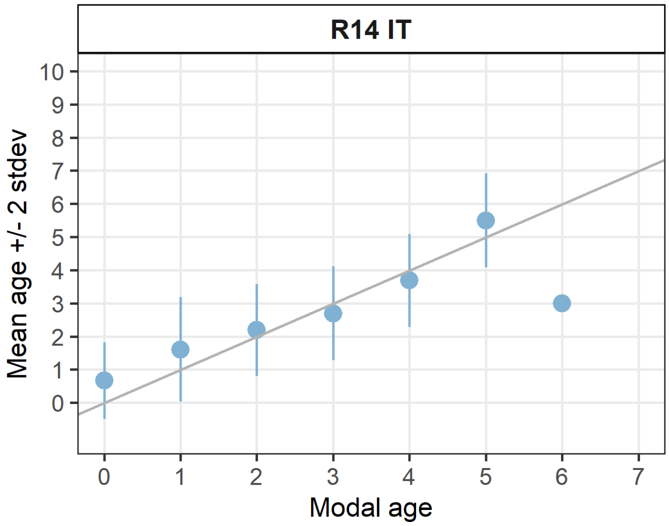
Number of age readings by age

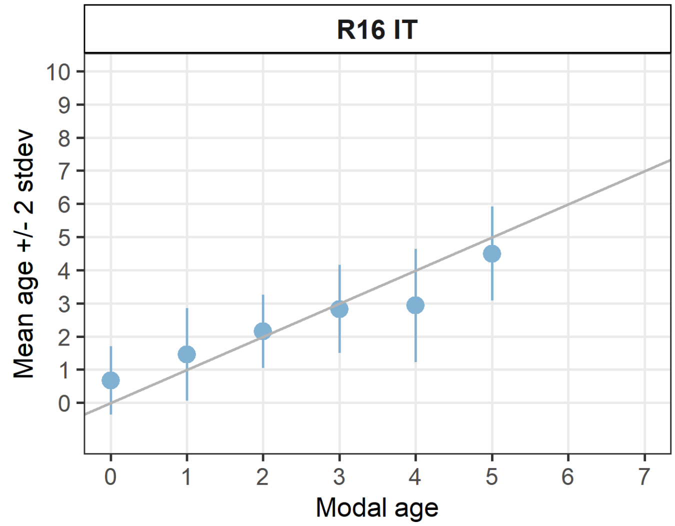
Table 6.10: Age composition by reader gives a summary of number of readings per reader and age. The total numbers of readings by age and by reader are also presented.

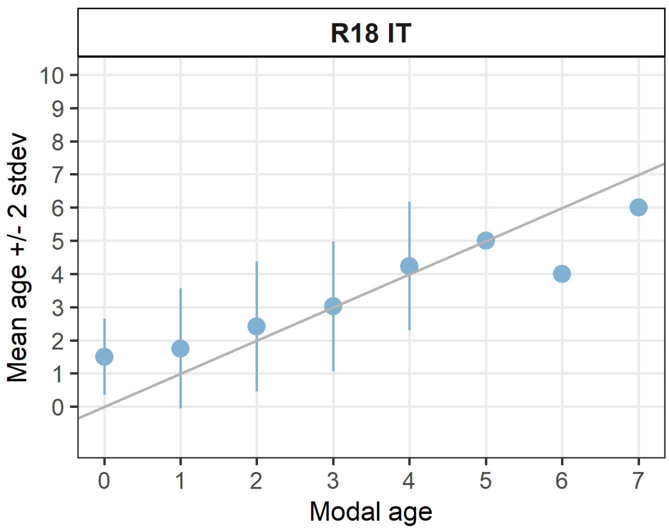
Age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R50 IT	total
0	23	2	43	6	3	6	0	7	7	97
1	71	60	109	80	56	52	52	76	51	607
2	63	95	74	101	93	107	97	88	73	791
3	46	49	20	52	66	57	51	44	29	414
4	31	14	7	12	17	11	29	24	7	152
5	12	2	3	4	2	1	14	3	0	41
6	5	0	0	2	1	0	4	0	0	12
7	2	0	0	0	0	0	0	0	0	2
8	0	0	0	1	0	0	0	0	0	1
9	0	0	1	0	0	0	0	0	0	1
Total	**253**	**222**	**257**	**258**	**238**	**234**	**247**	**242**	**167**	**2118**

Separate age bias plots by reader

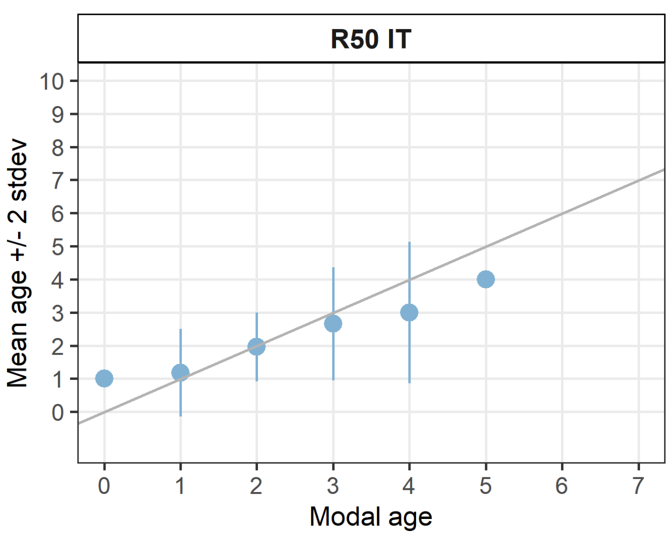



R14 IT
Mean age +/- 2 stdev
Modal age


R16 IT
Mean age +/- 2 stdev
Modal age


R18 IT
Mean age +/- 2 stdev
Modal age


R22 IT
Mean age +/- 2 stdev
Modal age


R50 IT
Mean age +/- 2 stdev
Modal age

Statistics by modal age plot (STDEV, CV and PA)

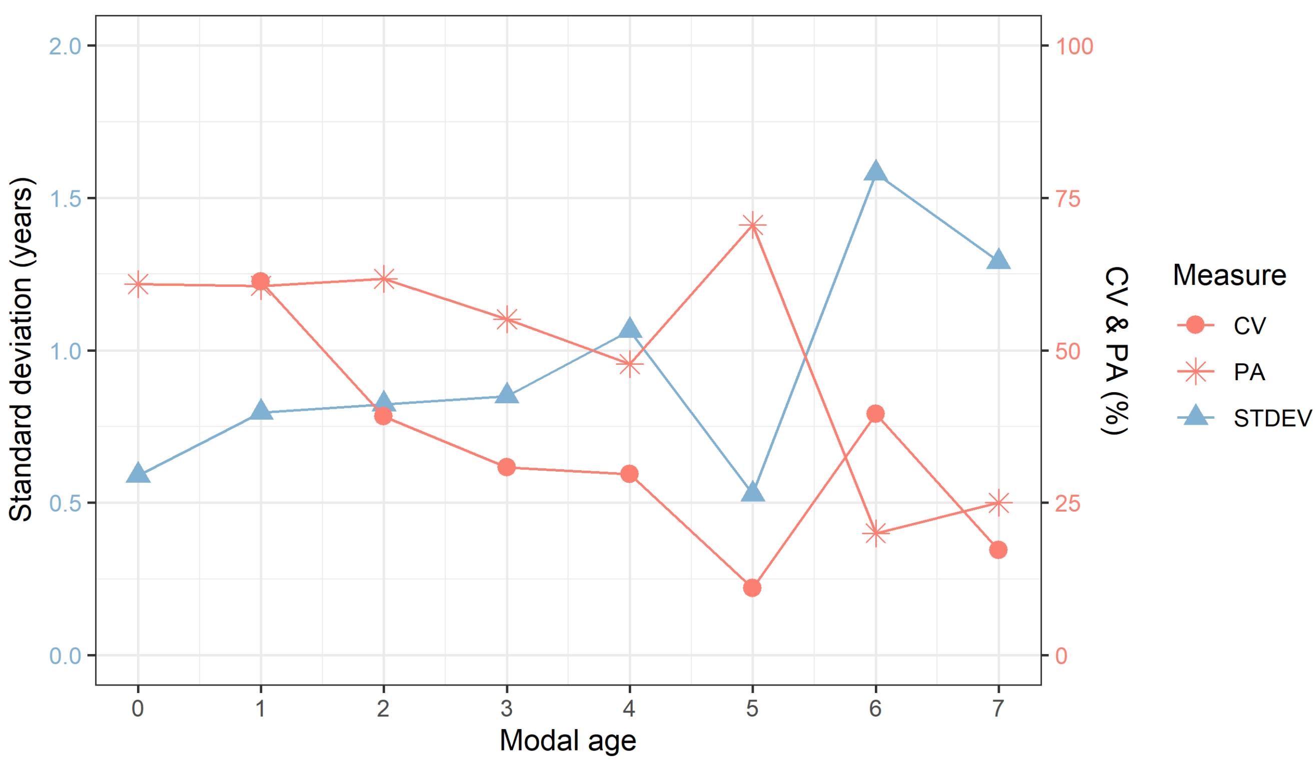


Figure 6.5: CV, PA and (STDEV (standard deviation) are plotted against modal age

Distribution of age reading errors

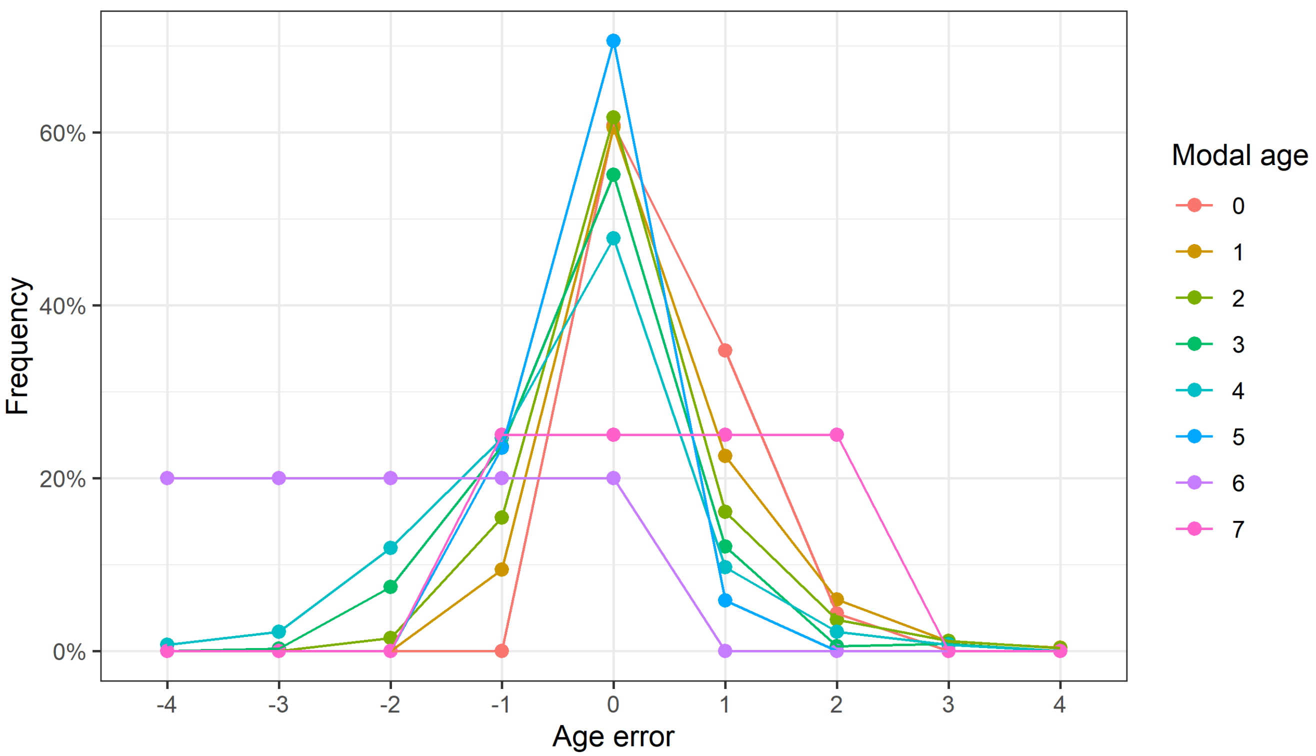


Figure 6.6: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

Relative bias for all readers

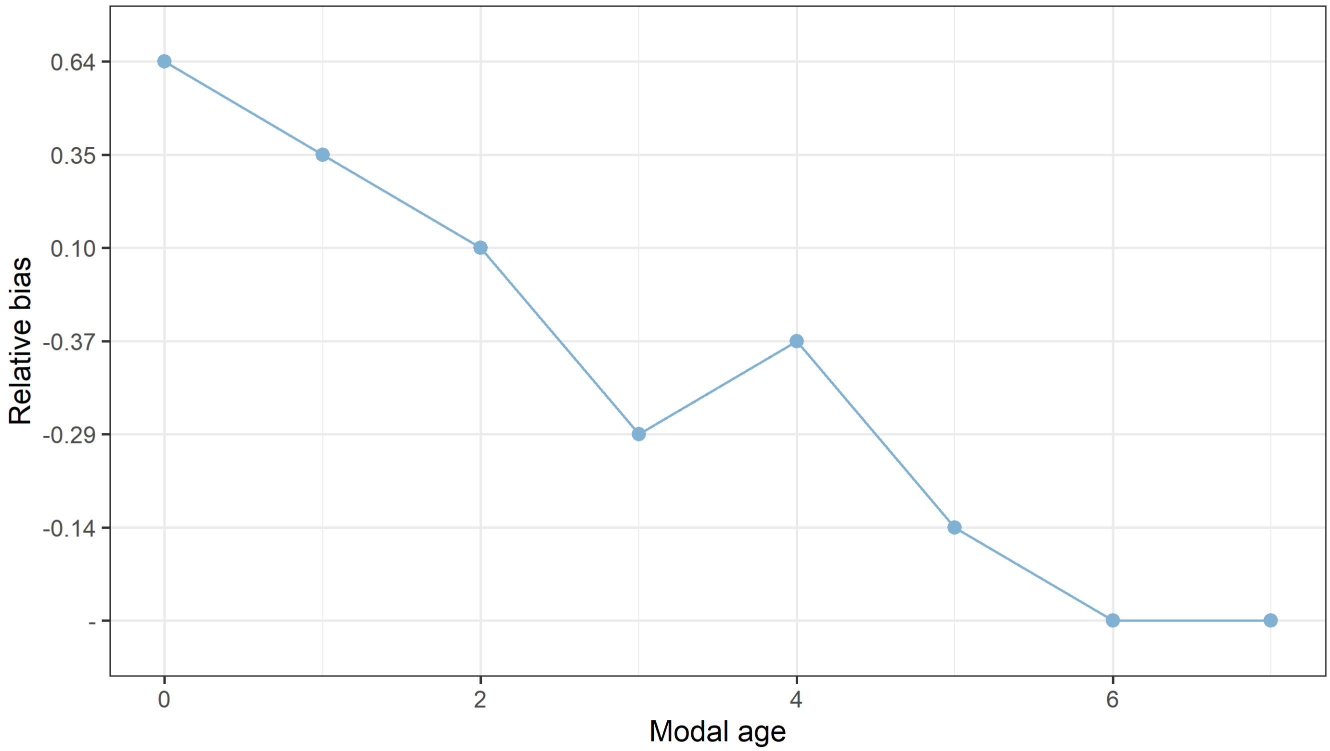


Figure 6.7: The relative bias by modal age as estimated by all age readers combined.

Mean length at age by reader

Table 6.11: Mean fish length at age per reader is calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R04 IT	R06 IT	R08 FR	R12 IT	R14 IT	R16 IT	R18 IT	R22 IT	R50 IT
0	130 mm	120 mm	144 mm	150 mm	119 mm	140 mm	-	114 mm	141 mm
1	146 mm	141 mm	155 mm	146 mm	145 mm	144 mm	146 mm	146 mm	143 mm
2	171 mm	171 mm	182 mm	170 mm	170 mm	171 mm	165 mm	170 mm	174 mm
3	183 mm	187 mm	208 mm	184 mm	174 mm	180 mm	172 mm	184 mm	200 mm
4	192 mm	190 mm	225 mm	205 mm	207 mm	198 mm	194 mm	188 mm	221 mm
5	203 mm	223 mm	207 mm	204 mm	199 mm	222 mm	206 mm	222 mm	-
6	218 mm	-	-	213 mm	224 mm	-	235 mm	-	-
7	257 mm	-	-	-	-	-	-	-	-
8	-	-	-	269 mm	-	-	-	-	-
9	-	-	269 mm	-	-	-	-	-	-
Weighted Mean	**168 mm**	**168 mm**	**168 mm**	**168 mm**	**167 mm**	**168 mm**	**169 mm**	**166 mm**	**170 mm**

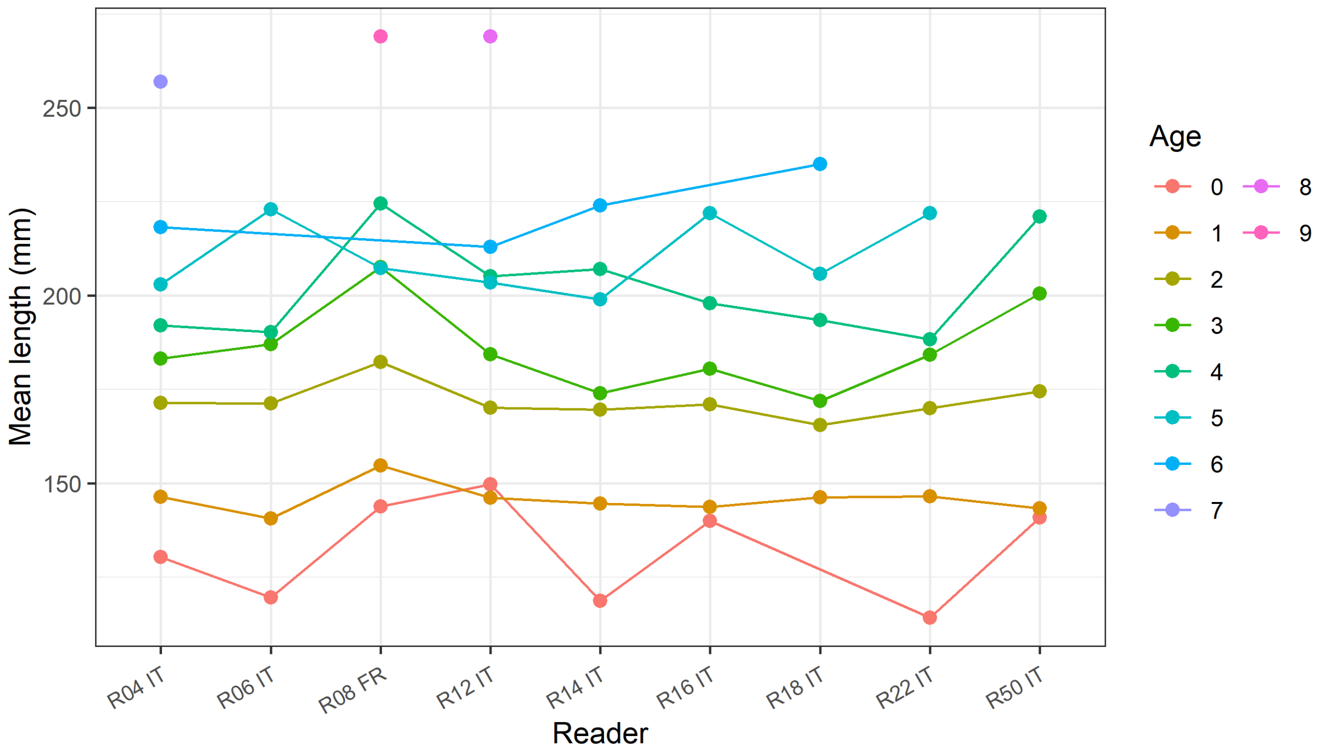


Figure 6.8: The mean fish length at age as estimated by each age reader.

6.2 Results *M. surmuletus* (Event-ID1919)

6.2.1 All readers

Summary statistics

Table 6.12: Summary of statistics; PA (%), CV (%) and APE (%).

NSample	CV	PA	APE
182	55 %	41 %	42 %

Data Overview

Table 6.13: Data overview including modal age and statistics per sample.

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
01_musur-22	264	F	30/03/2022	27.8.c	6	2	2	4	5	-	-	3	2	-	-	4	3	2	-	-	3	-	2	4	2	2	2	47	42	33
02_musur-22	157	F	30/03/2022	27.8.c	2	2	2	4	3	-	4	1	2	-	2	4	3	4	5	6	3	4	2	3	2	1	2	35	45	36
03_musur-22	152	M	30/03/2022	27.8.c	1	0	0	3	2	-	2	1	-	-	1	-	2	1	-	-	2	2	1	2	1	1	1	44	59	49
04_musur-22	236	M	30/03/2022	27.8.c	3	1	2	4	3	3	2	2	3	-	-	2	3	3	4	-	2	2	2	4	1	1	2	37	39	33
05_musur-22	165	M	30/03/2022	27.8.c	-	1	3	4	3	-	3	1	2	-	2	3	3	5	-	5	2	4	2	3	1	1	3	33	48	39
06_musur-22	223	M	30/03/2022	27.8.c	3	3	3	5	4	-	2	2	3	-	3	-	4	3	-	-	3	3	2	4	-	1	3	50	32	21
07_musur-22	177	M	30/03/2022	27.8.c	1	2	2	5	4	3	3	1	2	-	2	3	3	4	5	5	3	4	2	4	2	1	2	29	45	37
08_musur-22	234	M	30/03/2022	27.8.c	3	3	1	4	-	-	2	2	2	-	-	-	2	2	-	-	3	-	2	3	2	1	2	50	36	29
1.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	191	M	05/03/2021	21	4	1	1	3	2	3	1	2	2	-	2	3	2	1	-	6	2	3	3	3	1	1	2	30	55	42
10.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	151	M	14/05/2021	21	3	1	3	2	3	2	2	1	1	-	1	-	3	1	6	5	2	3	-	2	2	1	3	26	59	44
10004_musur-23	278	M	10/10/2023	27.8.c	6	4	3	6	5	5	4	3	4	-	4	5	3	3	5	-	4	-	4	4	5	2	4	37	26	20
10011_musur-23	279	F	19/10/2023	27.8.c	6	2	2	-	4	6	4	2	2	-	2	2	2	2	-	-	4	-	2	3	4	1	2	53	50	42
10014_musur-22	135	U	28/11/2022	27.9.a	0	1	1	4	2	-	1	0	1	-	0	3	2	2	4	4	2	2	-	3	1	0	1	26	79	64
10016_musur-22	124	U	28/11/2022	27.9.a	1	2	1	4	3	2	2	0	2	-	2	3	3	2	-	5	2	3	2	3	2	1	2	45	50	37
10020_musur-22	130	U	28/11/2022	27.9.a	1	1	1	3	2	-	2	0	2	-	1	3	3	3	4	4	2	1	3	3	1	0	1	30	61	50
10041_musur-22	245	F	13/10/2022	27.8.c	2	3	2	3	4	3	3	2	3	-	3	3	2	2	-	-	3	-	3	3	1	1	3	56	31	26
10045_musur-22	214	F	13/10/2022	27.8.c	5	3	1	-	3	-	5	1	2	-	1	3	2	4	5	6	2	-	1	3	1	1	1	33	61	51
10049_musur-22	250	M	13/10/2022	27.8.c	3	3	2	4	4	3	4	2	2	-	2	4	3	2	5	-	3	2	2	4	2	1	2	40	36	30

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
10070_musur-22	123	U	15/10/2022	27.8.c	0	1	0	3	1	1	1	0	1	-	0	3	2	1	-	-	2	1	0	2	1	0	1	42	92	67
10096_musur-22	286	M	17/10/2022	27.8.c	5	6	3	6	7	-	5	3	3	-	4	6	3	3	5	9	4	4	5	4	4	3	3	30	35	27
10ms8_11_24	201	M	12/03/2024	missing	1	2	2	4	3	-	2	2	3	2	-	5	3	3	-	-	2	1	3	3	3	1	3	39	42	33
11.Mulsur_OTB_MEDITS_ST.64_16x_L	216	F	15/07/2021	21	2	2	2	4	3	3	2	2	2	-	2	4	3	1	-	-	2	-	2	4	2	2	2	61	35	29
12.Mulsur_OTB_MEDITS_ST.57_16x_L	148	F	17/07/2021	21	1	1	2	3	1	2	1	1	1	-	1	-	3	2	-	4	2	-	3	3	2	1	1	44	51	42
12_musur-22	259	M	30/03/2022	27.8.c	9	3	3	4	4	-	4	3	-	-	-	4	3	5	-	-	3	-	2	4	2	3	3	40	45	28
13.Mulsur_OTB_MEDITS_ST.48_16x_L	185	M	20/07/2021	21	3	1	1	3	2	-	1	2	2	-	2	3	3	2	-	-	2	2	2	3	2	1	2	50	35	26
13_musur-22	240	M	30/03/2022	27.8.c	4	3	1	5	5	-	4	3	-	-	2	-	3	1	-	-	3	4	-	-	0	2	3	29	53	41
14.Mulsur_OTB_MEDITS_ST.48_16x_L	112	F	20/07/2021	21	2	1	1	3	1	-	2	1	2	-	-	3	3	2	4	4	1	2	2	3	2	1	2	37	47	37
15.Mulsur_GTR_KONSTANTINOS.NP818_IONIO_16x_L	230	M	25/09/2021	21	2	2	1	4	3	-	3	2	2	-	2	2	3	2	-	6	3	-	2	3	2	2	2	56	43	31
16.Mulsur_GTR_AGIOS.ANDREAS.SM679_IONIO_16x_L	301	F	06/12/2021	21	7	3	3	4	6	-	3	3	3	-	3	2	4	2	-	8	3	-	3	4	3	3	3	56	44	32
16ms16_11_24	249	F	08/04/2024	missing	3	4	3	5	3	3	4	4	3	4	3	4	5	4	5	6	3	3	4	5	3	2	3	41	26	21
17.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	245	F	22/11/2021	21	5	2	3	4	4	-	2	2	2	-	-	3	3	1	-	7	3	4	2	4	2	2	2	39	47	35

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
18.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	281	M	14/11/2021	21	-	2	4	-	5	-	4	3	2	-	-	4	3	0	-	-	3	-	3	4	0	3	3	36	51	37
19.Mulsur_OTB_PANAGIA.FANEROMENH.NP444_IONIO_16x_L	280	F	05/12/2021	21	-	2	1	4	-	-	3	3	1	-	3	3	3	5	-	7	3	3	3	4	1	1	3	47	53	35
1ms111_11_24	209	M	23/09/2024	missing	4	3	1	4	3	3	4	2	3	4	3	3	3	4	-	6	3	2	3	4	1	2	3	43	37	26
1ms21_11_24	180	M	29/04/2024	missing	1	3	4	6	5	-	5	2	4	5	4	5	5	3	6	6	3	4	-	5	4	1	5	30	37	29
2.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	290	F	02/03/2021	21	-	2	1	4	2	2	1	2	2	-	2	2	2	2	-	6	1	-	2	4	2	1	2	61	57	37
20.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	258	F	25/11/2021	21	5	2	2	3	-	-	2	2	-	-	3	2	3	2	-	-	3	4	1	4	1	1	2	38	46	38
24MULLSUR251-0001	284	F	10/01/2024	8	2	2	3	3	3	3	3	2	3	2	2	5	2	2	3	4	2	2	3	3	2	2	2	50	30	24
24MULLSUR251-0015	178	U	10/01/2024	8	0	1	3	3	1	-	2	0	1	-	1	-	2	0	2	0	-	1	2	2	3	1	1	33	75	63
24MULLSUR251-0025	280	F	10/01/2024	8	2	3	3	4	2	4	3	2	3	4	-	3	3	3	-	5	2	3	3	4	3	2	3	50	27	19
24MULLSUR251-0040	152	F	10/01/2024	8	0	0	1	2	0	-	-	0	0	-	0	-	1	1	-	2	0	0	0	1	1	0	0	59	-	-
24MULLSUR251-0050	151	F	10/01/2024	8	0	0	2	3	0	-	3	0	0	-	0	-	1	2	-	-	0	-	0	-	2	0	0	60	-	-
24MULLSUR251-0065	289	F	10/01/2024	8	3	2	2	4	2	3	2	2	2	-	2	-	1	1	2	-	1	-	2	3	2	1	2	56	39	26
24MULLSUR251-0067	138	U	27/03/2024	8	0	0	1	2	0	1	2	0	0	0	1	-	1	1	-	-	0	-	0	1	1	0	0	50	-	-
24MULLSUR251-0107	203	M	27/03/2024	8	0	1	1	2	1	1	1	1	1	1	1	-	1	2	1	2	0	1	1	2	1	0	1	67	56	35
24MULLSUR251-0111	247	M	27/03/2024	8	1	1	1	2	1	-	3	1	2	-	1	-	1	1	1	-	0	1	1	2	1	1	1	72	53	37
24MULLSUR351-0004	130	M	03/09/2024	8	0	0	1	2	0	1	1	0	0	0	0	-	1	1	1	1	0	0	0	1	0	0	0	57	-	-
24MULLSUR351-0021	160	F	03/09/2024	8	1	0	2	2	0	-	2	0	1	-	0	-	1	1	-	2	0	0	1	1	0	0	0	44	-	-

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
24MULLSUR351-0025	190	F	03/09/2024	8	2	1	2	4	1	2	3	1	2	2	1	4	2	2	4	-	1	2	2	2	1	0	2	48	55	37
24MULLSUR351-0032	150	M	03/09/2024	8	1	0	2	2	1	1	2	0	1	-	1	-	1	2	2	2	0	1	-	1	0	0	1	42	74	57
24MULLSUR351-0048	250	F	03/09/2024	8	3	2	3	3	2	-	4	2	2	4	2	-	1	3	-	6	1	-	-	3	2	1	2	35	49	38
24MULLSUR351-0053	240	F	03/09/2024	8	3	2	2	3	2	3	3	2	2	2	2	3	2	2	3	-	2	-	2	3	2	1	2	60	25	21
24MULLSUR551-0001	223	F	11/09/2024	7	3	2	1	2	-	-	3	1	2	-	2	4	2	4	-	4	2	-	2	3	3	0	2	41	47	38
24MULLSUR551-0002	168	M	02/12/2024	7	3	1	2	3	1	2	5	0	1	-	3	-	2	2	-	4	0	2	2	3	4	0	2	32	67	51
24MULLSUR551-0007	128	M	02/12/2024	7	-	0	2	2	0	-	3	0	1	-	2	-	1	1	-	3	0	-	-	2	3	0	0	33	-	-
24MULLSUR551-0008	182	M	02/12/2024	7	3	1	2	3	1	3	4	1	1	4	3	-	1	1	-	5	0	2	2	2	2	0	1	30	66	52
24MULLSUR551-0011	187	F	02/12/2024	7	3	1	1	4	2	-	2	1	1	-	1	-	2	3	-	-	0	2	1	2	2	1	1	41	58	46
24MULLSUR551-0013	252	M	02/12/2024	7	6	3	3	4	3	-	3	2	3	-	3	-	3	2	3	-	2	3	2	3	3	1	3	61	35	21
24MULLSUR551-0015	193	M	04/12/2024	7	3	1	2	3	1	2	3	1	2	-	1	-	1	2	2	4	2	1	2	2	2	0	2	45	50	38
24MULLSUR551-0018	207	M	04/12/2024	7	3	2	3	3	2	2	4	2	2	3	3	4	3	3	3	5	2	3	2	3	2	1	3	45	32	25
24MULLSUR551-0019	238	M	05/12/2024	7	3	3	4	5	4	3	4	2	4	5	5	7	4	3	5	5	2	4	3	6	3	2	4	27	33	26
24MULLSUR551-0022	240	M	28/05/2024	7	5	2	5	-	-	-	5	-	2	-	1	-	3	3	-	-	2	-	-	-	5	1	5	36	53	45
24MULLSUR551-0023	272	F	29/05/2024	7	6	3	5	4	3	-	5	3	3	-	2	-	3	2	4	7	3	-	3	-	5	3	3	47	37	30
24MULLSUR551-0026	215	F	06/06/2024	7	3	2	3	3	2	2	2	2	2	3	2	-	2	3	4	4	1	3	2	4	2	1	2	48	35	30
24MULLSUR551-0028	247	F	06/06/2024	7	4	2	3	3	2	-	3	2	3	-	2	-	3	3	3	5	2	2	2	2	3	1	3	42	34	27
24MULLSUR551-0031	158	M	09/06/2024	7	2	1	5	3	1	2	2	1	1	-	1	-	1	4	3	-	1	-	2	2	3	0	1	39	65	49
24MULLSUR551-0036	195	M	09/06/2024	7	3	1	5	3	2	-	5	1	1	-	2	-	2	2	-	-	1	2	2	3	3	1	2	35	55	42
25ms16_11_24	239	F	08/04/2024	missing	1	4	3	4	3	3	4	3	3	4	3	4	3	3	4	6	3	3	3	4	4	1	3	50	31	22
27ms84_11_24	217	F	15/07/2024	missing	2	4	3	5	4	4	5	2	3	3	4	4	3	3	-	-	3	-	4	4	4	2	4	42	26	22
28ms111_11_24	152	F	23/09/2024	missing	0	1	1	2	1	2	2	1	1	3	1	2	1	2	1	4	2	1	1	2	1	0	1	50	63	49
28ms8_11_24	192	M	12/03/2024	missing	1	3	2	3	3	2	1	2	2	3	3	3	3	2	4	-	2	2	3	3	2	1	3	43	34	29

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
3.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	238	M	02/03/2021	21	3	3	3	-	-	-	3	3	3	-	3	9	4	2	5	-	2	3	2	3	4	2	3	53	49	30
33ms111_11_24	112	M	23/09/2024	missing	0	1	1	3	-	1	2	0	1	1	1	3	1	3	3	3	1	1	1	2	1	0	1	52	72	60
34ms8_11_24	216	M	12/03/2024	missing	2	3	3	4	4	3	4	2	-	7	3	5	3	2	6	5	3	3	3	4	3	2	3	43	38	29
38ms70_11_24	213	M	10/07/2024	missing	3	3	2	4	3	3	4	2	2	7	3	3	2	5	-	6	3	4	3	3	4	1	3	43	42	30
4.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	224	M	02/03/2021	21	5	1	2	5	5	-	3	2	-	-	3	8	4	2	-	-	2	-	-	-	6	2	2	36	56	46
41ms8_11_24	189	F	12/03/2024	missing	1	1	1	4	3	3	2	2	2	4	2	3	3	3	-	4	2	1	3	3	2	1	3	33	43	37
44ms9_11_24	203	F	12/03/2024	missing	1	2	2	6	4	4	3	2	3	4	4	6	3	4	-	7	3	2	3	4	1	1	4	29	50	39
46ms70_11_24	265	F	10/07/2024	missing	3	4	2	5	5	5	5	4	3	4	4	5	3	4	5	6	3	4	3	5	5	1	5	36	30	23
48ms111_11_24	143	M	23/09/2024	missing	0	1	1	2	1	2	2	1	1	2	1	3	1	2	2	4	2	1	1	2	1	0	1	45	61	48
5.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	264	F	15/04/2021	21	4	1	2	-	5	-	2	3	2	-	5	-	3	2	-	-	3	3	3	5	3	2	3	38	40	29
55ms111_11_24	94	U	23/09/2024	missing	0	0	0	2	1	1	1	0	1	1	1	2	2	1	-	2	1	0	0	2	0	0	1	38	-	-
57ms84_11_24	189	M	15/07/2024	missing	2	2	1	8	4	3	5	1	3	2	3	3	3	3	-	7	3	3	3	3	1	1	3	48	59	37
5ms16_11_24	159	M	08/04/2024	missing	1	2	4	4	3	3	3	1	3	4	3	5	4	2	4	5	2	2	3	3	3	1	3	36	40	30
6.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	311	F	15/04/2021	21	6	2	3	-	6	-	4	3	2	-	2	5	1	4	-	-	3	-	-	5	3	3	3	33	43	35
6ms21_11_24	222	F	29/04/2024	missing	2	4	3	5	4	3	3	3	3	4	-	4	4	5	-	5	3	-	4	4	3	2	3	37	25	21
7.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	308	F	14/05/2021	21	5	4	3	5	5	-	6	4	2	-	3	-	4	2	-	-	4	-	2	5	2	3	5	25	35	30

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
8.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	175	M	14/05/2021	21	3	2	1	4	3	2	2	1	1	-	3	-	3	2	-	-	2	-	2	3	2	1	2	41	41	32
83ms84_11_24	193	F	15/07/2024	missing	1	2	1	-	2	3	3	1	2	3	2	3	3	4	-	6	2	2	2	3	4	1	2	35	49	38
9.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	146	M	14/05/2021	21	3	2	2	3	3	-	2	1	2	-	-	-	3	2	5	5	2	-	3	3	4	1	2	35	43	33
GSA18_MS-01	225	F	04/09/2024	18	4	3	1	3	3	3	1	2	1	2	3	3	3	2	3	5	3	1	3	3	-	1	3	52	43	35
GSA18_MS-02	175	F	04/09/2024	18	3	1	1	4	2	2	1	1	-	-	1	-	1	1	-	-	2	-	-	3	0	1	1	53	66	53
GSA18_MS-03	170	F	04/09/2024	18	1	0	0	4	1	-	-	1	1	-	1	-	1	1	-	-	1	0	0	2	1	0	1	56	106	62
GSA18_MS-04	160	M	04/09/2024	18	1	0	1	3	1	2	1	0	-	2	2	-	2	3	-	-	2	-	1	3	1	0	1	35	68	58
GSA18_MS-05	150	F	04/09/2024	18	1	0	1	4	1	2	1	0	1	1	1	-	2	2	-	-	1	-	1	3	1	0	1	56	80	57
GSA18_MS-06	140	M	04/09/2024	18	0	0	2	4	1	3	1	0	-	-	2	-	2	3	-	-	1	0	1	3	2	0	0	29	-	-
GSA18_MS-07	140	F	04/09/2024	18	1	0	1	4	1	2	1	0	-	-	2	-	2	2	-	-	1	0	1	2	3	0	1	35	82	65
GSA18_MS-08	135	M	04/09/2024	18	1	0	2	3	1	2	-	0	1	1	1	-	2	2	-	-	1	0	0	-	2	0	1	35	83	66
GSA18_MS-09	265	F	20/09/2024	18	4	3	2	5	3	4	2	2	2	-	-	4	2	2	-	-	2	1	3	6	3	1	2	39	47	37
GSA18_MS-10	225	M	20/09/2024	18	3	3	4	5	4	-	3	2	2	-	4	-	3	3	-	-	3	2	4	6	6	2	3	35	37	30
GSA18_MS-11	215	F	20/09/2024	18	1	1	4	4	2	3	3	1	1	5	2	-	2	1	-	-	2	3	-	5	2	-	1	29	56	46
GSA18_MS-12	210	M	20/09/2024	18	2	2	4	5	3	3	3	2	1	6	-	6	2	2	-	-	2	4	-	5	5	1	2	33	51	43
GSA18_MS-13	205	F	20/09/2024	18	3	3	3	4	4	3	4	1	2	4	-	4	3	3	-	-	2	4	3	5	3	1	3	42	34	25
GSA18_MS-14	205	F	20/09/2024	18	4	1	5	-	3	4	3	1	1	-	3	-	2	2	-	-	2	3	-	6	5	1	1	25	55	44
GSA18_MS-15	200	F	20/09/2024	18	2	2	4	5	4	3	2	1	2	6	2	7	2	3	-	-	2	4	-	6	3	1	2	37	55	44
GSA18_MS-16	190	F	20/09/2024	18	2	2	3	5	4	3	3	1	2	5	4	7	5	4	6	6	2	3	3	6	3	1	3	27	47	39
GSA18_MS-17	190	F	20/09/2024	18	4	2	3	4	2	2	2	1	2	-	2	-	2	2	5	-	2	-	3	5	3	0	2	50	51	40
GSA18_MS-18	160	F	28/05/2024	18	1	1	2	3	3	2	2	1	1	-	2	-	2	2	5	-	2	3	3	4	6	1	2	37	57	44

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
GSA18_MS-19	160	M	28/05/2024	18	0	0	3	5	-	2	1	1	1	-	1	-	2	4	-	-	1	-	2	-	5	1	1	40	84	65
GSA18_MS-20	165	M	28/05/2024	18	1	1	3	4	-	2	2	1	2	5	2	-	2	4	-	-	2	3	3	4	2	1	2	39	49	40
GSA18_MS-21	170	M	28/05/2024	18	3	1	3	4	3	2	2	1	2	5	3	4	3	3	-	5	2	2	3	4	5	1	3	33	43	34
GSA18_MS-22	150	M	28/05/2024	18	4	2	4	5	3	2	3	1	2	-	2	-	4	4	-	5	2	4	4	5	2	1	2	32	43	37
GSA18_MS-23	155	M	28/05/2024	18	2	1	4	4	3	2	3	1	1	4	2	-	3	3	-	-	2	-	2	5	5	1	2	28	50	42
GSA18_MS-24	200	M	28/05/2024	18	1	2	3	5	3	3	2	2	2	3	3	-	3	4	-	7	2	-	4	5	4	1	3	32	48	35
GSA18_MS-25	215	F	22/04/2024	18	3	2	4	4	4	3	2	2	2	3	3	-	2	3	-	-	2	4	3	4	3	2	2	37	28	23
GSA18_MS-26	195	M	22/04/2024	18	3	2	4	5	5	3	4	2	3	-	-	-	4	3	-	-	3	4	5	5	2	2	3	29	32	28
GSA18_MS-27	190	F	22/04/2024	18	1	1	4	6	-	3	1	1	-	4	1	-	4	3	6	5	2	-	1	4	3	1	1	39	63	54
GSA18_MS-28	175	F	22/04/2024	18	1	2	3	5	3	3	2	1	2	-	-	-	4	4	-	-	2	-	1	5	3	1	1	25	52	43
GSA18_MS-29	160	F	22/04/2024	18	1	1	4	5	4	-	2	1	2	4	3	-	3	3	5	-	2	-	1	4	2	1	1	28	53	46
GSA18_MS-30	155	F	22/04/2024	18	3	1	4	5	5	2	1	1	-	-	3	-	3	2	6	-	2	-	2	4	5	1	1	24	56	46
GSA18_MS-31	130	M	22/04/2024	18	1	1	4	5	5	2	2	1	2	4	3	-	3	3	6	-	2	3	2	3	4	1	1	20	51	41
GSA18_MS-32	140	M	22/04/2024	18	1	0	3	-	2	-	1	1	2	-	2	-	4	3	-	-	2	-	0	-	2	1	2	36	66	52
GSA19_MULLSUR_01	182	M	10/01/2024	19	2	1	3	3	4	2	4	1	3	3	4	4	4	3	2	3	2	2	3	3	4	1	3	36	37	30
GSA19_MULLSUR_02	152	F	10/01/2024	19	0	1	1	2	2	1	2	0	2	-	2	3	1	1	1	-	2	1	0	3	1	1	1	45	65	53
GSA19_MULLSUR_03	144	F	10/01/2024	19	0	1	1	3	2	1	2	0	2	-	2	3	2	2	2	3	2	-	0	3	1	1	2	40	60	50
GSA19_MULLSUR_04	157	F	10/01/2024	19	0	0	1	1	1	1	2	0	2	-	2	3	2	1	1	-	1	-	1	3	1	0	1	47	76	59
GSA19_MULLSUR_05	146	F	10/01/2024	19	0	1	1	2	1	2	2	1	2	-	1	6	2	3	1	-	1	1	1	3	1	1	1	55	77	53
GSA19_MULLSUR_06	232	F	10/01/2024	19	1	1	2	3	2	-	3	2	2	-	2	5	3	1	-	-	1	1	1	3	3	1	1	39	54	41
GSA19_MULLSUR_07	252	F	27/03/2024	19	-	2	1	2	3	2	3	3	2	-	2	3	4	2	-	-	2	1	1	2	1	1	2	44	42	31
GSA19_MULLSUR_08	200	M	27/03/2024	19	2	2	1	2	2	2	2	2	1	-	2	5	4	3	4	-	1	1	2	2	1	1	2	50	53	36
GSA19_MULLSUR_09	193	M	27/03/2024	19	2	2	2	2	3	2	4	1	2	2	3	4	4	3	-	-	1	1	2	3	2	1	2	45	43	34

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
GSA19_MULLSUR_10	224	M	03/09/2024	19	-	2	2	5	4	2	3	2	2	-	3	5	5	2	3	-	1	2	2	3	3	0	2	42	50	39
GSA19_MULLSUR_11	124	F	03/09/2024	19	0	1	1	3	1	1	2	0	2	1	1	3	2	2	1	2	1	1	1	2	1	0	1	50	64	51
GSA19_MULLSUR_12	125	M	03/09/2024	19	0	0	1	2	1	1	2	0	-	-	1	3	1	2	2	-	1	2	1	1	1	0	1	47	72	55
GSA19_MULLSUR_13	207	M	03/09/2024	19	1	2	2	4	2	2	3	1	2	-	2	5	2	2	3	-	2	2	2	3	1	1	2	55	46	32
GSA19_MULLSUR_14	226	F	03/09/2024	19	1	1	2	2	1	2	1	2	1	-	2	8	4	4	-	-	1	-	1	2	4	1	1	44	81	56
GSA19_MULLSUR_15	183	M	03/09/2024	19	1	1	2	2	1	-	2	1	2	-	2	7	4	2	-	-	1	2	1	2	1	0	2	44	81	48
GSA19_MULLSUR_16	236	F	11/09/2024	19	1	1	1	-	2	-	2	2	2	-	2	3	3	1	4	-	2	-	2	3	2	0	2	47	50	35
GSA19_MULLSUR_17	165	M	02/12/2024	19	1	0	2	2	2	2	1	1	2	-	1	3	2	4	2	-	1	2	2	2	2	0	2	55	54	41
GSA19_MULLSUR_18	183	M	02/12/2024	19	-	1	2	2	2	-	2	1	2	-	2	3	2	3	-	-	1	2	2	2	2	1	2	65	32	22
GSA19_MULLSUR_19	240	F	02/12/2024	19	3	2	3	4	5	3	4	2	3	-	2	4	2	3	5	4	2	3	3	4	3	1	3	38	34	26
GSA19_MULLSUR_20	137	F	02/12/2024	19	0	0	0	1	1	1	1	0	1	-	1	5	2	1	-	-	1	2	0	1	0	0	1	47	124	74
MSUR_DCF23_01	156	F	16/02/2023	22	4	2	5	5	-	2	5	1	1	-	1	7	3	2	4	-	2	-	4	4	4	0	4	28	59	50
MSUR_DCF23_02	164	M	16/02/2023	22	1	2	4	6	-	-	5	1	2	4	3	7	2	3	4	6	2	5	2	6	2	1	2	30	56	48
MSUR_DCF23_03	174	F	16/05/2023	22	5	5	4	7	5	4	6	1	2	4	4	5	5	4	6	7	3	5	4	6	5	1	5	32	36	28
MSUR_DCF23_04	185	M	16/02/2023	22	3	2	5	6	4	-	6	1	1	4	2	8	3	3	5	7	2	4	2	5	3	1	3	19	55	45
MSUR_DCF23_05	194	M	16/02/2023	22	2	3	4	5	-	3	5	2	1	-	-	6	4	2	-	-	3	3	3	5	3	1	3	35	44	35
MSUR_DCF23_06	201	M	16/02/2023	22	5	4	4	6	5	4	5	2	2	-	3	6	3	2	5	6	3	4	3	6	4	3	4	24	34	27
MSUR_DCF23_07	219	M	16/02/2023	22	3	4	2	4	3	-	4	2	3	2	3	4	4	3	5	6	3	3	3	5	6	2	3	38	34	28
MSUR_DCF23_08	227	M	16/05/2023	22	4	4	5	6	-	4	6	2	2	-	4	9	5	5	4	7	3	5	3	6	4	2	4	30	39	30
MSUR_DCF23_09	231	F	16/02/2023	22	-	3	5	7	4	4	5	2	3	-	4	7	6	2	4	7	4	4	2	6	5	2	4	30	39	32
MSUR_DCF23_10	287	F	16/02/2023	22	2	3	4	0	4	5	5	3	4	-	4	5	5	2	-	6	3	4	3	5	4	1	4	30	42	33
MSUR_DCF23_11	155	F	15/09/2023	22	1	2	2	4	3	2	4	1	1	3	2	4	4	3	4	4	2	3	4	4	2	1	4	36	43	38
MSUR_DCF23_12	164	F	15/09/2024	22	5	1	1	5	3	3	5	1	1	-	-	6	2	2	-	-	2	2	2	3	1	0	1	28	69	56

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
MSUR_DCF23_13	175	F	04/10/2023	22	1	2	3	4	4	3	4	1	2	3	3	4	2	3	4	5	3	2	4	4	2	2	4	32	37	30
MSUR_DCF23_14	185	F	15/09/2023	22	2	2	2	5	4	2	4	1	1	-	2	4	3	3	-	5	3	3	2	4	2	0	2	35	50	41
MSUR_DCF23_15	199	F	04/10/2023	22	4	1	2	5	5	3	5	1	-	3	3	5	2	2	-	7	3	3	3	4	2	0	3	30	54	41
MSUR_DCF23_16	217	F	27/10/2023	22	2	3	4	6	-	-	5	1	-	-	-	8	2	1	-	-	2	-	-	4	2	1	2	31	68	55
MSUR_DCF23_17	224	F	27/10/2023	22	3	4	3	5	5	4	6	2	4	4	4	5	5	4	5	5	4	3	5	5	4	1	4	36	28	20
MSUR_DCF23_18	235	F	27/10/2023	22	3	3	3	5	4	4	5	3	-	3	3	3	3	3	-	7	3	3	-	4	1	1	3	58	40	27
MSUR_DCF23_19	241	F	27/10/2023	22	1	3	2	-	2	-	2	3	2	-	2	2	2	2	-	-	2	1	-	3	1	1	2	56	35	24
MSUR_DCF23_20	249	M	27/10/2023	22	4	4	4	6	6	4	5	3	3	3	-	5	3	3	-	6	3	4	4	5	3	1	3	35	32	24
MULLSURGSA16_01	110		19/02/2017	16	2	2	3	3	2	2	4	1	3	-	3	4	2	2	2	5	2	2	3	2	3	2	2	52	36	29
MULLSURGSA16_02	120		23/02/2017	16	0	1	1	2	1	1	1	0	1	1	1	3	1	1	-	2	1	0	1	2	2	0	1	57	70	48
MULLSURGSA16_03	140		23/02/2017	16	0	0	1	2	1	-	1	0	1	1	1	4	2	2	2	2	1	1	1	1	3	0	1	48	78	59
MULLSURGSA16_04	150		28/03/2017	16	1	1	4	3	2	2	2	2	2	-	-	3	2	2	-	5	2	1	2	3	2	1	2	53	47	33
MULLSURGSA16_05	160		28/03/2017	16	0	0	2	2	2	1	2	1	2	-	1	3	1	2	2	3	2	1	2	2	2	0	2	52	55	46
MULLSURGSA16_06	180		30/05/2017	16	2	1	4	3	3	-	3	3	3	-	2	3	2	2	3	5	2	1	3	2	3	2	3	45	36	28
MULLSURGSA16_07	200		06/04/2017	16	0	1	1	1	1	1	2	1	1	-	1	-	1	1	-	-	2	1	1	2	1	1	1	78	42	27
MULLSURGSA16_08	220		06/04/2017	16	1	0	4	2	1	1	3	1	2	-	1	-	1	2	-	-	2	0	2	3	4	2	1	33	66	51
MULLSURGSA16_09	240		28/05/2017	16	1	0	2	1	1	1	3	0	1	2	2	-	2	3	-	3	2	1	-	3	1	0	1	37	67	57
MULLSURGSA16_10	270		22/03/2017	16	1	0	3	1	2	1	3	1	2	-	2	-	1	3	-	3	2	3	2	2	3	1	1	32	49	40
MULLSURGSA16_11	90		19/11/2017	16	1	1	3	3	3	2	4	1	3	-	3	4	3	2	2	3	2	2	3	2	3	1	3	43	38	32
MULLSURGSA16_12	100		21/11/2017	16	1	0	3	2	2	2	3	1	2	-	2	3	2	4	3	5	3	2	2	3	2	1	2	43	48	36
MULLSURGSA16_13	120		21/11/2017	16	0	1	2	3	2	1	3	1	1	-	2	3	2	3	-	4	3	1	3	2	2	1	1	30	51	40
MULLSURGSA16_14	130		21/11/2017	16	1	0	2	2	1	2	3	1	3	-	-	-	1	3	3	3	2	2	3	2	2	0	2	37	52	41
MULLSURGSA16_15	150		21/11/2017	16	1	0	3	2	2	2	2	0	2	-	2	-	2	4	1	3	2	0	2	2	0	0	2	50	71	57

Sample ID	Total Length	sex	Catch date	ICES area	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	Modal	PA %	CV %	APE %
MULLSURGSA16_16	160		21/11/2017	16	1	1	3	2	2	-	4	1	2	-	2	2	2	3	2	5	2	1	2	2	1	1	2	50	51	33
MULLSURGSA16_17	180		21/11/2017	16	1	0	2	2	2	1	5	1	2	-	2	5	2	4	2	4	2	1	2	2	3	0	2	48	65	46
MULLSURGSA16_18	190		21/11/2017	16	0	0	1	2	1	-	2	0	1	-	2	2	1	3	2	3	2	1	1	3	1	0	1	35	71	60
MULLSURGSA16_19	200		05/12/2017	16	0	0	1	3	2	1	3	0	1	1	2	4	1	4	2	3	1	2	2	2	2	0	2	32	72	58
MULLSURGSA16_20	210		08/12/2017	16	0	0	0	2	2	1	2	0	1	1	1	-	1	6	1	3	1	1	1	2	0	0	1	43	111	74

Table 6.14: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings by modal age and by reader are also presented.

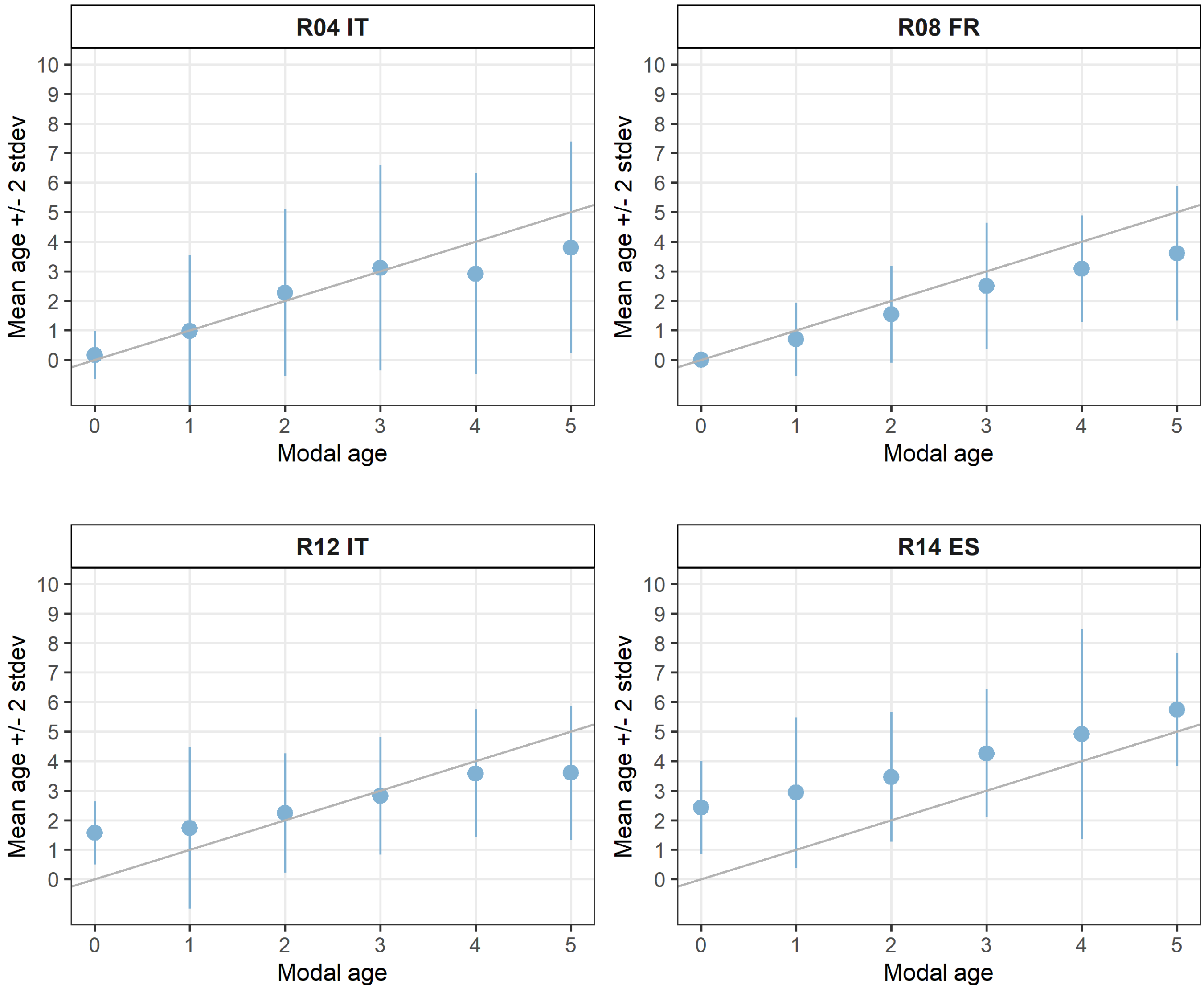
Modal age	**R04 IT**	**R08 FR**	**R12 IT**	**R14 ES**	**R16 IT**	**R18 IT**	**R20 IT**	**R22 GR**	**R24 GR**	**R26 IT**	**R28 IT**	**R32 GB**	**R36 FR**	**R38 SI**	**R42 IT**	**R48 ES**	**R52 GR**	**R54 GR**	**R56 IT**	**R58 ES**	**R60 IT**	**R62 GR**	**total**
0	6	7	7	7	7	3	6	7	6	2	7	0	7	7	1	4	7	4	6	6	7	7	121
1	49	49	49	47	46	37	47	49	42	18	47	21	49	49	23	21	48	36	43	47	49	48	914
2	59	63	63	58	57	42	62	63	60	14	52	45	63	63	29	29	63	44	57	61	63	63	1173
3	43	46	46	42	43	27	46	46	41	24	37	36	46	46	20	31	46	38	42	44	44	46	880
4	11	12	12	12	10	12	12	12	12	6	12	12	12	12	9	9	12	9	12	12	12	12	246
5	5	5	5	4	4	2	5	4	5	3	5	3	5	5	3	3	5	3	3	4	5	5	91
Total	**173**	**182**	**182**	**170**	**167**	**123**	**178**	**181**	**166**	**67**	**160**	**117**	**182**	**182**	**85**	**97**	**181**	**134**	**163**	**174**	**180**	**181**	**3425**

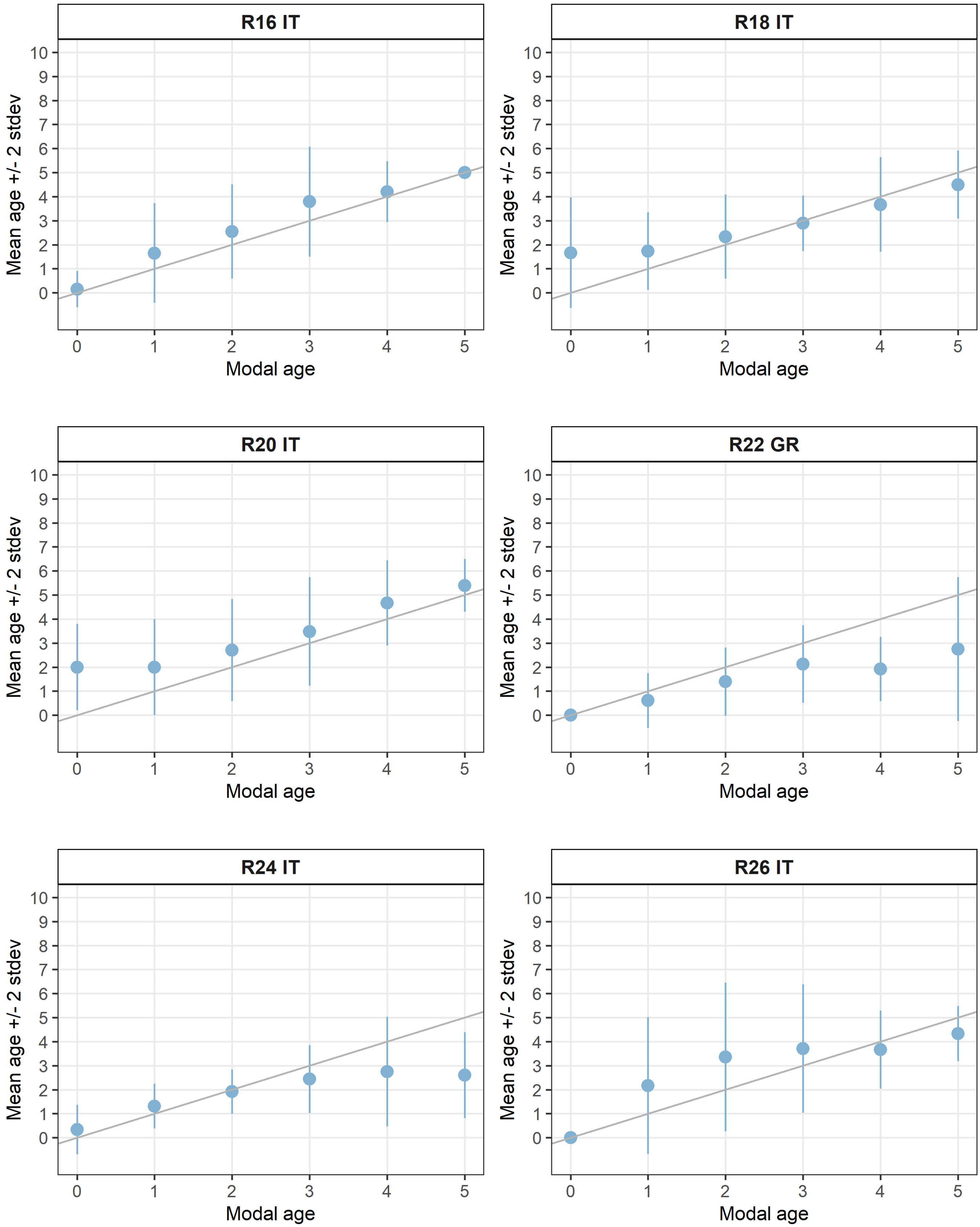
Number of age readings by age

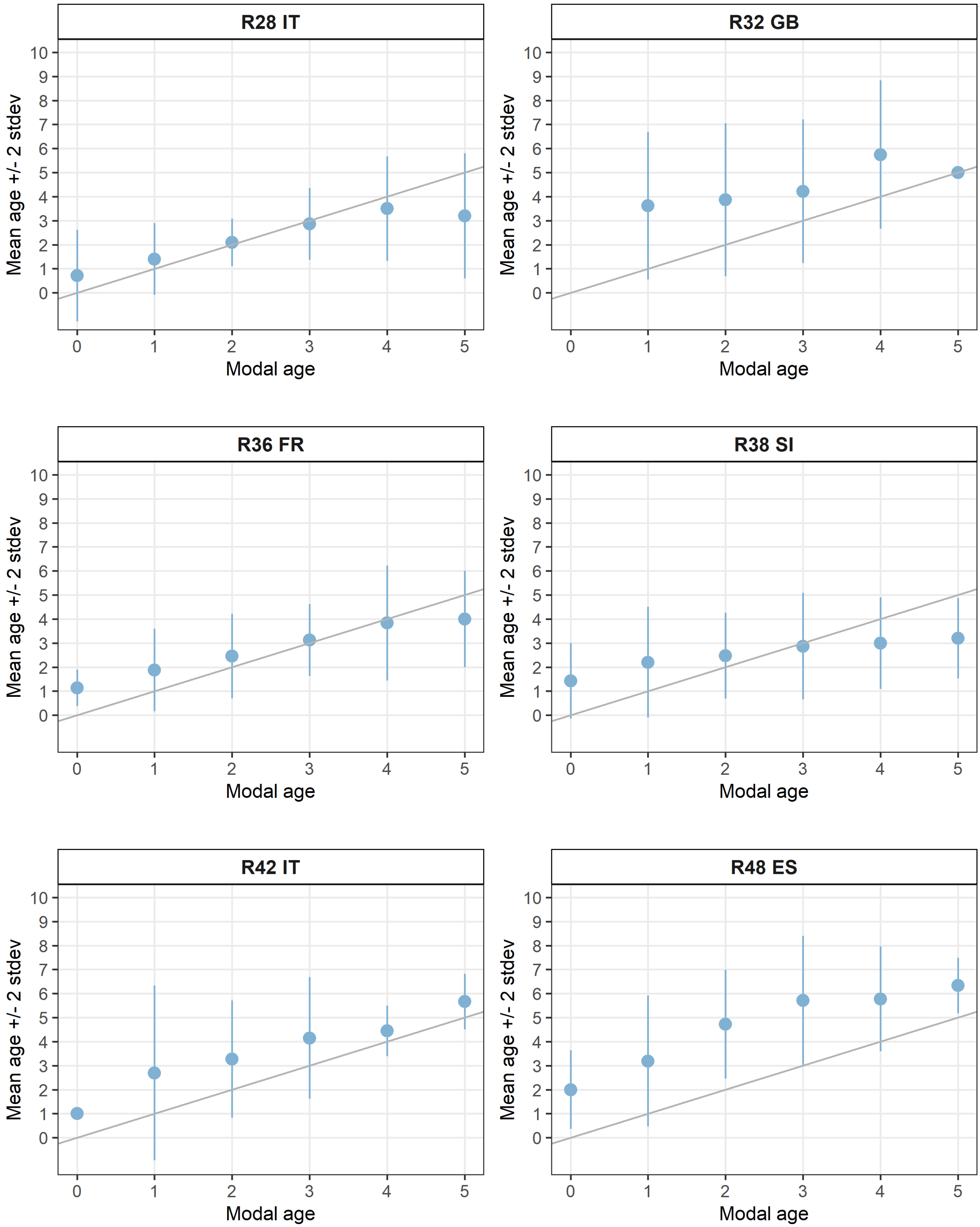
Table 6.15: Age composition by reader gives a summary of number of readings per reader and age. The total numbers of readings by age and by reader are also presented.

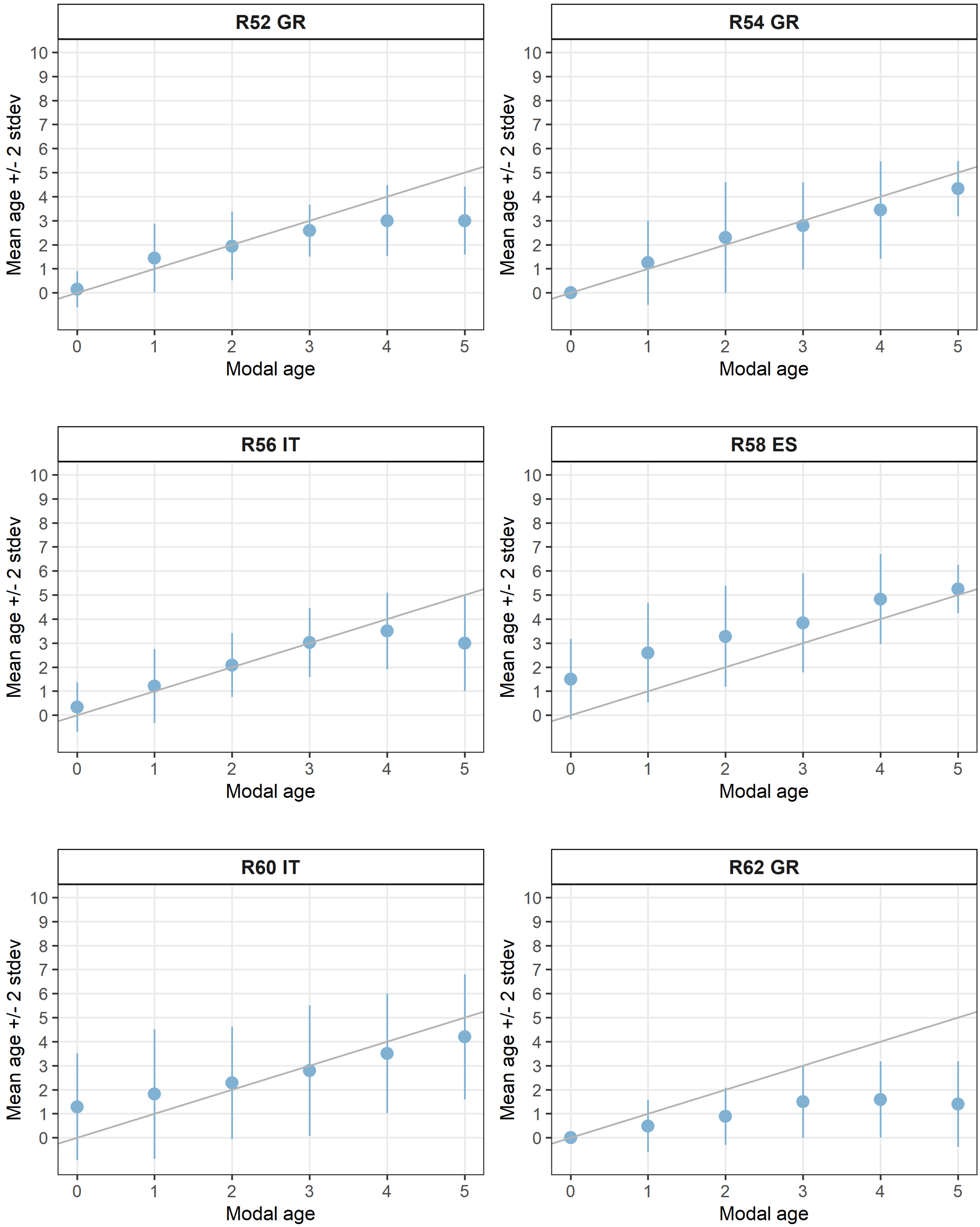
Age	**R04 IT**	**R08 FR**	**R12 IT**	**R14 ES**	**R16 IT**	**R18 IT**	**R20 IT**	**R22 GR**	**R24 GR**	**R26 IT**	**R28 IT**	**R32 GB**	**R36 FR**	**R38 SI**	**R42 IT**	**R48 ES**	**R52 GR**	**R54 GR**	**R56 IT**	**R58 ES**	**R60 IT**	**R62 GR**	**total**
0	29	33	6	1	6	0	0	33	4	2	6	0	0	2	0	1	12	11	12	0	10	50	218
1	50	56	47	5	35	23	25	72	47	10	37	0	31	27	10	1	33	33	30	8	42	96	718
2	26	51	50	34	40	46	55	53	79	11	62	11	60	68	17	8	85	35	60	40	54	27	972
3	36	28	44	39	38	38	42	20	31	14	39	40	60	53	13	13	45	30	46	56	38	8	771
4	14	12	26	46	27	12	29	3	5	20	14	27	22	25	18	16	6	22	12	38	20	0	414
5	10	1	9	31	17	3	22	0	0	6	2	19	8	6	19	25	0	3	3	21	12	0	217
6	6	1	0	11	3	1	5	0	0	2	0	7	1	1	8	19	0	0	0	11	4	0	80
7	1	0	0	2	1	0	0	0	0	2	0	7	0	0	0	12	0	0	0	0	0	0	25
8	0	0	0	1	0	0	0	0	0	0	0	4	0	0	0	1	0	0	0	0	0	0	6
9	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	4
Total	**173**	**182**	**182**	**170**	**167**	**123**	**178**	**181**	**166**	**67**	**160**	**117**	**182**	**182**	**85**	**97**	**181**	**134**	**163**	**174**	**180**	**181**	**3425**

Separate age bias plots by reader




R16 IT
R18 IT
R20 IT
R22 GR
R24 IT
R26 IT
Mean age +/- 2 stdev
Modal age
0
1
2
3
4
5
6
7
8
9
10


R28 IT
R32 GB
R36 FR
R38 SI
R42 IT
R48 ES
Mean age +/- 2 stdev
Modal age
0
1
2
3
4
5
6
7
8
9
10


R52 GR
R54 GR
R56 IT
R58 ES
R60 IT
R62 GR
Mean age +/- 2 stdev
Modal age
0 1 2 3 4 5
0 1 2 3 4 5 6 7 8 9 10

Statistics by modal age plot (STDEV, CV and PA)

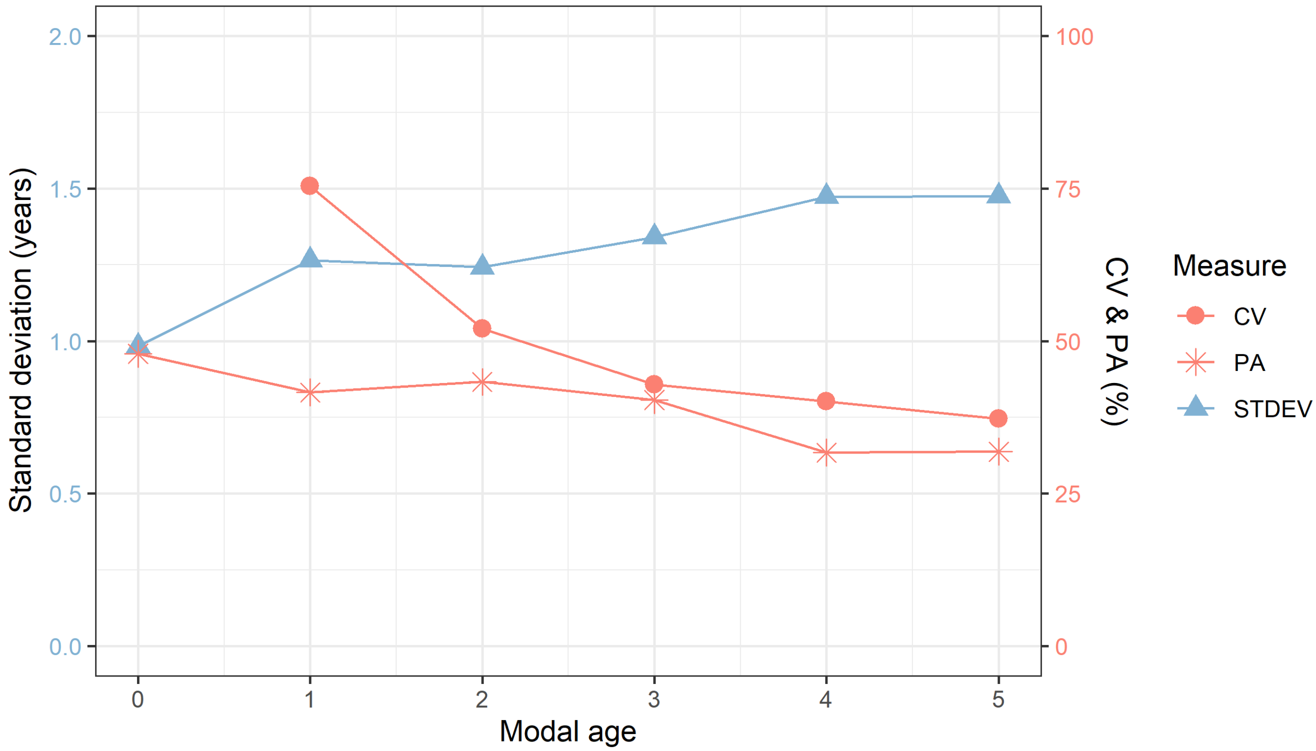


Figure 6.9: CV, PA and (STDEV (standard deviation) are plotted against modal age

Distribution of age reading errors

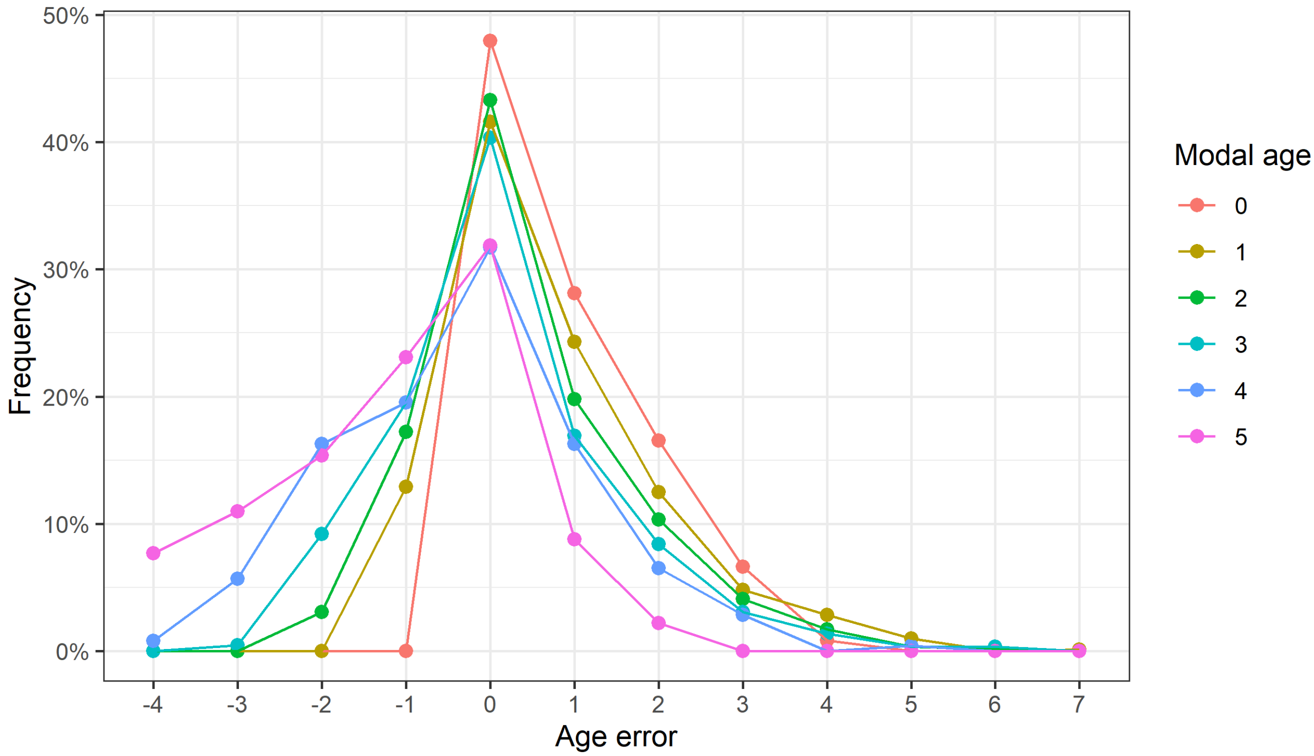


Figure 6.10: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

Relative bias for all readers

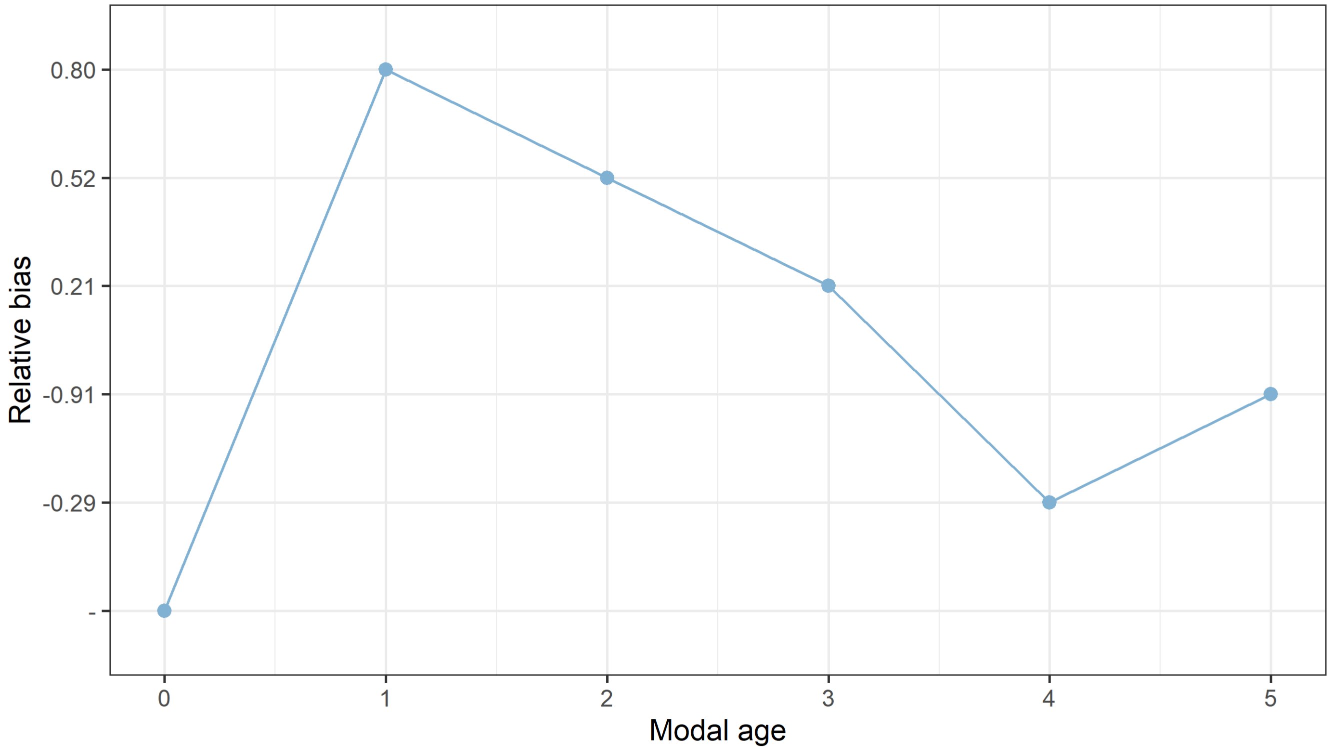


Figure 6.11: The relative bias by modal age as estimated by all age readers combined.

Mean length at age by reader

Table 6.16: Mean fish length (mm) at age per reader is calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	R24 GR	R26 IT	R28 IT	R32 GB	R36 FR	R38 SI	R42 IT	R48 ES	R52 GR	R54 GR	R56 IT	R58 ES	R60 IT	R62 GR	total
0	150	158	148	287	143	-	-	148	143	134	142	-	-	230	-	178	166	146	139	-	173	162	218
1	176	172	179	201	162	161	165	173	171	149	164	-	180	180	167	130	175	181	175	142	183	197	718
2	201	211	199	166	192	168	180	226	200	208	199	221	183	197	165	143	187	179	200	169	190	226	972
3	211	235	213	176	196	209	209	259	221	199	205	178	208	197	197	170	225	210	206	191	208	277	771
4	216	242	196	207	217	226	213	274	241	202	226	204	208	193	190	174	268	216	204	222	211	-	414
5	231	174	208	205	225	277	214	-	-	193	251	221	219	228	215	181	-	188	235	220	210	-	217
6	276	286	-	216	287	279	224	-	-	205	-	201	231	210	173	221	-	-	-	211	207	-	80
7	301	-	-	202	286	-	-	-	-	214	-	195	-	-	-	220	-	-	-	-	-	-	25
8	-	-	-	189	-	-	-	-	-	-	-	213	-	-	-	301	-	-	-	-	-	-	6
9	259	-	-	-	-	-	-	-	-	-	-	232	-	-	-	286	-	-	-	-	-	-	4
Weighted Mean	**194**	**195**	**195**	**192**	**194**	**189**	**196**	**195**	**196**	**192**	**193**	**199**	**195**	**195**	**187**	**190**	**195**	**190**	**194**	**195**	**195**	**195**	**3425**

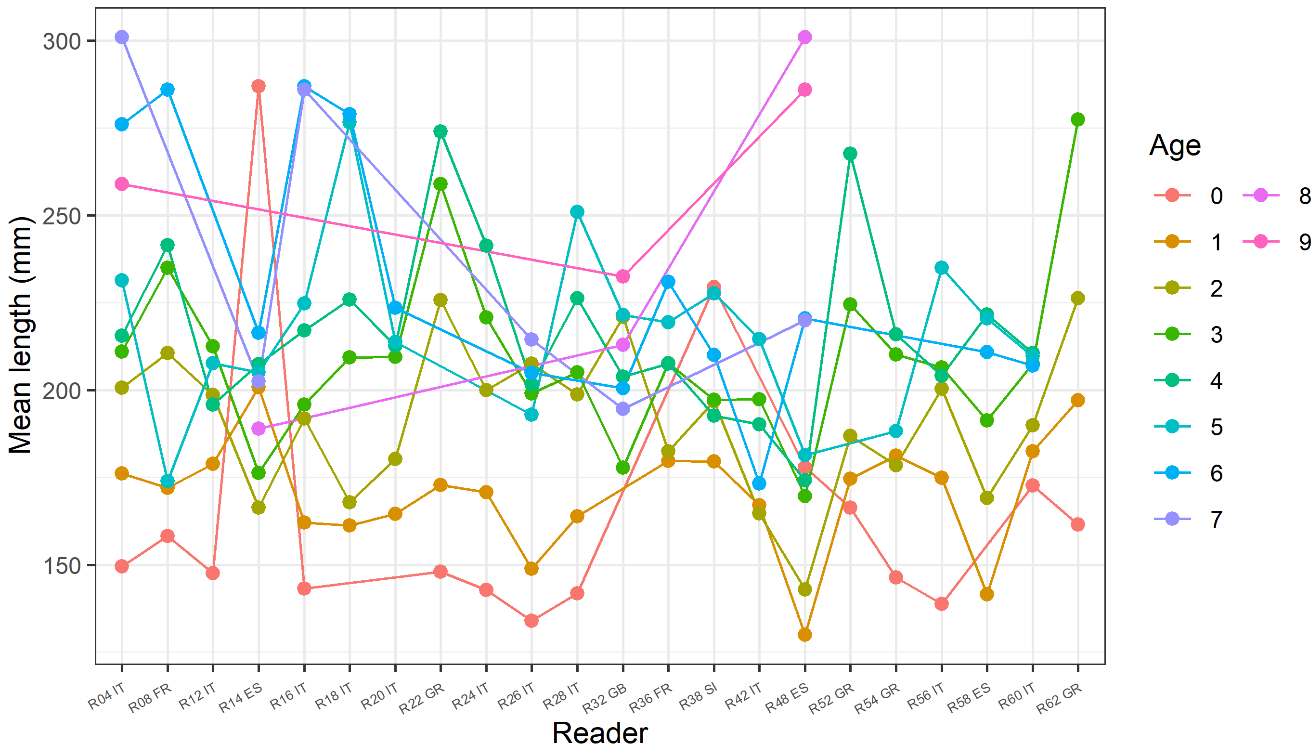


Figure 6.12: The mean fish length at age as estimated by each age reader.

6.2.2 Advanced readers

All samples included

Summary statistics

Table 6.17: Summary of statistics; PA (%), CV (%) and APE (%).

NSample	CV	PA	APE
182	53 %	44 %	41 %

Data overview

Table 6.18: Data overview including modal age and statistics per sample.

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
01_musur-22	264	F	30/03/2022	27.8.c	6	2	2	4	5	-	-	3	2	33	45	36
02_musur-22	157	F	30/03/2022	27.8.c	2	2	2	4	3	-	4	1	2	43	44	37
03_musur-22	152	M	30/03/2022	27.8.c	1	0	0	3	2	-	2	1	0	29	-	-
04_musur-22	236	M	30/03/2022	27.8.c	3	1	2	4	3	3	2	2	3	38	37	30
05_musur-22	165	M	30/03/2022	27.8.c	-	1	3	4	3	-	3	1	3	50	49	40
06_musur-22	223	M	30/03/2022	27.8.c	3	3	3	5	4	-	2	2	3	43	34	25
07_musur-22	177	M	30/03/2022	27.8.c	1	2	2	5	4	3	3	1	2	25	54	43
08_musur-22	234	M	30/03/2022	27.8.c	3	3	1	4	-	-	2	2	3	33	42	33
1.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	191	M	05/03/2021	21	4	1	1	3	2	3	1	2	1	38	53	43
10.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	151	M	14/05/2021	21	3	1	3	2	3	2	2	1	3	38	39	31
10004_musur-23	278	M	10/10/2023	27.8.c	6	4	3	6	5	5	4	3	6	25	27	22
10011_musur-23	279	F	19/10/2023	27.8.c	6	2	2	-	4	6	4	2	2	43	48	40
10014_musur-22	135	U	28/11/2022	27.9.a	0	1	1	4	2	-	1	0	1	43	107	76
10016_musur-22	124	U	28/11/2022	27.9.a	1	2	1	4	3	2	2	0	2	38	66	48
10020_musur-22	130	U	28/11/2022	27.9.a	1	1	1	3	2	-	2	0	1	43	68	54
10041_musur-22	245	F	13/10/2022	27.8.c	2	3	2	3	4	3	3	2	3	50	26	20
10045_musur-22	214	F	13/10/2022	27.8.c	5	3	1	-	3	-	5	1	3	33	60	44
10049_musur-22	250	M	13/10/2022	27.8.c	3	3	2	4	4	3	4	2	3	38	27	21
10070_musur-22	123	U	15/10/2022	27.8.c	0	1	0	3	1	1	1	0	1	50	113	75
10096_musur-22	286	M	17/10/2022	27.8.c	5	6	3	6	7	-	5	3	6	29	31	23
10ms8_11_24	201	M	12/03/2024	missing	1	2	2	4	3	-	2	2	2	57	42	30
11.Mulsur_OTB_MEDITS_ST.64_16x_L	216	F	15/07/2021	21	2	2	2	4	3	3	2	2	2	62	30	25
12.Mulsur_OTB_MEDITS_ST.57_16x_L	148	F	17/07/2021	21	1	1	2	3	1	2	1	1	1	62	50	42
12_musur-22	259	M	30/03/2022	27.8.c	9	3	3	4	4	-	4	3	3	43	50	31
13.Mulsur_OTB_MEDITS_ST.48_16x_L	185	M	20/07/2021	21	3	1	1	3	2	-	1	2	1	43	48	40
13_musur-22	240	M	30/03/2022	27.8.c	4	3	1	5	5	-	4	3	4	29	39	30
14.Mulsur_OTB_MEDITS_ST.48_16x_L	112	F	20/07/2021	21	2	1	1	3	1	-	2	1	1	57	50	42

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
15.Mulsur_GTR_KONSTANTINOS.NP818_IONIO_16x_L	230	M	25/09/2021	21	2	2	1	4	3	-	3	2	2	43	40	32
16.Mulsur_GTR_AGIOS.ANDREAS.SM679_IONIO_16x_L	301	F	06/12/2021	21	7	3	3	4	6	-	3	3	3	57	40	33
16ms16_11_24	249	F	08/04/2024	missing	3	4	3	5	3	3	4	4	3	50	21	17
17.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	245	F	22/11/2021	21	5	2	3	4	4	-	2	2	2	43	39	32
18.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	281	M	14/11/2021	21	-	2	4	-	5	-	4	3	4	40	32	24
19.Mulsur_OTB_PANAGIA.FANEROMENH.NP444_IONIO_16x_L	280	F	05/12/2021	21	-	2	1	4	-	-	3	3	3	40	44	34
1ms111_11_24	209	M	23/09/2024	missing	4	3	1	4	3	3	4	2	4	38	36	25
1ms21_11_24	180	M	29/04/2024	missing	1	3	4	6	5	-	5	2	5	29	48	40
2.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	290	F	02/03/2021	21	-	2	1	4	2	2	1	2	2	57	50	29
20.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	258	F	25/11/2021	21	5	2	2	3	-	-	2	2	2	67	45	33
24MULLSUR251-0001	284	F	10/01/2024	8	2	2	3	3	3	3	3	2	3	62	20	18
24MULLSUR251-0015	178	U	10/01/2024	8	0	1	3	3	1	-	2	0	0	29	-	-
24MULLSUR251-0025	280	F	10/01/2024	8	2	3	3	4	2	4	3	2	3	38	29	23
24MULLSUR251-0040	152	F	10/01/2024	8	0	0	1	2	0	-	-	0	0	67	-	-
24MULLSUR251-0050	151	F	10/01/2024	8	0	0	2	3	0	-	3	0	0	57	-	-
24MULLSUR251-0065	289	F	10/01/2024	8	3	2	2	4	2	3	2	2	2	62	30	25
24MULLSUR251-0067	138	U	27/03/2024	8	0	0	1	2	0	1	2	0	0	50	-	-
24MULLSUR251-0107	203	M	27/03/2024	8	0	1	1	2	1	1	1	1	1	75	53	25
24MULLSUR251-0111	247	M	27/03/2024	8	1	1	1	2	1	-	3	1	1	71	55	43
24MULLSUR351-0004	130	M	03/09/2024	8	0	0	1	2	0	1	1	0	0	50	-	-
24MULLSUR351-0021	160	F	03/09/2024	8	1	0	2	2	0	-	2	0	2	43	-	-
24MULLSUR351-0025	190	F	03/09/2024	8	2	1	2	4	1	2	3	1	2	38	53	38

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
24MULLSUR351-0032	150	M	03/09/2024	8	1	0	2	2	1	1	2	0	1	38	74	58
24MULLSUR351-0048	250	F	03/09/2024	8	3	2	3	3	2	-	4	2	3	43	28	23
24MULLSUR351-0053	240	F	03/09/2024	8	3	2	2	3	2	3	3	2	3	50	21	20
24MULLSUR551-0001	223	F	11/09/2024	7	3	2	1	2	-	-	3	1	2	33	45	33
24MULLSUR551-0002	168	M	02/12/2024	7	3	1	2	3	1	2	5	0	3	25	73	54
24MULLSUR551-0007	128	M	02/12/2024	7	-	0	2	2	0	-	3	0	0	50	-	-
24MULLSUR551-0008	182	M	02/12/2024	7	3	1	2	3	1	3	4	1	3	38	52	44
24MULLSUR551-0011	187	F	02/12/2024	7	3	1	1	4	2	-	2	1	1	43	58	43
24MULLSUR551-0013	252	M	02/12/2024	7	6	3	3	4	3	-	3	2	3	57	37	26
24MULLSUR551-0015	193	M	04/12/2024	7	3	1	2	3	1	2	3	1	3	38	46	38
24MULLSUR551-0018	207	M	04/12/2024	7	3	2	3	3	2	2	4	2	2	50	28	24
24MULLSUR551-0019	238	M	05/12/2024	7	3	3	4	5	4	3	4	2	3	38	26	21
24MULLSUR551-0022	240	M	28/05/2024	7	5	2	5	-	-	-	5	-	5	75	35	26
24MULLSUR551-0023	272	F	29/05/2024	7	6	3	5	4	3	-	5	3	3	43	29	25
24MULLSUR551-0026	215	F	06/06/2024	7	3	2	3	3	2	2	2	2	2	62	22	20
24MULLSUR551-0028	247	F	06/06/2024	7	4	2	3	3	2	-	3	2	3	43	28	23
24MULLSUR551-0031	158	M	09/06/2024	7	2	1	5	3	1	2	2	1	2	38	64	44
24MULLSUR551-0036	195	M	09/06/2024	7	3	1	5	3	2	-	5	1	3	29	59	46
25ms16_11_24	239	F	08/04/2024	missing	1	4	3	4	3	3	4	3	3	50	32	21
27ms84_11_24	217	F	15/07/2024	missing	2	4	3	5	4	4	5	2	4	38	33	27
28ms111_11_24	152	F	23/09/2024	missing	0	1	1	2	1	2	2	1	1	50	57	45
28ms8_11_24	192	M	12/03/2024	missing	1	3	2	3	3	2	1	2	3	38	39	31
3.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	238	M	02/03/2021	21	3	3	3	-	-	-	3	3	3	100	0	0
33ms111_11_24	112	M	23/09/2024	missing	0	1	1	3	-	1	2	0	1	43	94	68
34ms8_11_24	216	M	12/03/2024	missing	2	3	3	4	4	3	4	2	3	38	27	21
38ms70_11_24	213	M	10/07/2024	missing	3	3	2	4	3	3	4	2	3	50	25	17
4.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	224	M	02/03/2021	21	5	1	2	5	5	-	3	2	5	43	52	45
41ms8_11_24	189	F	12/03/2024	missing	1	1	1	4	3	3	2	2	1	38	53	43
44ms9_11_24	203	F	12/03/2024	missing	1	2	2	6	4	4	3	2	2	38	53	42

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
46ms70_11_24	265	F	10/07/2024	missing	3	4	2	5	5	5	5	4	5	50	27	21
48ms111_11_24	143	M	23/09/2024	missing	0	1	1	2	1	2	2	1	1	50	57	45
5.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	264	F	15/04/2021	21	4	1	2	-	5	-	2	3	2	33	52	41
55ms111_11_24	94	U	23/09/2024	missing	0	0	0	2	1	1	1	0	0	50	-	-
57ms84_11_24	189	M	15/07/2024	missing	2	2	1	8	4	3	5	1	2	25	73	56
5ms16_11_24	159	M	08/04/2024	missing	1	2	4	4	3	3	3	1	3	38	45	37
6.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L	311	F	15/04/2021	21	6	2	3	-	6	-	4	3	6	33	42	33
6ms21_11_24	222	F	29/04/2024	missing	2	4	3	5	4	3	3	3	3	50	27	21
7.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	308	F	14/05/2021	21	5	4	3	5	5	-	6	4	5	43	21	17
8.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	175	M	14/05/2021	21	3	2	1	4	3	2	2	1	2	38	46	36
83ms84_11_24	193	F	15/07/2024	missing	1	2	1	-	2	3	3	1	1	43	48	40
9.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L	146	M	14/05/2021	21	3	2	2	3	3	-	2	1	3	43	33	27
GSA18_MS-01	225	F	04/09/2024	18	4	3	1	3	3	3	1	2	3	50	43	35
GSA18_MS-02	175	F	04/09/2024	18	3	1	1	4	2	2	1	1	1	50	60	47
GSA18_MS-03	170	F	04/09/2024	18	1	0	0	4	1	-	-	1	1	50	126	81
GSA18_MS-04	160	M	04/09/2024	18	1	0	1	3	1	2	1	0	1	50	88	61
GSA18_MS-05	150	F	04/09/2024	18	1	0	1	4	1	2	1	0	1	50	103	70
GSA18_MS-06	140	M	04/09/2024	18	0	0	2	4	1	3	1	0	0	38	-	-
GSA18_MS-07	140	F	04/09/2024	18	1	0	1	4	1	2	1	0	1	50	103	70
GSA18_MS-08	135	M	04/09/2024	18	1	0	2	3	1	2	-	0	1	29	-	-
GSA18_MS-09	265	F	20/09/2024	18	4	3	2	5	3	4	2	2	2	38	36	29
GSA18_MS-10	225	M	20/09/2024	18	3	3	4	5	4	-	3	2	3	43	28	23
GSA18_MS-11	215	F	20/09/2024	18	1	1	4	4	2	3	3	1	1	38	55	47
GSA18_MS-12	210	M	20/09/2024	18	2	2	4	5	3	3	3	2	2	38	36	25
GSA18_MS-13	205	F	20/09/2024	18	3	3	3	4	4	3	4	1	3	50	32	21
GSA18_MS-14	205	F	20/09/2024	18	4	1	5	-	3	4	3	1	4	29	51	38

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
GSA18_MS-15	200	F	20/09/2024	18	2	2	4	5	4	3	2	1	2	38	47	39
GSA18_MS-16	190	F	20/09/2024	18	2	2	3	5	4	3	3	1	3	38	43	32
GSA18_MS-17	190	F	20/09/2024	18	4	2	3	4	2	2	2	1	2	50	43	35
GSA18_MS-18	160	F	28/05/2024	18	1	1	2	3	3	2	2	1	1	38	45	35
GSA18_MS-19	160	M	28/05/2024	18	0	0	3	5	-	2	1	1	0	29	-	-
GSA18_MS-20	165	M	28/05/2024	18	1	1	3	4	-	2	2	1	1	43	58	43
GSA18_MS-21	170	M	28/05/2024	18	3	1	3	4	3	2	2	1	3	38	45	37
GSA18_MS-22	150	M	28/05/2024	18	4	2	4	5	3	2	3	1	4	25	44	33
GSA18_MS-23	155	M	28/05/2024	18	2	1	4	4	3	2	3	1	2	25	48	40
GSA18_MS-24	200	M	28/05/2024	18	1	2	3	5	3	3	2	2	3	38	45	33
GSA18_MS-25	215	F	22/04/2024	18	3	2	4	4	4	3	2	2	4	38	31	25
GSA18_MS-26	195	M	22/04/2024	18	3	2	4	5	5	3	4	2	3	25	34	29
GSA18_MS-27	190	F	22/04/2024	18	1	1	4	6	-	3	1	1	1	57	82	67
GSA18_MS-28	175	F	22/04/2024	18	1	2	3	5	3	3	2	1	3	38	52	40
GSA18_MS-29	160	F	22/04/2024	18	1	1	4	5	4	-	2	1	1	43	67	59
GSA18_MS-30	155	F	22/04/2024	18	3	1	4	5	5	2	1	1	1	38	64	55
GSA18_MS-31	130	M	22/04/2024	18	1	1	4	5	5	2	2	1	1	38	67	58
GSA18_MS-32	140	M	22/04/2024	18	1	0	3	-	2	-	1	1	1	50	77	58
GSA19_MULLSUR_01	182	M	10/01/2024	19	2	1	3	3	4	2	4	1	2	25	48	40
GSA19_MULLSUR_02	152	F	10/01/2024	19	0	1	1	2	2	1	2	0	1	38	74	58
GSA19_MULLSUR_03	144	F	10/01/2024	19	0	1	1	3	2	1	2	0	1	38	83	65
GSA19_MULLSUR_04	157	F	10/01/2024	19	0	0	1	1	1	1	2	0	1	50	94	75
GSA19_MULLSUR_05	146	F	10/01/2024	19	0	1	1	2	1	2	2	1	1	50	57	45
GSA19_MULLSUR_06	232	F	10/01/2024	19	1	1	2	3	2	-	3	2	2	43	41	29
GSA19_MULLSUR_07	252	F	27/03/2024	19	-	2	1	2	3	2	3	3	2	43	33	27
GSA19_MULLSUR_08	200	M	27/03/2024	19	2	2	1	2	2	2	2	2	2	88	19	12
GSA19_MULLSUR_09	193	M	27/03/2024	19	2	2	2	2	3	2	4	1	2	62	39	28
GSA19_MULLSUR_10	224	M	03/09/2024	19	-	2	2	5	4	2	3	2	2	57	43	34
GSA19_MULLSUR_11	124	F	03/09/2024	19	0	1	1	3	1	1	2	0	1	50	88	61
GSA19_MULLSUR_12	125	M	03/09/2024	19	0	0	1	2	1	1	2	0	0	38	-	-
GSA19_MULLSUR_13	207	M	03/09/2024	19	1	2	2	4	2	2	3	1	2	50	47	32

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
GSA19_MULLSUR_14	226	F	03/09/2024	19	1	1	2	2	1	2	1	2	1	50	36	33
GSA19_MULLSUR_15	183	M	03/09/2024	19	1	1	2	2	1	-	2	1	1	57	37	34
GSA19_MULLSUR_16	236	F	11/09/2024	19	1	1	1	-	2	-	2	2	1	50	37	33
GSA19_MULLSUR_17	165	M	02/12/2024	19	1	0	2	2	2	2	1	1	2	50	54	45
GSA19_MULLSUR_18	183	M	02/12/2024	19	-	1	2	2	2	-	2	1	2	67	31	27
GSA19_MULLSUR_19	240	F	02/12/2024	19	3	2	3	4	5	3	4	2	3	38	32	25
GSA19_MULLSUR_20	137	F	02/12/2024	19	0	0	0	1	1	1	1	0	0	50	-	-
MSUR_DCF23_01	156	F	16/02/2023	22	4	2	5	5	-	2	5	1	5	43	50	44
MSUR_DCF23_02	164	M	16/02/2023	22	1	2	4	6	-	-	5	1	1	33	67	58
MSUR_DCF23_03	174	F	16/05/2023	22	5	5	4	7	5	4	6	1	5	38	38	26
MSUR_DCF23_04	185	M	16/02/2023	22	3	2	5	6	4	-	6	1	6	29	51	41
MSUR_DCF23_05	194	M	16/02/2023	22	2	3	4	5	-	3	5	2	3	29	37	31
MSUR_DCF23_06	201	M	16/02/2023	22	5	4	4	6	5	4	5	2	4	38	27	20
MSUR_DCF23_07	219	M	16/02/2023	22	3	4	2	4	3	-	4	2	4	43	29	23
MSUR_DCF23_08	227	M	16/05/2023	22	4	4	5	6	-	4	6	2	4	43	32	24
MSUR_DCF23_09	231	F	16/02/2023	22	-	3	5	7	4	4	5	2	5	29	37	28
MSUR_DCF23_10	287	F	16/02/2023	22	2	3	4	0	4	5	5	3	4	25	51	38
MSUR_DCF23_11	155	F	15/09/2023	22	1	2	2	4	3	2	4	1	2	38	50	41
MSUR_DCF23_12	164	F	15/09/2024	22	5	1	1	5	3	3	5	1	5	38	62	50
MSUR_DCF23_13	175	F	04/10/2023	22	1	2	3	4	4	3	4	1	4	38	47	39
MSUR_DCF23_14	185	F	15/09/2023	22	2	2	2	5	4	2	4	1	2	50	50	43
MSUR_DCF23_15	199	F	04/10/2023	22	4	1	2	5	5	3	5	1	5	38	54	46
MSUR_DCF23_16	217	F	27/10/2023	22	2	3	4	6	-	-	5	1	2	17	53	43
MSUR_DCF23_17	224	F	27/10/2023	22	3	4	3	5	5	4	6	2	3	25	33	25
MSUR_DCF23_18	235	F	27/10/2023	22	3	3	3	5	4	4	5	3	3	50	24	20
MSUR_DCF23_19	241	F	27/10/2023	22	1	3	2	-	2	-	2	3	2	50	35	26
MSUR_DCF23_20	249	M	27/10/2023	22	4	4	4	6	6	4	5	3	4	50	24	19
MULLSURGSA16_01	110		19/02/2017	16	2	2	3	3	2	2	4	1	2	50	39	30
MULLSURGSA16_02	120		23/02/2017	16	0	1	1	2	1	1	1	0	1	62	73	50
MULLSURGSA16_03	140		23/02/2017	16	0	0	1	2	1	-	1	0	0	43	-	-
MULLSURGSA16_04	150		28/03/2017	16	1	1	4	3	2	2	2	2	2	50	47	32

Sample ID	Total Length	sex	Catch date	ICES area/GSA	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	Modal age	PA %	CV %	APE %
MULLSURGSA16_05	160		28/03/2017	16	0	0	2	2	2	1	2	1	2	50	71	60
MULLSURGSA16_06	180		30/05/2017	16	2	1	4	3	3	-	3	3	3	57	35	26
MULLSURGSA16_07	200		06/04/2017	16	0	1	1	1	1	1	2	1	1	75	53	25
MULLSURGSA16_08	220		06/04/2017	16	1	0	4	2	1	1	3	1	1	50	80	63
MULLSURGSA16_09	240		28/05/2017	16	1	0	2	1	1	1	3	0	1	50	88	61
MULLSURGSA16_10	270		22/03/2017	16	1	0	3	1	2	1	3	1	1	50	71	58
MULLSURGSA16_11	90		19/11/2017	16	1	1	3	3	3	2	4	1	1	38	52	44
MULLSURGSA16_12	100		21/11/2017	16	1	0	3	2	2	2	3	1	2	38	59	46
MULLSURGSA16_13	120		21/11/2017	16	0	1	2	3	2	1	3	1	1	38	65	54
MULLSURGSA16_14	130		21/11/2017	16	1	0	2	2	1	2	3	1	2	38	62	50
MULLSURGSA16_15	150		21/11/2017	16	1	0	3	2	2	2	2	0	2	50	71	58
MULLSURGSA16_16	160		21/11/2017	16	1	1	3	2	2	-	4	1	1	43	58	43
MULLSURGSA16_17	180		21/11/2017	16	1	0	2	2	2	1	5	1	2	38	85	57
MULLSURGSA16_18	190		21/11/2017	16	0	0	1	2	1	-	2	0	0	43	-	-
MULLSURGSA16_19	200		05/12/2017	16	0	0	1	3	2	1	3	0	0	38	-	-
MULLSURGSA16_20	210		08/12/2017	16	0	0	0	2	2	1	2	0	0	50	-	-

List of multimodal cases

Table 6.19: List of cases for which multiple modes where obtained when all readers are considered. The column NModes_trad shows the number of multiple modes for each FishID or SampleID when all readers are given the same expertise weight.

NModes_trad	SampleID
3	03_musur-22
2	04_musur-22
3	07_musur-22
2	08_musur-22
2	10.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L
4	10004_musur-23
3	10045_musur-22
2	10049_musur-22
3	10096_musur-22
2	12_musur-22
3	13_musur-22
2	1ms111_11_24
3	24MULLSUR251-0015
2	24MULLSUR251-0025
2	24MULLSUR351-0021
2	24MULLSUR351-0025
2	24MULLSUR351-0032

NModes_trad	**SampleID**
2	24MULLSUR351-0048
2	24MULLSUR351-0053
3	24MULLSUR551-0001
3	24MULLSUR551-0002
2	24MULLSUR551-0008
2	24MULLSUR551-0015
2	24MULLSUR551-0019
2	24MULLSUR551-0028
2	24MULLSUR551-0031
3	24MULLSUR551-0036
2	28ms8_11_24
2	34ms8_11_24
2	57ms84_11_24
2	6.Mulsur_OTB_BARBANTONIS.NP476_IONIO_16x_L
2	9.Mulsur_OTB_GERASIMOS.NP507_IONIO_16x_L
3	GSA18_MS-08
2	GSA18_MS-12
3	GSA18_MS-14
2	GSA18_MS-18
2	GSA18_MS-19
3	GSA18_MS-22
4	GSA18_MS-23
2	GSA18_MS-24
2	GSA18_MS-25
4	GSA18_MS-26
4	GSA19_MULLSUR_01
2	GSA19_MULLSUR_02
2	GSA19_MULLSUR_07
2	GSA19_MULLSUR_12
2	GSA19_MULLSUR_14
2	GSA19_MULLSUR_16
2	GSA19_MULLSUR_20
3	MSUR_DCF23_05
2	MSUR_DCF23_06
2	MSUR_DCF23_09
3	MSUR_DCF23_10
2	MSUR_DCF23_12
6	MSUR_DCF23_16
3	MSUR_DCF23_17
2	MULLSURGSA16_03
2	MULLSURGSA16_11
2	MULLSURGSA16_14
2	**MULLSURGSA16_17**

Number of age readings by modal age

Table 6.20: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings by modal age and by reader are also presented.

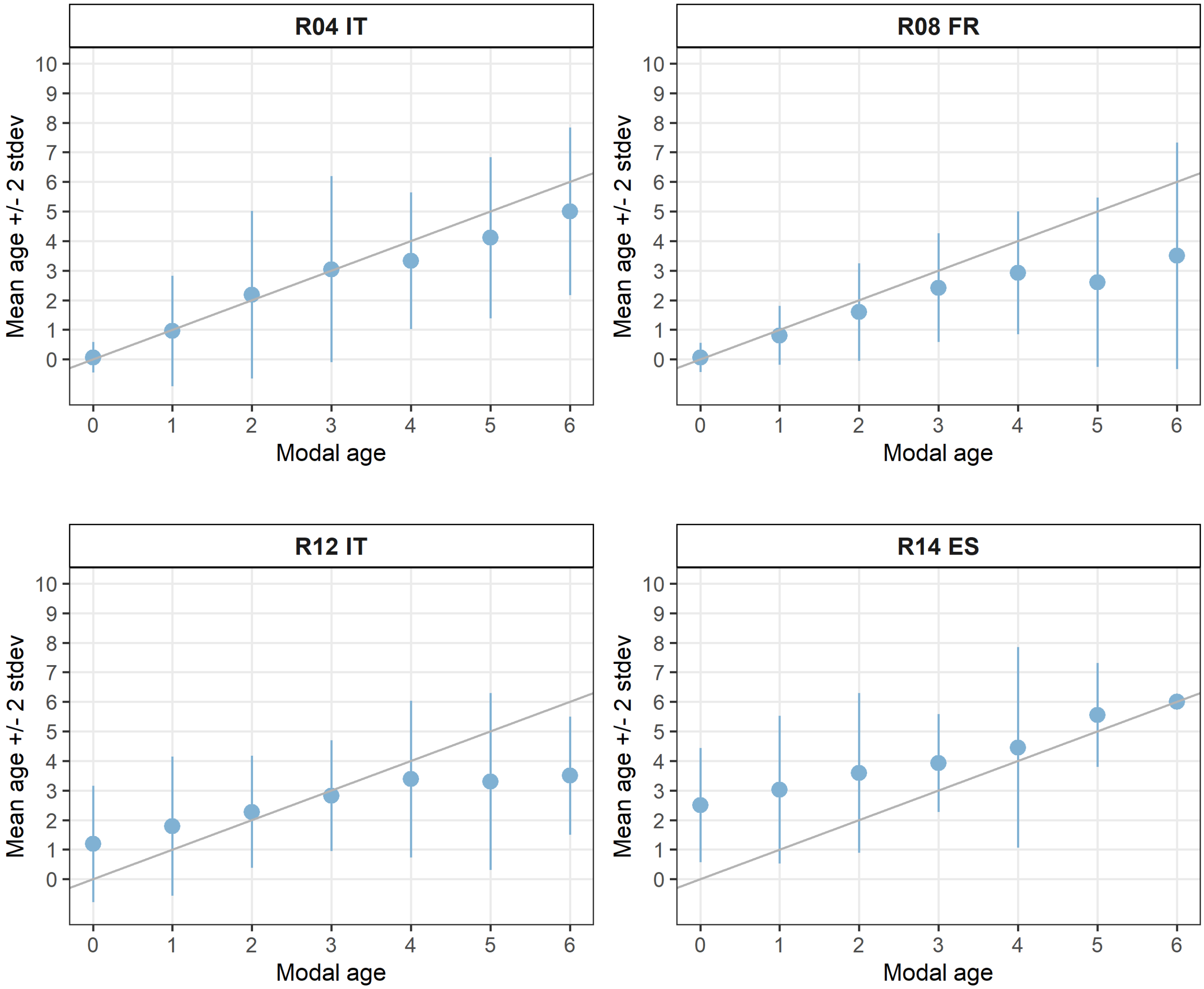
Modal age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	total
0	15	16	16	16	15	9	15	16	118
1	47	47	47	44	43	34	45	47	354
2	43	47	47	44	44	34	46	47	352
3	43	45	45	43	41	29	45	45	336
4	12	13	13	11	12	10	13	13	97
5	9	10	10	9	8	6	10	9	71
6	4	4	4	3	4	1	4	4	28
Total	**173**	**182**	**182**	**170**	**167**	**123**	**178**	**181**	**1356**

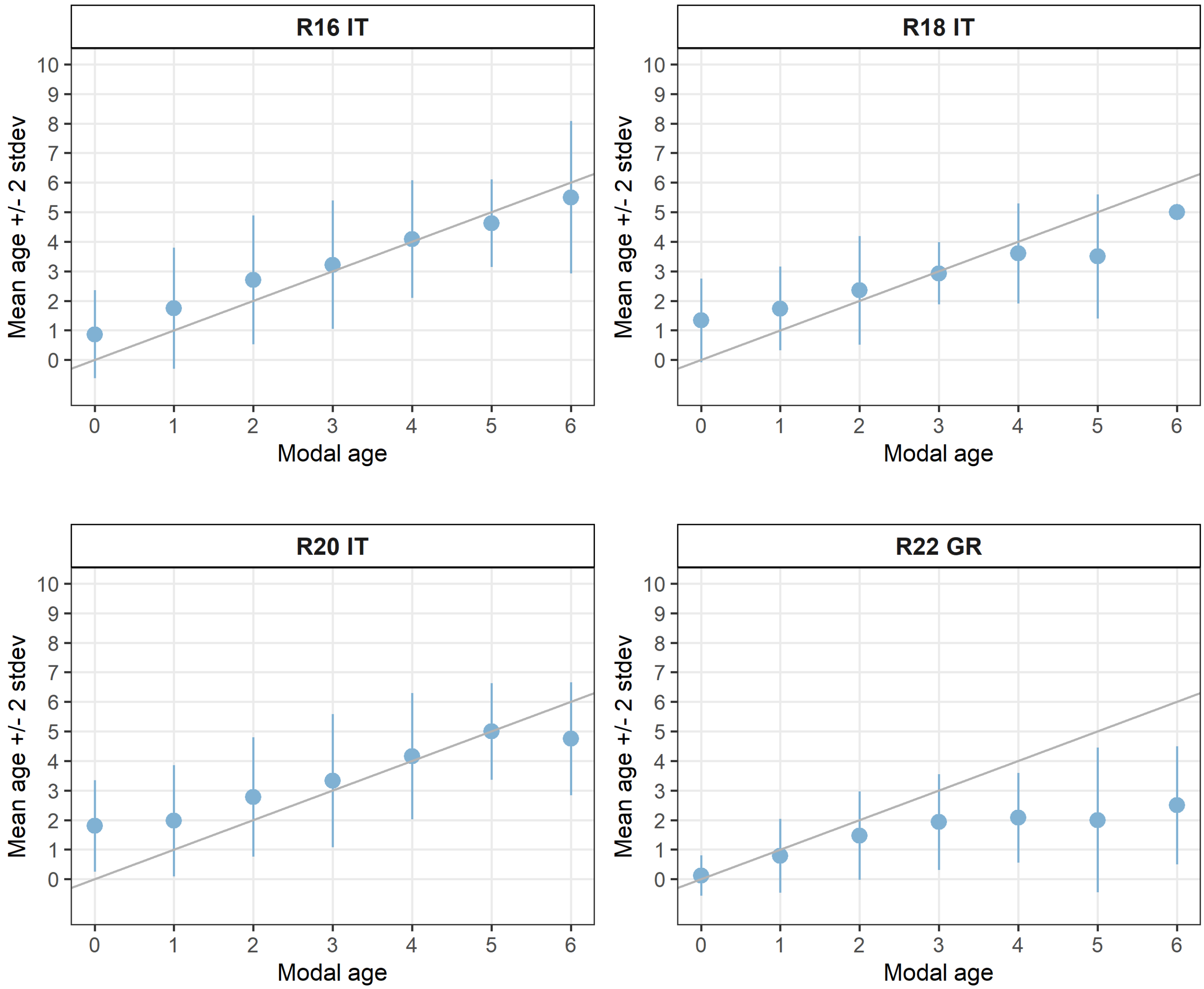
Number of age readings by age

Table 6.21: Age composition by reader gives a summary of number of readings per reader and age. The total numbers of readings by age and by reader are also presented.

Age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR	total
0	29	33	6	1	6	0	0	33	108
1	50	56	47	5	35	23	25	72	313
2	26	51	50	34	40	46	55	53	355
3	36	28	44	39	38	38	42	20	285
4	14	12	26	46	27	12	29	3	169
5	10	1	9	31	17	3	22	0	93
6	6	1	0	11	3	1	5	0	27
7	1	0	0	2	1	0	0	0	4
8	0	0	0	1	0	0	0	0	1
9	1	0	0	0	0	0	0	0	1
Total	**173**	**182**	**182**	**170**	**167**	**123**	**178**	**181**	**1356**

Separate age bias plots by reader




R16 IT
R18 IT
R20 IT
R22 GR
Mean age +/- 2 stdev
Modal age
0
1
2
3
4
5
6
7
8
9
10

Statistics by modal age plot (STDEV, CV and PA)

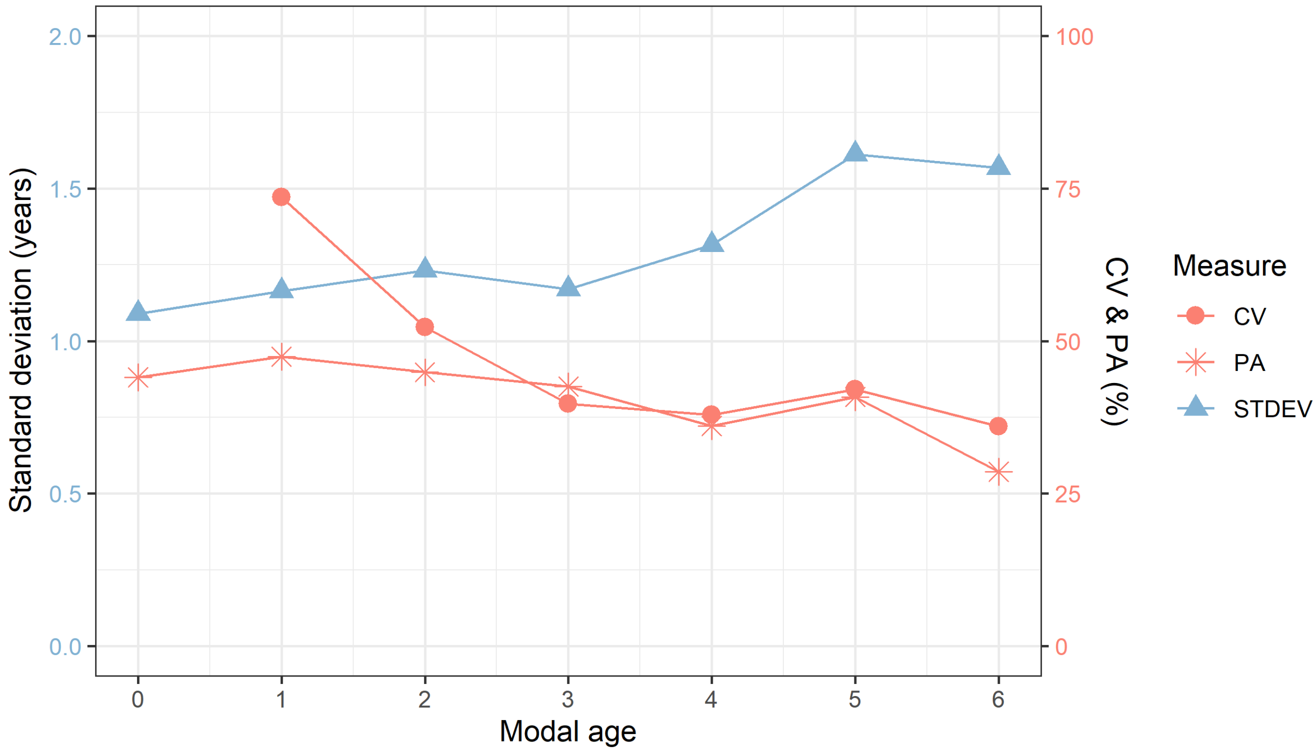


Figure 6.13: CV, PA and (STDEV (standard deviation) are plotted against modal age

Distribution of age reading errors

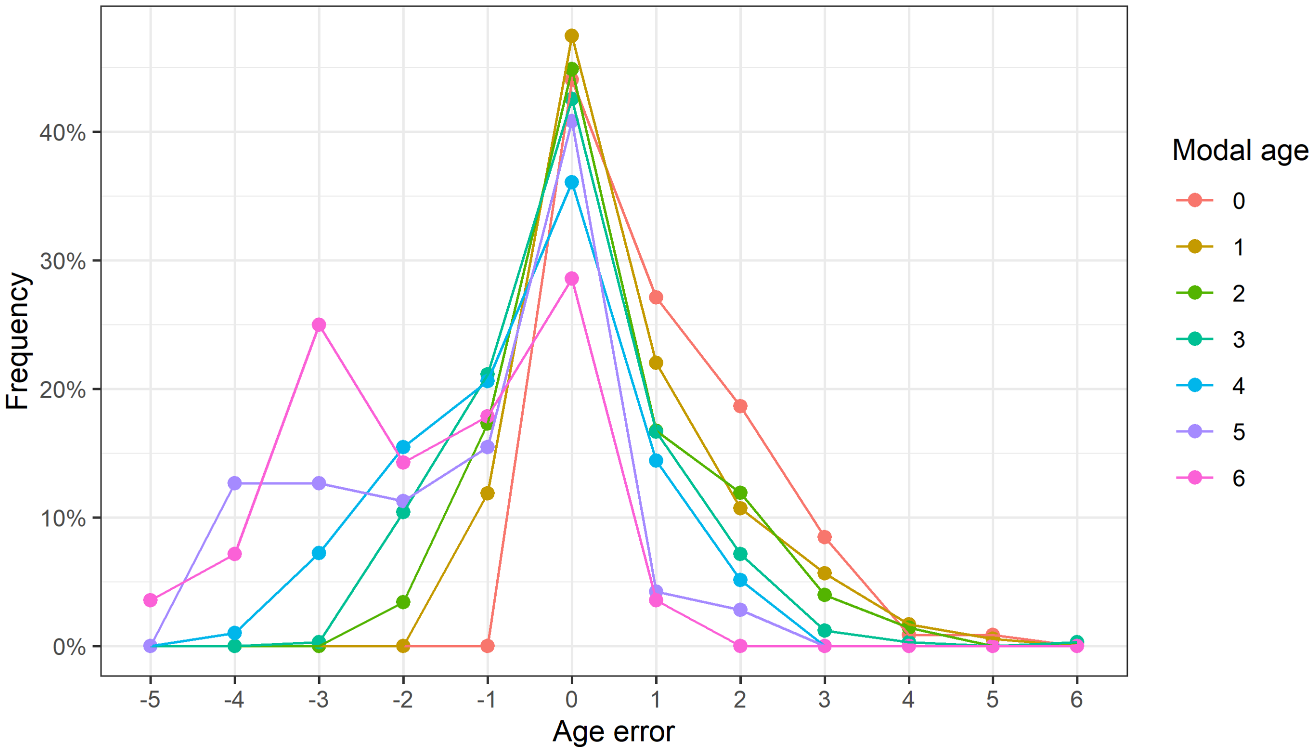


Figure 6.14: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

Relative bias for all readers

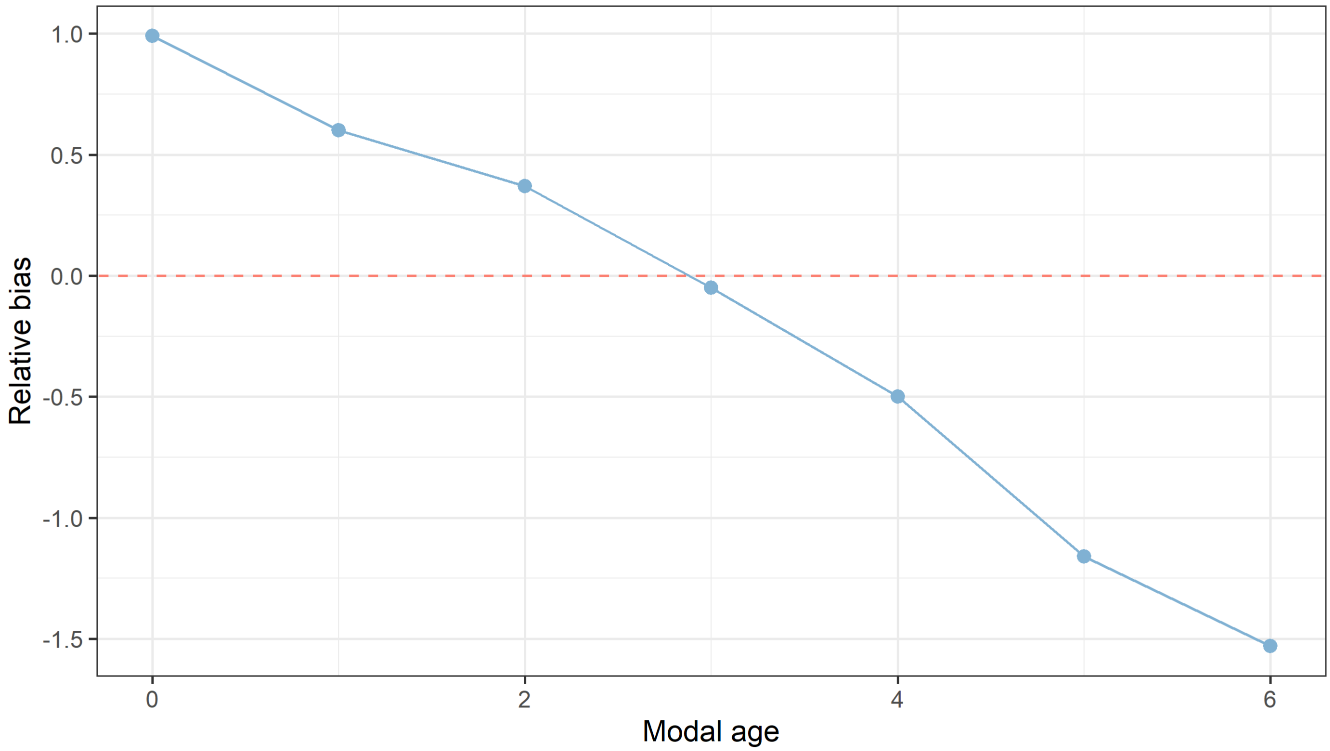


Figure 6.15: The relative bias by modal age as estimated by all age readers combined.

Mean length at age by reader

Table 6.22: Mean fish length at age per reader is calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R04 IT	R08 FR	R12 IT	R14 ES	R16 IT	R18 IT	R20 IT	R22 GR
0	150 mm	158 mm	148 mm	287 mm	143 mm	-	-	148 mm
1	176 mm	172 mm	179 mm	201 mm	162 mm	161 mm	165 mm	173 mm
2	201 mm	211 mm	199 mm	166 mm	192 mm	168 mm	180 mm	226 mm
3	211 mm	235 mm	213 mm	176 mm	196 mm	209 mm	209 mm	259 mm
4	216 mm	242 mm	196 mm	207 mm	217 mm	226 mm	213 mm	274 mm
5	231 mm	174 mm	208 mm	205 mm	225 mm	277 mm	214 mm	-
6	276 mm	286 mm	-	216 mm	287 mm	279 mm	224 mm	-
7	301 mm	-	-	202 mm	286 mm	-	-	-
8	-	-	-	189 mm	-	-	-	-
9	259 mm	-	-	-	-	-	-	-
Weighted Mean	**194 mm**	**195 mm**	**195 mm**	**192 mm**	**194 mm**	**189 mm**	**196 mm**	**195 mm**

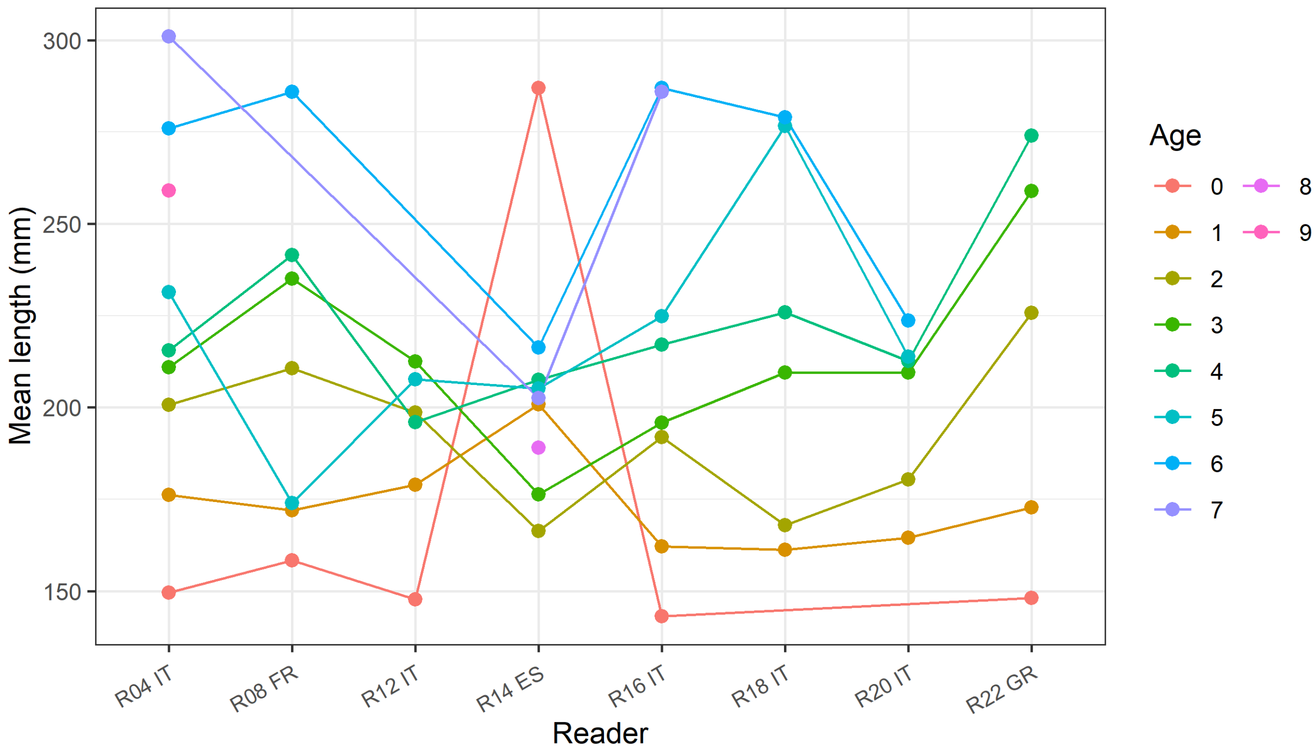


Figure 6.16: The mean fish length at age as estimated by each age reader.

7. Recommendations

A new workshop involving readers in age interpretation of *Mullus barbatus* and *Mullus surmuletus* using otoliths is recommended and approved in WGBIOP 2025 (ICES, in prep).