Report of Otolith Exchange Analysis for Plaice (*Pleuronectes platessa*) in divisions 7.h-k (Celtic Sea South, Southwest of Ireland)

Coordinated by Marcin Blaszkowski

Marine Institute, Fisheries Ecosystems Advisory Services

Rinville, Oranmore, Galway, H91 R673**,** Ireland

Participants (in alphabetical order):

Blaszkowski, M., Chantre, C., Defruit, G., Elleboode, R., Gillespie-Mules, R., Maertens, I., Moerman, M., Pettigrew, J., Smith, J., Smith, T., Telliez, S.

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1 Executive summary

As there is no age calibration data available for plaice stock in divisions 7.h-k (Celtic Sea South, southwest of Ireland), Working Group on Biological Parameters (WGBIOP 2018) called for full scale otoliths exchange in order to identify and resolve age interpretation differences between readers and laboratories.

A total of 11 participants were involved in the Plaice 7.h-k otoliths exchange. Age readers represented all 4 countries where landings of plaice from divisions 7.h-k have been reported. Age estimation of plaice stock in 7.h-k is based on whole otoliths with the exception to UK-CEFAS where either sectioned otoliths or broken and burnt method are used.

Following WGBIOP Guidelines for Otoliths Exchanges (2018) a sets of 191 whole plaice otoliths and 64 of sectioned were selected and uploaded for analysing using the SmartDots application.

Despite the fact landings are evenly distributed between areas 7h and 7jk acquiring the samples of whole otoliths from 7h proved difficult and thus only 20 samples supplied by IFRAMER, France have been included in the exchange. Remaining 171 whole otoliths from division 7j were provided by Marine Institute, Ireland and all sectioned otoliths by CEAFAS, UK. No sampling by any of the participating institutes had taken place in division 7k therefore no otoliths were available to include in the exchange from this area.

The objectives of the present exchange were:

1) Revise and collate published age estimation protocols for plaice (*Pleuronectes platessa*).

2) Evaluate the accuracy and precision in otolith age reading of plaice in divisions 7.h-k (Celtic Sea South ,Southwest of Ireland).

3) Evaluate if age reading interpretation protocols for plaice in Celtic Sea presented in Ageing Manual in Report of the Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) Plaice. ICES 2010. (WKARP) have been adopted by all age readers.

4) Identify issues related to age reading of plaice in divisions 7.h-k.

5) Report results to WGBIOP that will take place in October 2019

The statistics representing age reading performance were calculated for all readers combined and for experienced readers only. All areas were included and calculations were carried separately for each preparation method. As expected agreement was higher and variance (APE & CV) was lower for advanced readers compared to all readers regardless of preparation method. In all cases the statistics were significantly better for whole otoliths than for sectioned otoliths. The average percentage agreement of 76% and variance CV=13%, APE=8% were reached by all readers annotating whole otoliths. There was slight improvement when only advanced readers were combined: PA=78%; CV=12%; APE=7%. The results of present exchange for whole otoliths are in line with the statistics achieved during Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) Plaice (WKARP 2010). Overall average percentage agreement for sectioned otoliths PA=56% and variance CV=18%; APE=18% were lower. There was little improvement when only advanced readers are included: PA=64%; CV=17%; APE=10%.

Age readers were specifically asked to annotate only preparation methods they are familiar with as otherwise the results may be biased. Total of 10 age readers annotated whole otoliths and only 5 annotated sectioned plaice. Remaining 6 readers did not feel confident as they had none or very limited experience with this preparation method.

Differences in age determination mainly related to varied readers approach to otoliths irregular growth and edge interpretation. Age readers faced the same issues during Plaice Ageing Workshop back in 2010 (WKARP 2010). At the time the Ageing Manual for Plaice was included in the report with specific interpretation guidelines for plaice stock in Celtic Sea. It is believed if the readers consistently adhere to those rules the statistics should improve for whole plaice otoliths in 7.h-k.

Plaice in 7.h-k is considered as fast growing stock and specimens of age higher than 10 years are rare and represent small percentage of total catch. During WKARP 2010 it was concluded that for plaice in divisions 7a, 7b, 7g and 7j ranging from 1 to 10 years old, otolith sectioning is not necessary as reading whole otoliths does not result in underestimation of ages.

Using 2 different preparation methods for ageing the same stock may cause confusion and bias in interpretation of ages. Due to low reader agreement on 'sectioned' otoliths it is recommended that WGBIOP:

- Review the methods used to age plaice for stock assessment purposes in 7h-k and identify how to ensure consistency between institutes
- Define a framework/roadmap for improved reader agreement, i.e. regular mini exchanges utilising the SmartDots platform, revised protocol, unbalanced sample size for 7h and 7jk divisions

It is recommended that readers involved in age determination of plaice in 7.h-k should familiarize themselves with current reference sets/ interpretation protocols and consistently follow them while ageing.

Regular exchanges, both internally and externally in order to learn and to improve the agreements between readers should be organised using SmartDots application.

2 Terms of reference

1. Revise and collate published age estimation protocols for plaice (*Pleuronectes platessa*)

2. Evaluate the accuracy and precision in otolith age reading of plaice in divisions 7.h-k (Celtic Sea South, Southwest of Ireland)

3. Evaluate if age reading interpretation protocols for plaice in Celtic Sea presented in Ageing Manual in Report of the Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) Plaice. ICES 2010. (WKARP) have been adopted by all age readers

4. Identify issues related to age reading of plaice in divisions 7.h-k

5. Report results to WGBIOP that will take place in October 2019

3 Participant list

A total of 11 participants were involved in the Plaice 7.h-k otoliths exchange. A list of the participants with a summary of their experience in age estimation of plaice is shown in Table 3.1. Age readers represented all 4 countries where landings of plaice from divisions 7.h-k have been reported as shown in Table 3.2. Age estimation of plaice stock in 7.h-k is based on whole otoliths with the exception to UK-CEFAS where either sectioned otoliths or broken and burnt method are used.

Table 3.1. Participants list.

Country	Reader name	Reader code	Expertise*	Provides data for assessment	Preparation method used for ageing plaice	Participation in WKARP 2010**
Ireland-MI	Marcin Blaszkowski coordinator	R02 IE	Advanced	Yes	whole otoliths	Yes
France-IFREMER	Geoffrey Bled Defruit	R04 FR	Advanced	Yes	whole otoliths	No
France-IFREMER	Romain Elleboode	R06 FR	Advanced	Yes	whole otoliths	Yes
Belgium-ILVO	Ilse Maertens	R08 BE	Advanced	Yes	whole otoliths	Yes
Belgium-ILVO	Martine Moerman	R10 BE	Advanced	Yes	whole otoliths	Yes
Ireland-MI	Turloch Smith	R12 IE	Advanced	Yes	whole otoliths	No
France-IFREMER	Celina Chantre	R14 FR	Basic	No	whole otoliths	No
Scotland-MARLAB	Ruadhan Gillespie-Mules	R16 GB-SCT	Basic	No	whole otoliths	No
UK-CEFAS	Joanne Smith	R22 GB	Basic	No	broken&burnt	Yes
France-IFREMER	Soléne Telliez	R24 FR	Basic	No	whole otoliths	No
UK-CEFAS	James Pettigrew	R20 GB	Basic	No	sections	No

* level of expertise in Smartdots: advanced=provides data for assessment; basic=does not provide data for assessment
** ICES. 2010. Report of the Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) Plaice (WKARP) , 2-5 November 2010, Ijmuiden, The Netherlands. ICES CM 2010/ACOM: 45. 65 pp.

Table 3.2 Commercial landings for Plaice in divisions 7.h–k. All weights are in tonnes.

Year	Divisions 7.j–k					Division 7.h					7.j–k	7.h	Divisions 7.h–k	
	BEL	FRA	IRL	UK	OTH	BEL	FRA	IRL	UK	OTH	Total	Total	Official	ICES estimates
1993	0	8	383	46	0	0	56	0	179	0	437	235	672	655
1994	0	6	251	60	0	0	42	20	199	0	317	261	578	577
1995	0	12	317	90	0	0	48	4	196	0	419	248	667	542
1996	0	3	295	38	0	0	45	10	117	52	336	224	560	453
1997	0	6	337	32	0	0	63	7	106	0	375	176	551	645
1998	0	8	282	16	0	0	41	4	90	13	306	148	454	444
1999	42	0	296	15	0	3	0	3	67	1	311	74	385	406
2000	4	16	195	9	5	0	38	5	67	2	225	112	337	299
2001	0	16	157	6	3	27	34	3	67	0	182	131	313	261
2002	14	21	155	5	2	55	24	0	54	0	183	133	316	313
2003	4	7	125	9	6	16	25	2	47	0	147	90	237	217
2004	0	5	87	6	6	67	27	4	30	0	104	128	232	221
2005	0	4	88	2	0	32	16	2	26	0	94	76	170	164
2006	1	6	63	1	1	22	31	2	17	0	71	72	143	147

2007	2	9	72	2	11	7	21	0	18	2	94	48	142	120
2008	3	5	72	1	1	25	7	0	11	0	79	43	122	135
2009	4	7	71	2	0	1	37	0	30	0	80	68	148	148
2010	5	11	66	1	0	0	44	0	34	0	78	78	156	155
2011	6	11	67	2	0	4	47	6	42	0	80	99	179	178
2012	7	17	93	0	0	2	45	6	36	0	110	89	199	196
2013	0	14	51	0	0	0	35	1	40	0	65	76	141	182
2014	0	11	78	0	0	4	41	4	15	0	89	64	153	169
2015	0	10	24	0	0	5	50	2	17	0	34	74	108	114
2016	0	7	30	0	0	7	39	2	15	0	37	63	100	99
2017	0	12	39	1	0	11	41	3	9	0	52	64	116	115
2018*	1	5	30	0	0	16	30	2	0	11	59	36	95	97

* Preliminary.

Source*:* ICES. 2019. Plaice (*Pleuronectes platessa*) in divisions 7.h-k (Celtic Sea South, southwest of Ireland). *In* Report of the ICES Advisory Committee, 2019. ICES Advice 2019, ple.27.7h-k, https://doi.org/10.17895/ices.advice.4801

4 Introduction

As there is no age calibration data available for plaice stock in divisions 7.h-k (Celtic Sea South, Southwest of Ireland) the October 2018 Working Group on Biological Parameters (WGBIOP) recommended a full scale otolith exchange with the results to be reported back to WGBIOP 2019 meeting in October.

Age estimation protocols for plaice have been established and presented in Report of the Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) Plaice (WKARP 2010) and furthermore all problems and descriptive features related to ageing plaice have been collated in Handbook of fish age estimation protocols and validation methods, ICES 2019. Following chapters 4.1 and 4.2 will present up to date reading protocols for plaice and issues specifically related to plaice in Celtic Sea.

Reading of these guidelines should be essential part of training new readers. Both report WKARP 2010 and Handbook had been sent to all participants before Exchange started and it was expected plaice ageing interpretation guidelines should have been followed while annotating images in SmartDots.

Results of present otolith exchange will demonstrate that age readers faced the same issues regarding plaice age interpretation which have been already addressed during Plaice Reading Workshop back in 2010 (WKARP 2010).

The aim of this report is to:

- present and discuss results of exchange regarding accuracy and precision of ageing plaice in 7.h-k
- identify problems related to differences in plaice age interpretation in 7.h-k
- create reference set demonstrating common issues and mistakes which will provide training tool and will standardize ageing protocols for Celtic Sea plaice in the future.

4.1 Age estimation problems and features of plaice stock: ICES Handbook 2019 (ToR 1)

Extract presented from:

Vitale, F., Worsøe Clausen, L., and Ní Chonchúir, G. (Eds.) 2019. Handbook of fish age estimation protocols and validation methods. ICES Cooperative Research Report No. 346. 180 pp. http://doi.org/10.17895/ices.pub.5221:

“Most plaice stocks have few issues in the age estimation process. However, fish from the northern North Sea have a much slower growth rate than more southerly fish and exhibit split rings as well as narrow annuli.

There can be considerable variation in the size of the first year’s growth. This can cause problems when sectioning the otoliths because a very small nucleus can occasionally be missed by the blade, with the result that the otolith seems to lack a nucleus when viewed, making accurate age estimation almost impossible.

Plaice otoliths are prone to split rings, and the reader should gauge whether inclusion of a split as a true age ring maintains the integrity of the normal growth of the otolith with the age of the fish. A split is often repeated each year, and this is usually seen at the same position between the two annuli each time.

Normally, a plaice otolith shows a good amount of growth in year 1, the largest growth in year 2, and then diminishing growth in subsequent years. At around age 4 or 5, the annual growth becomes uniform. The new annulus ring (the opaque zone) is formed once the feeding season starts and generally occurs around March or April.

Younger fish tend to begin laying down the opaque zone of new growth earlier than older fish.”

4.2 WKARP 2010: Plaice Ageing Manual (ToR 1)

During WKARP 2010 it has been discussed that interpretation of plaice age varies depending on stock. In order to standardize approach the specific guidelines regarding age interpretation were included in the report for 3 geographical areas:

- Skagerrak and Kattegat (IIIa),
- North Sea (IV) and eastern English Channel (VIId)
- Irish Sea (VIIa), Celtic Sea (VIIg, VIIj), ICES Divisions VIIb and VIa

Regarding this report only interpretation guidelines for Celtic Sea plaice are presented which should be applied to plaice stock in 7.h-k.

Following recommendations of WKARP 2010 and then standard approach in Smartdots age determination should be based on counting translucent rings which represent winter growth.

4.2.1 Date of birth

The birthday of all plaice is considered to be January 1st

4.2.2 First annulus

The size of the first annuli in plaice otoliths can vary considerably. This is probably due to the prolonged spawning period with fish spawned earlier in the season showing larger first annulus and those that spawned later in the season showing smaller first annulus. In some specimens when counting the first annulus, **two translucent zones can be very close to each other**. In those cases it is generally **considered as just one translucent** zone and counted as the first annulus.

4.2.3 Otolith edge

The appearance of the otolith edge varies seasonally and between age classes. The translucent zone is deposited in second half of the year and is usually not completed before New Year, except in young fish from fast growing stocks. Older fish deposit the translucent zone over a longer period. It is also important to note that regional differences in timing of otolith zone formation occur; opaque/translucent deposition starts later at higher latitudes. Furthermore annual temperature variations may also affect the timing of opaque/translucent growth

- **Q1 fish**: at the edge of the otolith there should be a translucent zone. This translucent zone is counted when assigning an age. Therefore the age attributed is n where ‘n’ is the number of translucent rings.

- **Q2 fish**: at the edge of the otolith there should be a fully formed translucent zone and there may also be evidence of opaque growth. This translucent zone is counted when assigning an age, therefore the age attributed is n.
- **Q3 fish**: at the edge of the otolith one can expect to see either a translucent zone (possibly incomplete) or an opaque zone.
    - Generally a translucent zone at the edge indicates current year's growth and therefore is not counted; the age attributed is n-1.
    - However there can be some exceptions in older otoliths where there is a complete translucent zone at the edge with little or no opaque growth. In this case the translucent zone is considered to be last year's growth and is therefore counted, the age attributed is n.
    - If **there is an opaque zone at the edge of the otolith** then all translucent zones are counted and the age attributed is **n**.

  Quarter 3 causes the most confusion, as the age attributed is n or n-1. When assigning an age, one must consider certain factors such as whether the fish is young or old and whether it is early or late in the quarter.
- **Q4 fish**: the edge of the otolith should have a translucent zone. This translucent zone is for the present winter and as the birth date is considered to be the January 1st it is not counted, therefore the age assigned is n-1.

4.2.4 Split rings

Split rings can be confused with true annuli which leads to age overestimation. Observation of the width of the rings from nucleus to the edge gives a good indication as to whether it is a true ring or not. From nucleus to the edge, rings should get progressively narrower and more tightly packed. However due to environmental factors (i.e. starvation, water temperature fluctuation) it is not always true. The final interpretation of age depends on the experience of the age reader for a given stock. Split rings can also be detected if the ring is not as prominent as the other rings and if it does not appear as a pattern throughout the whole otolith.

During WKARP 2010 it was discussed whether or not one can expect a consistent growth pattern in the otoliths, i.e. from the nucleus to the edge, the rings should get progressively narrower and more tightly packed. Some countries were of the opinion that if this pattern cannot be seen in the otoliths, some rings should be considered to be false to obtain consistency with the expected pattern. Other countries argued that growth could vary between years due to environmental factors and therefore a consistent growth pattern should not be assumed. The group did not reach an agreement on this issue at the time. This issue can only be resolved by validation studies.

5 Methods

5.1 Overview of samples

Following WGBIOP Guidelines for Otoliths Exchanges (2018) a set of 191 whole plaice otoliths and 64 of sectioned were selected and uploaded for analysing using the SmartDots application (http://ices.dk/marine-data/tools/Pages/smartdots.aspx).

Despite the fact landings are evenly distributed between areas 7jk and 7h (Table 3.2) acquiring the samples of whole otoliths from 7h proved difficult and thus only 20 samples provided by IFREMER, France have been included in the exchange. Sectioned otoliths were provided by CEFAS-UK which is the only institute to read sections for plaice 7.h-k stock. No sampling by any of the participating institutes had taken place in division 7k therefore no otoliths were available to include in the exchange from this area.

The distribution of samples is heavily weighted towards 7j area and all 171 otoliths from this division were provided by Marine Institute, Ireland. This fact corresponds with current ICES quality of assessment for plaice in divisions 7.h–k:

"No landings-at-age data are available for the Division 7.h component. Discards are significant, but not fully quantified. The assessment is carried out on the landings from divisions 7.j and 7.k only, but is assumed to be representative of Division 7.h as well. Therefore, the advice is based on an assessment accepted for trends used as an indicator of stock size"

Source: ICES. 2019. Plaice (*Pleuronectes platessa*) in divisions 7.h-k (Celtic Sea South, southwest of Ireland). In Report of the ICES Advisory Committee, 2019. ICES Advice 2019, ple.27.7h-k, https://doi.org/10.17895/ices.advice.4801

Table 5.1.1: Overview of samples used for the exchange-whole otoliths.

Year	ICES area	Quarter	Number of samples	Modal age range	Length range
2013	27.7.h	4	2	4	380-390 mm
2016	27.7.h	4	18	3-6	230-450 mm
2018	27.7.j	1	86	1-12	110-480 mm
2018	27.7.j	3	54	2-10	250-490 mm
2018	27.7.j	4	31	1-9	210-470 mm

Table 5.1.2: Overview of samples used for the exchange-sectioned otoliths.

Year	ICES area	Quarter	Number of samples	Modal age range	Length range
2018	27.7.h	2	29	4-10	310-520 mm
2018	27.7.h	3	35	2-12	270-530 mm

A total of 11 age readers participated in the exchange of which 10 annotated whole otoliths, 4 annotated both whole and sectioned otoliths and 1 annotated only sections Table 5.1.3 and 5.1.4.

Age readers were specifically asked to annotate only preparation methods they are familiar with as otherwise the results may be biased. Many age readers did not feel confident to annotate sectioned plaice as they had none or very limited experience with this preparation method for plaice.

Table 5.1.3: Whole otoliths Reader overview.

Reader code	Expertise
R02 IE	Advanced
R04 FR	Advanced
R06 FR	Advanced
R08 BE	Advanced
R10 BE	Advanced
R12 IE	Advanced
R14 FR	Basic
R16 GB-SCT	Basic
R22 GB	Basic
R24 FR	Basic

Table 5.1.4: Sectioned otoliths Reader overview.

Reader code	Expertise
R02 IE	Advanced
R06 FR	Advanced
R08 BE	Advanced
R10 BE	Advanced
R20 GB	Basic

5.2 Statistical analyses

This report contains statistical analyses and comparisons of age readings in the form of tables and graphical plots based on Guus Eltink Excel sheet 'Age Reading Comparisons' (Eltink, A.T.G.W. 2000) and R scripts specifically developed for Smartdots. For each individual fish the Coefficient of Variation (CV), percentage agreement (PA) and Average Percentage Error (APE) to modal age was calculated. Additionally, age error matrices (AEM) were produced for advanced age readers separately for whole and sectioned otoliths.

All statistical analyses were produced separately for whole and sectioned otoliths and for all and then for only advanced age readers who provide data for stock assessment.

Percentage Agreement

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. A rank is also assigned to each reader

PA = (no. of readings agreeing with modal age/total no. of readings) x 100%

Co-efficient of Variation (CV)-Precision

The table presents the 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. Finally a rank value is added per reader, where the reader with the lowest weighted mean is assigned with a rank and so forth (in the situation of ties between two weighted means will every tied element be assigned to the lowest rank. This is the procedure for all ties methods when assigning ranks).

Average Percentage Error (APE)

APE was calculated based on the method outlined by Beamish & Fournier (1981). This method is not independent of fish age and thus provides a better estimate of precision. 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:

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

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

Age error matricx (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 fish and for each reader.

6 Analysis of age calibration exercise (ToR 2)

6.1 Results

6.1.1 Readability

Quality of images and thus readability of samples uploaded to SmartDots was not a concern for age readers and 79.1% of all readings for whole otoliths and 75.5% for sections were reported as AQ1-easy to read: Table 6.1.1.1 and Table 6.1.1.2

The percentage of readings with AQ3 rank –very difficult/unreadable- was small: 2.3% for whole and 3.8% for sectioned otoliths.

For total of 191 whole otoliths only 3 age readers reported readability AQ3: one advanced age reader assigned AQ3 to 32 of his readings and 2 basic age readers to 6 and 5 readings respectively.

Table 6.1.1.1: Readability- Whole otoliths (number of samples=191; number of readings= 1910)

Readability whole otoliths	%
AQ1- easy to read with high precision	79.1
AQ2- difficult to age with acceptable precision	18.6
AQ3- unreadable or very difficult to age with acceptable precision	2.3

For all 64 sectioned otoliths, 9 out of 12 AQ3 readings were reported by one basic age reader and 3 by others.

Table 6.1.1.2: Readability-Sectioned otoliths (number of samples=64; number of readings=319).

Readability sectioned otoliths	%
AQ1	75.5
AQ2	20.7
AQ3	3.8

6.1.2 Whole otoliths-All readers

The weighted average percentage agreement based on modal ages for all readers is 76 %, with the weighted average CV of 13 % and APE of 8 %.

Table 6.1.1.1: Summary of statistics; PA (%), CV (%) and APE (%).

CV	PA	APE
13 %	76 %	8 %

Table 6.1.1.2: 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. A rank is also assgned to each reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR	all
1	100 %	100 %	100 %	67 %	67 %	100 %	100 %	33 %	0 %	67 %	**73 %**
2	95 %	85 %	100 %	75 %	75 %	85 %	100 %	90 %	75 %	80 %	**86 %**
3	92 %	92 %	96 %	77 %	73 %	92 %	92 %	88 %	73 %	88 %	**87 %**
4	83 %	87 %	80 %	63 %	63 %	90 %	87 %	77 %	70 %	77 %	**78 %**
5	100 %	88 %	76 %	88 %	88 %	88 %	76 %	94 %	94 %	88 %	**88 %**
6	100 %	86 %	48 %	81 %	67 %	81 %	62 %	89 %	57 %	57 %	**73 %**
7	100 %	82 %	6 %	76 %	71 %	82 %	41 %	81 %	76 %	71 %	**69 %**
8	89 %	63 %	31 %	70 %	56 %	81 %	44 %	70 %	78 %	85 %	**67 %**
9	95 %	80 %	5 %	85 %	60 %	60 %	40 %	80 %	75 %	80 %	**66 %**
10	100 %	67 %	0 %	89 %	78 %	67 %	56 %	89 %	78 %	89 %	**71 %**
11	-	-	-	-	-	-	-	-	-	-	**-**
12	100 %	100 %	0 %	0 %	100 %	100 %	0 %	100 %	100 %	100 %	**70 %**
Weighted Mean	**94 %**	**82 %**	**55 %**	**76 %**	**69 %**	**83 %**	**69 %**	**82 %**	**73 %**	**79 %**	**76 %**

Table 6.1.1.3: 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. A rank is also assigned to each reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR	all
1	0 %	0 %	0 %	43 %	43 %	0 %	0 %	50 %	0 %	43 %	**41 %**
2	11 %	17 %	0 %	20 %	20 %	17 %	0 %	15 %	47 %	32 %	**24 %**
3	9 %	9 %	7 %	16 %	15 %	9 %	9 %	15 %	18 %	12 %	**13 %**
4	12 %	9 %	11 %	14 %	14 %	11 %	9 %	14 %	16 %	14 %	**13 %**
5	0 %	11 %	12 %	6 %	6 %	6 %	10 %	5 %	5 %	6 %	**8 %**
6	0 %	6 %	14 %	7 %	13 %	7 %	10 %	9 %	13 %	13 %	**11 %**
7	0 %	6 %	8 %	11 %	14 %	5 %	15 %	9 %	9 %	9 %	**11 %**
8	4 %	10 %	15 %	7 %	12 %	8 %	13 %	12 %	9 %	6 %	**12 %**
9	2 %	9 %	15 %	4 %	7 %	10 %	13 %	5 %	6 %	5 %	**10 %**
10	0 %	9 %	10 %	3 %	4 %	5 %	16 %	7 %	5 %	3 %	**9 %**
11	-	-	-	-	-	-	-	-	-	-	**-**
12	-	-	-	-	-	-	-	-	-	-	**11 %**
Weighted Mean	**5 %**	**9 %**	**10 %**	**11 %**	**13 %**	**9 %**	**10 %**	**11 %**	**15 %**	**12 %**	**13 %**

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 and finally a rank is assigned to each reader.

Table 6.1.1.4: Relative bias table represents the relative bias per modal age per reader, the relative bias of all readers combined per modal age and a weighted mean of the relative bias per reader. A rank is also assigned to each reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR	all
1	0.00	0.00	0.00	0.33	0.33	0.00	0.00	1.00	1.00	0.33	**0.30**
2	0.05	0.15	0.00	0.25	0.25	0.15	0.00	0.10	0.45	0.30	**0.17**
3	0.08	0.08	-0.04	0.27	0.19	0.08	0.00	0.15	-0.04	-0.04	**0.07**
4	0.20	0.00	-0.20	0.43	0.43	0.07	0.07	0.13	-0.07	0.07	**0.11**
5	0.00	-0.06	-0.29	0.12	0.12	0.12	-0.12	0.06	-0.06	0.12	**0.00**
6	0.00	-0.14	-0.67	0.10	0.48	0.00	-0.29	-0.16	-0.10	0.10	**-0.07**
7	0.00	-0.06	-1.12	0.12	0.41	0.18	-0.71	0.00	0.06	0.24	**-0.09**
8	0.04	-0.22	-1.19	0.33	0.63	0.19	-0.81	0.15	-0.07	0.19	**-0.08**
9	0.05	-0.10	-1.65	0.05	0.35	0.00	-0.90	-0.10	-0.05	-0.20	**-0.25**
10	0.00	-0.56	-1.89	0.11	0.22	-0.33	-1.11	-0.22	-0.22	0.11	**-0.39**
11	-	-	-	-	-	-	-	-	-	-	**-**
12	0.00	0.00	-3.00	-1.00	0.00	0.00	-3.00	0.00	0.00	0.00	**-0.70**
Weighted Mean	**0.06**	**-0.07**	**-0.68**	**0.22**	**0.36**	**0.07**	**-0.37**	**0.06**	**0.01**	**0.09**	**-0.02**

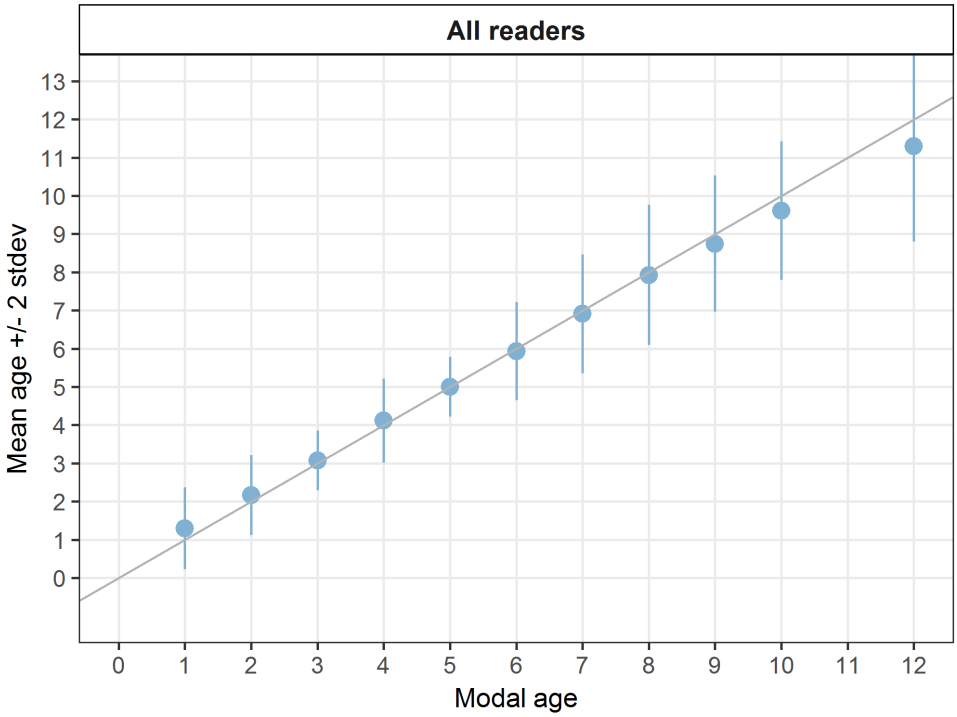


Figure 6.1.1.1:: Age bias plot for all readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated man age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age.

For each pair that is being compared, the differences between the readings per image are found and the frequency of each occured difference is obtained. A rank value is calculated for the positive and the negative differences (R+ and R- in the Guus Eltink sheet). The value with the smallest rank is then used to calculate a z-value that determines the level of bias (not clear from Guus Eltink sheet how the equations are defined).

Table 6.1.1.5: 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)

Comparison	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR
R02 IE	-	**	**	**	**	-	**	-	-	-
R04 FR	**	-	**	**	**	**	**	*	-	**
R06 FR	**	**	.	**	**	**	**	**	**	**
R08 BE	**	**	**	.	**	**	**	**	**	*
R10 BE	**	**	**	**	.	**	**	**	**	**
R12 IE	-	**	**	**	**	-	**	-	-	-
R14 FR	**	**	**	**	**	**	.	**	**	**
R16 GB-SCT	-	*	**	**	**	-	**	-	-	-
R22 GB	-	-	**	**	**	-	**	-	-	-
R24 FR	-	**	**	*	**	-	**	-	-	-
Modal age	-	-	.	.	.	-	.	-	-	-

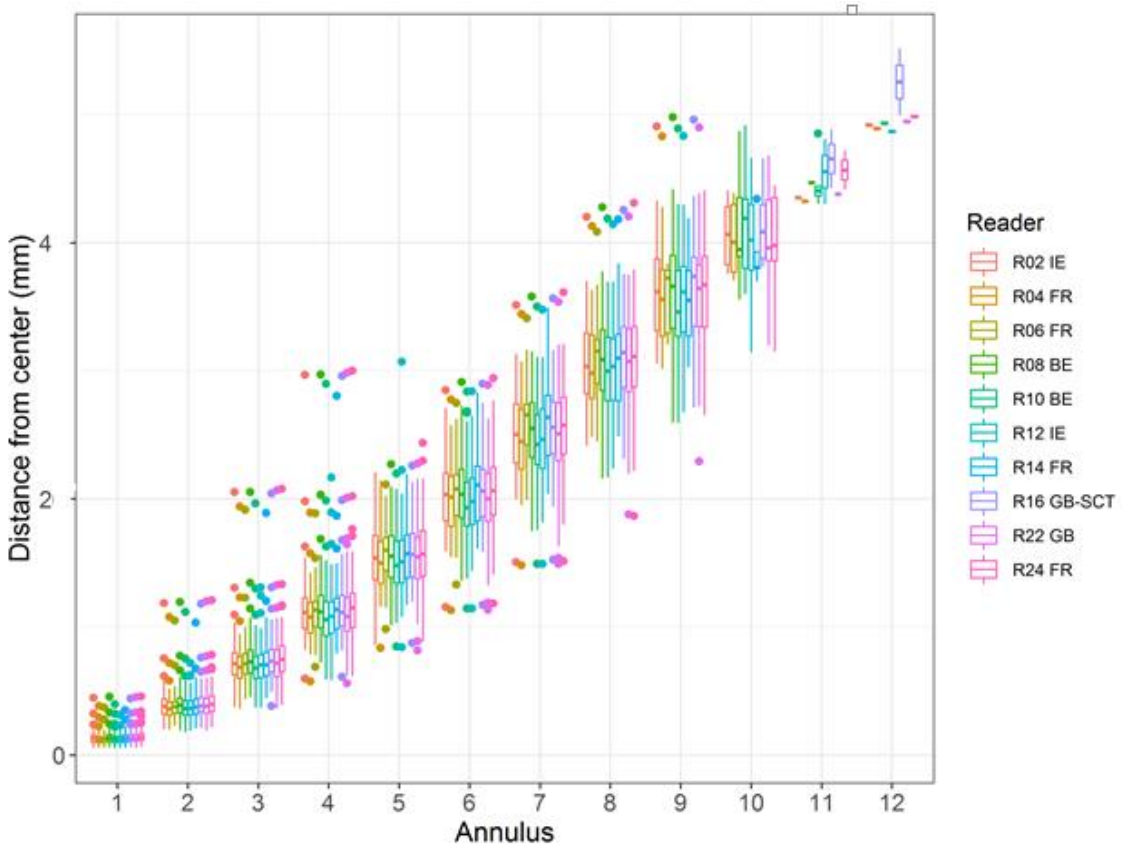


Figure 6.1.1.2: Plot of average distance from the centre to the winter rings for all readers-whole otoliths. The boxes represent the median, upper and lower box boundaries of the interquartile range, whiskers represent 1.5 times the 25th percentile for the lower whisker and 1.5 times the 75th percentile for the upper whisker and the dots represent the outliers.

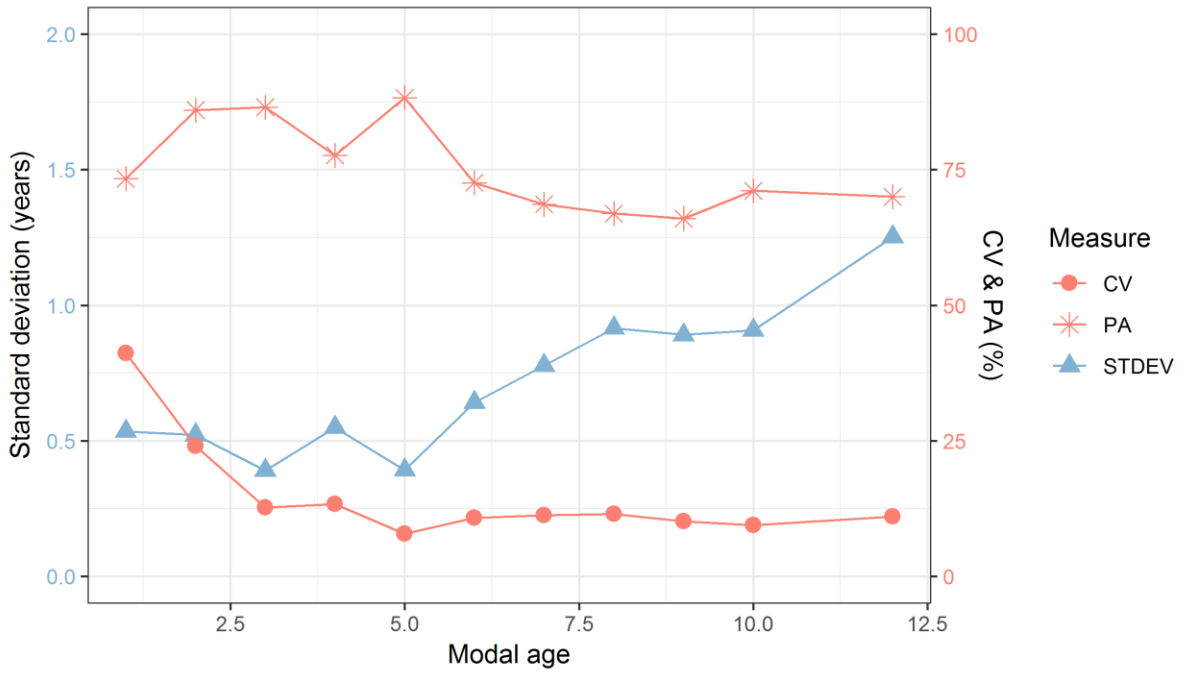


Figure 6.1.1.2: CV, PA and (STDEV (standard deviation) are plotted against modal age

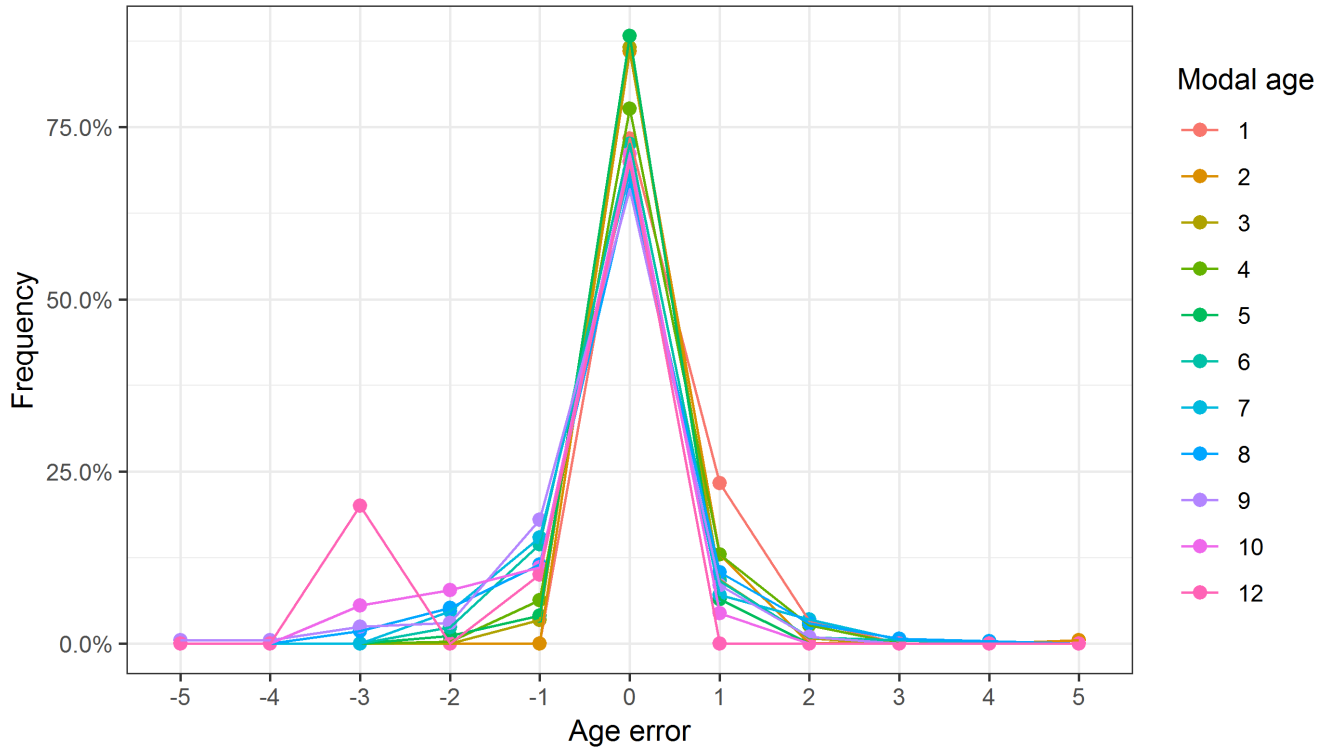


Figure 6.1.1.3: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

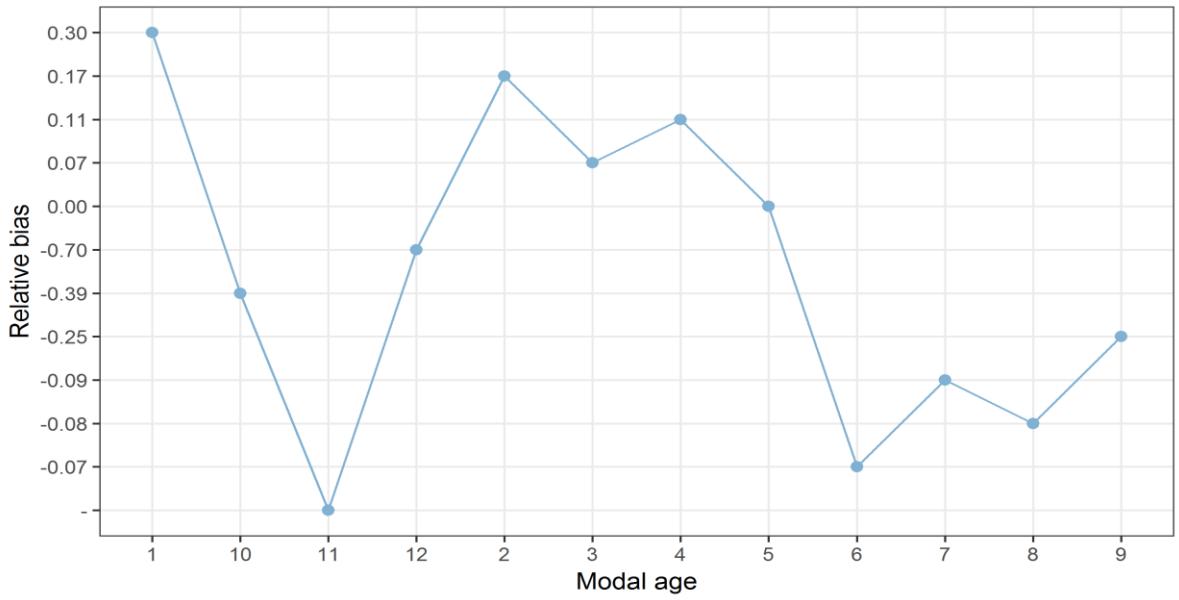


Figure 6.1.1.4: The relative bias by modal age as estimated by all age readers combined.

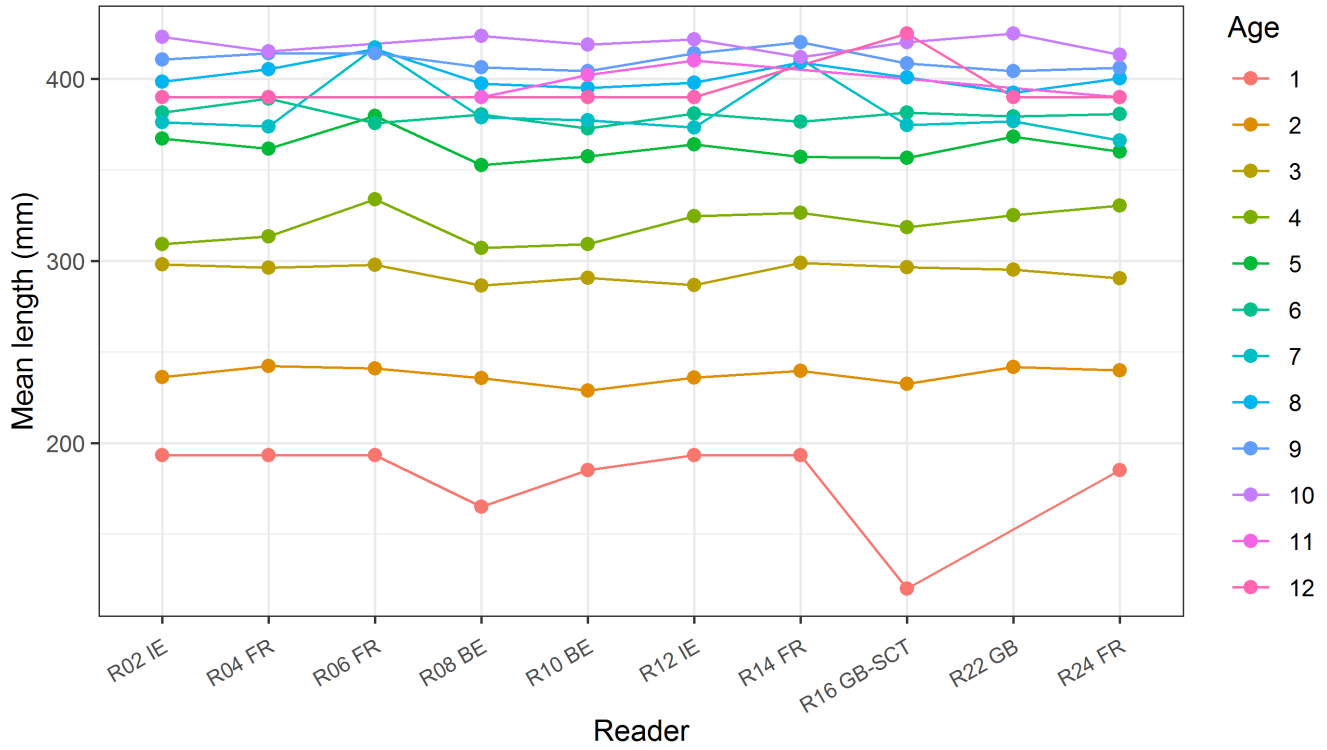


Figure 6.1.1.5: The mean length at age as estimated by each age reader.

6.1.3 Whole otoliths-Advanced readers

The weighted average percentage agreement based on modal ages for advanced readers is 78 %, with the weighted average CV of 12 % and APE of 7 %.

Table 6.1.2.1: Summary of statistics; PA (%), CV (%) and APE (%).

CV	PA	APE
12 %	78 %	7 %

Table 6.1.2.2: 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. A rank is also assgned to each reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	all
1	100 %	100 %	100 %	67 %	67 %	100 %	**89 %**
2	100 %	89 %	100 %	74 %	79 %	89 %	**89 %**
3	93 %	93 %	93 %	74 %	74 %	93 %	**86 %**
4	96 %	92 %	81 %	73 %	73 %	92 %	**85 %**
5	100 %	84 %	68 %	95 %	95 %	79 %	**87 %**
6	96 %	78 %	43 %	83 %	70 %	83 %	**75 %**
7	100 %	81 %	6 %	81 %	75 %	88 %	**72 %**
8	89 %	63 %	31 %	74 %	59 %	81 %	**66 %**
9	100 %	80 %	5 %	90 %	70 %	55 %	**67 %**
10	100 %	60 %	0 %	80 %	80 %	70 %	**65 %**
11	-	-	-	-	-	-	**-**
12	100 %	100 %	0 %	0 %	100 %	100 %	**67 %**
Weighted Mean	**96 %**	**82 %**	**53 %**	**79 %**	**74 %**	**83 %**	**78 %**

Table 6.1.2.3: 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. A rank is also assigned to each reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	all
1	0 %	0 %	0 %	43 %	43 %	0 %	**29 %**
2	0 %	15 %	0 %	20 %	19 %	15 %	**15 %**
3	9 %	9 %	9 %	18 %	15 %	9 %	**12 %**
4	5 %	7 %	11 %	13 %	13 %	7 %	**11 %**
5	0 %	12 %	15 %	5 %	5 %	9 %	**9 %**
6	4 %	9 %	15 %	7 %	12 %	7 %	**11 %**
7	0 %	6 %	7 %	11 %	14 %	5 %	**11 %**
8	4 %	9 %	16 %	7 %	12 %	7 %	**12 %**
9	0 %	9 %	15 %	4 %	7 %	10 %	**11 %**
10	0 %	9 %	9 %	5 %	4 %	5 %	**9 %**
11	-	-	-	-	-	-	**-**
12	-	-	-	-	-	-	**11 %**
Weighted Mean	**3 %**	**9 %**	**11 %**	**11 %**	**12 %**	**8 %**	**12 %**

Table 6.1.2.4: Relative bias table represents the relative bias per modal age and advanced reader, the relative bias of all advanced readers combined per modal age and a weighted mean of the relative bias per reader. A rank is also assigned to each reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	all
1	0.00	0.00	0.00	0.33	0.33	0.00	**0.11**
2	0.00	0.11	0.00	0.26	0.21	0.11	**0.11**
3	0.07	0.07	-0.07	0.22	0.19	0.07	**0.09**
4	0.04	-0.08	-0.19	0.31	0.31	0.00	**0.06**
5	0.00	-0.11	-0.42	0.05	0.05	-0.11	**-0.09**
6	-0.04	-0.26	-0.78	0.09	0.43	0.00	**-0.09**
7	0.00	-0.06	-1.06	0.06	0.38	0.12	**-0.09**
8	-0.04	-0.30	-1.27	0.33	0.63	0.15	**-0.08**
9	0.00	-0.10	-1.70	0.00	0.25	-0.05	**-0.27**
10	0.00	-0.60	-1.90	0.00	0.20	-0.30	**-0.43**
11	-	-	-	-	-	-	**-**
12	0.00	0.00	-3.00	-1.00	0.00	0.00	**-0.67**
Weighted Mean	**0.01**	**-0.12**	**-0.73**	**0.17**	**0.31**	**0.02**	**-0.06**

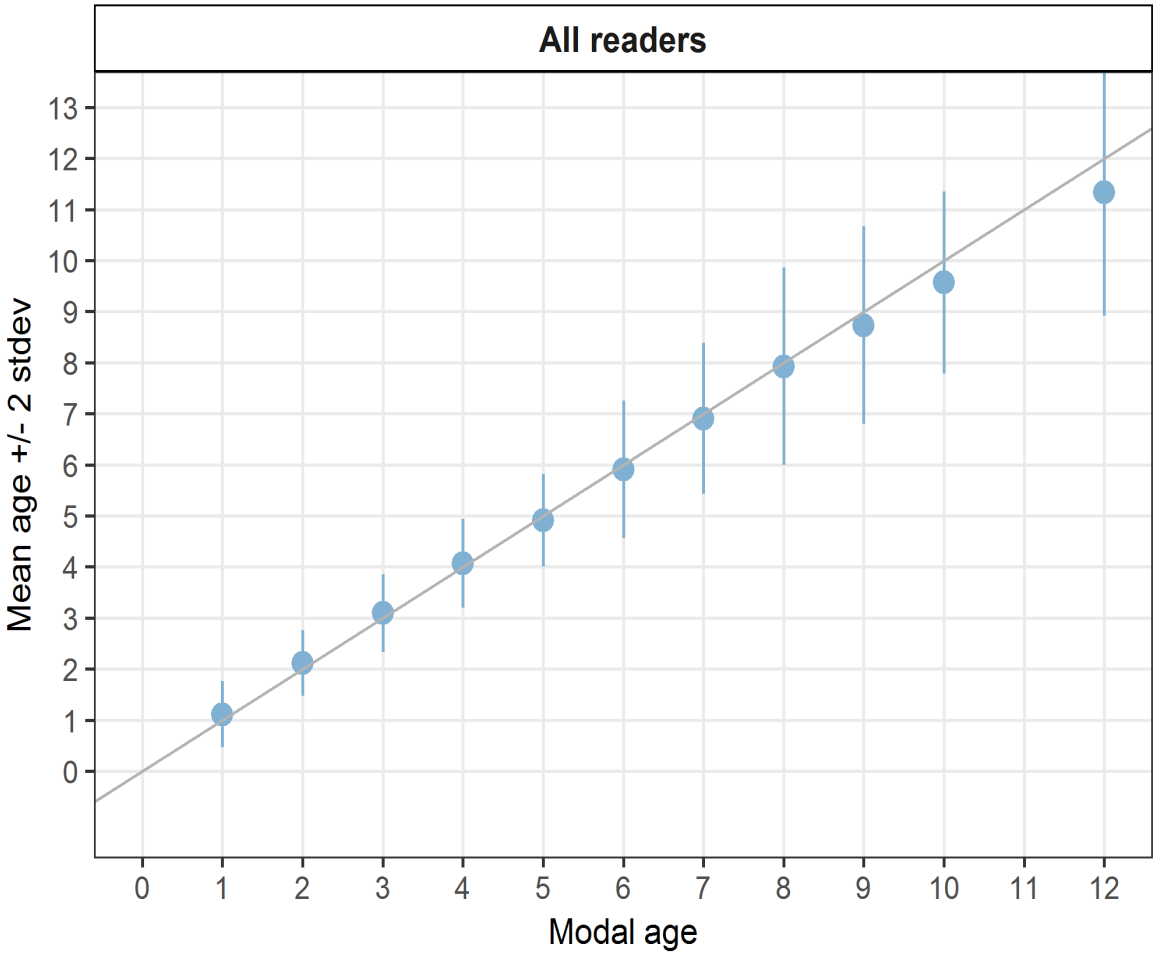


Figure 6.1.2.1: Age bias plot for advanced readers.

Age error matrices are calculated per area and only based on the age readings of the advanced readers.

Table 6.1.2.5: Age error matrix (AEM) for . The AEM shows the proportional distribution of age readings for each modal age. Age column should sum to one but due to rounding there might be small deviations in some cases. Only advanced readers are used for calculating the AEM.

Modal age	1	2	3	4	5	6	7	8	9	10	12
Age 1	0.8889	-	-	-	-	-	-	-	-	-	-
Age 2	0.1111	0.886	0.024691	-	-	-	-	-	-	-	-
Age 3	-	0.114	0.864198	0.05128	0.02632	-	-	-	-	-	-
Age 4	-	-	0.104938	0.84615	0.07018	0.043478	-	-	0.008333	-	-
Age 5	-	-	0.006173	0.08974	0.86842	0.115942	0.03125	0.02484	-	-	-
Age 6	-	-	-	0.01282	0.03509	0.753623	0.16667	0.05590	0.033333	-	-
Age 7	-	-	-	-	-	0.072464	0.71875	0.10559	0.050000	0.03333	-
Age 8	-	-	-	-	-	0.007246	0.04167	0.66460	0.141667	0.11667	-
Age 9	-	-	-	-	-	0.007246	0.03125	0.09317	0.666667	0.15000	0.1667
Age 10	-	-	-	-	-	-	0.01042	0.04348	0.083333	0.65000	-
Age 11	-	-	-	-	-	-	-	0.01242	0.016667	0.05000	0.1667
Age 12	-	-	-	-	-	-	-	-	-	-	0.6667

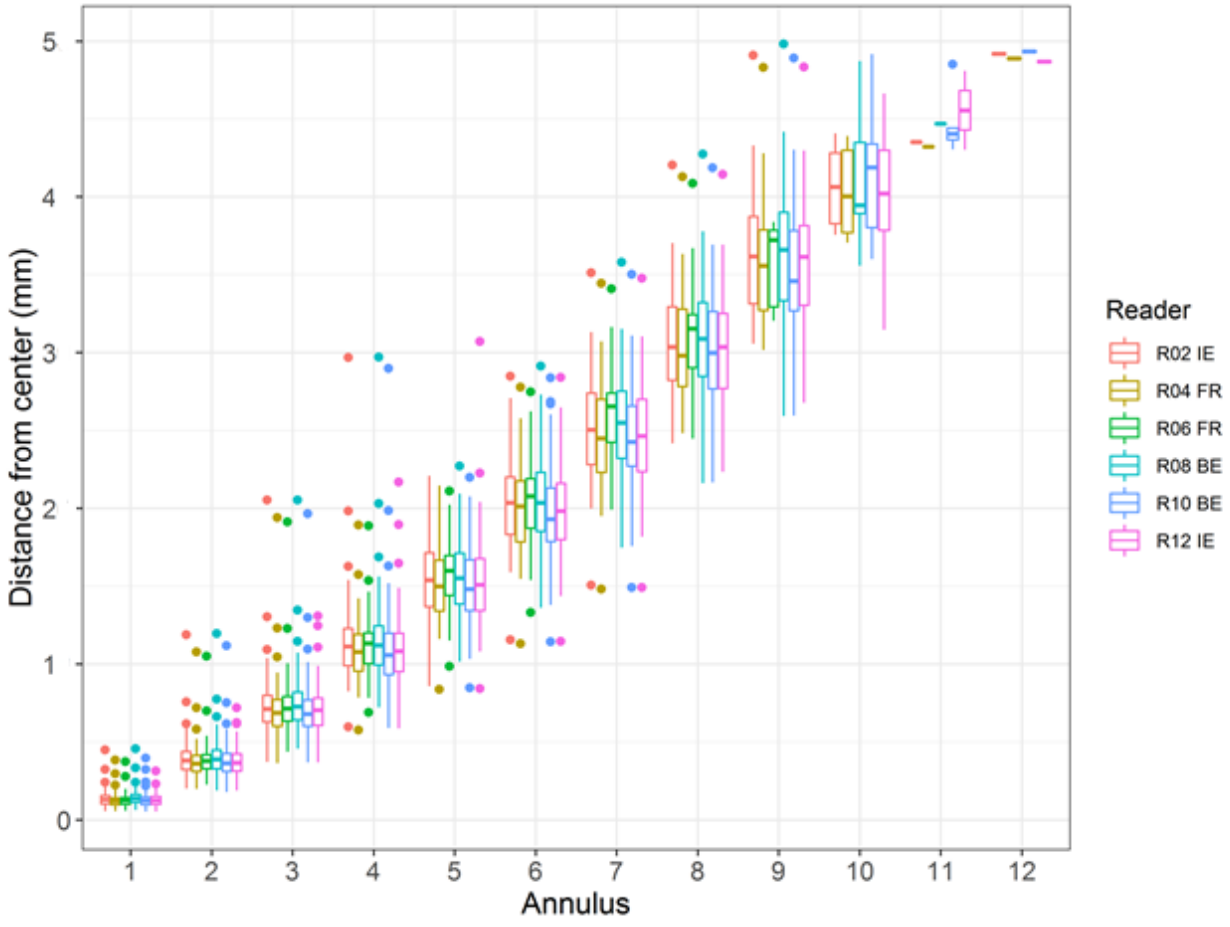


Figure 6.1.2.2: Plot of average distance from the centre to the winter rings for advanced readers-whole otoliths. The boxes represent the median, upper and lower box boundaries of the interquartile range, whiskers represent 1.5 times the 25th percentile for the lower whisker and 1.5 times the 75th percentile for the upper whisker and the dots represent the outliers.

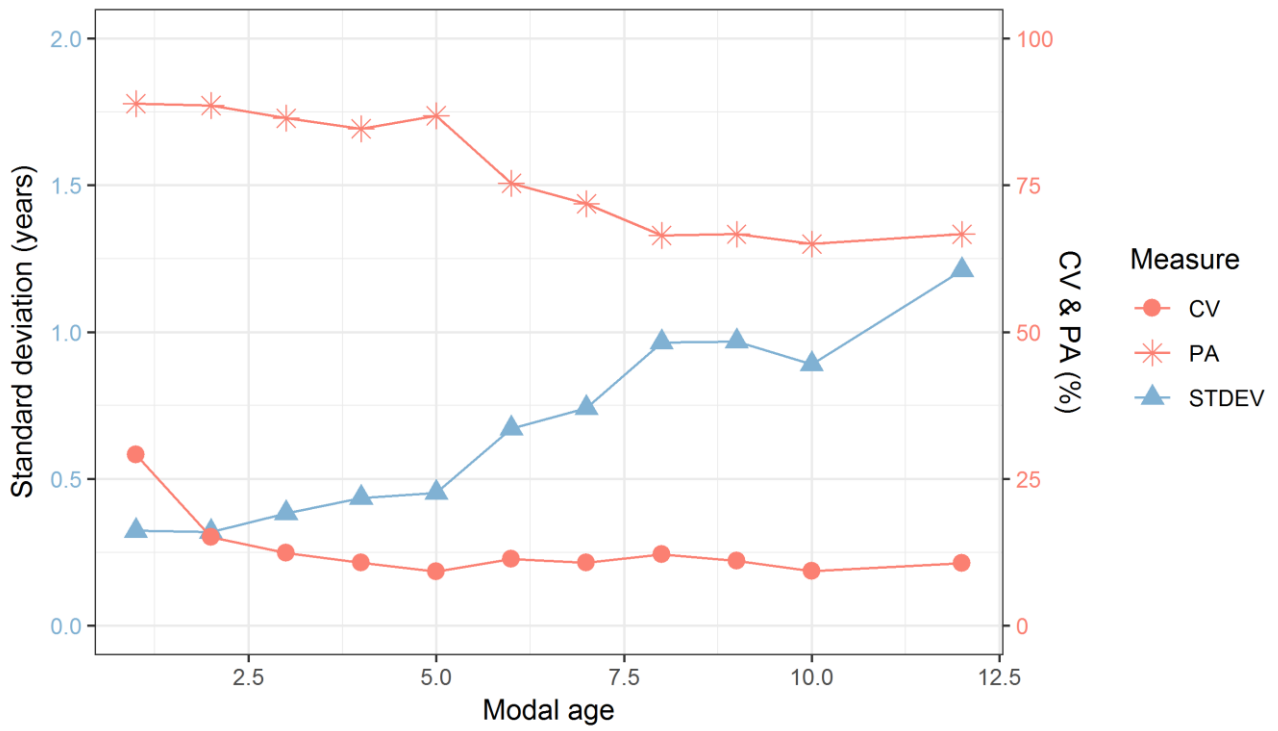


Figure 6.1.2.2: CV, PA and (STDEV (standard deviation) are plotted against modal age

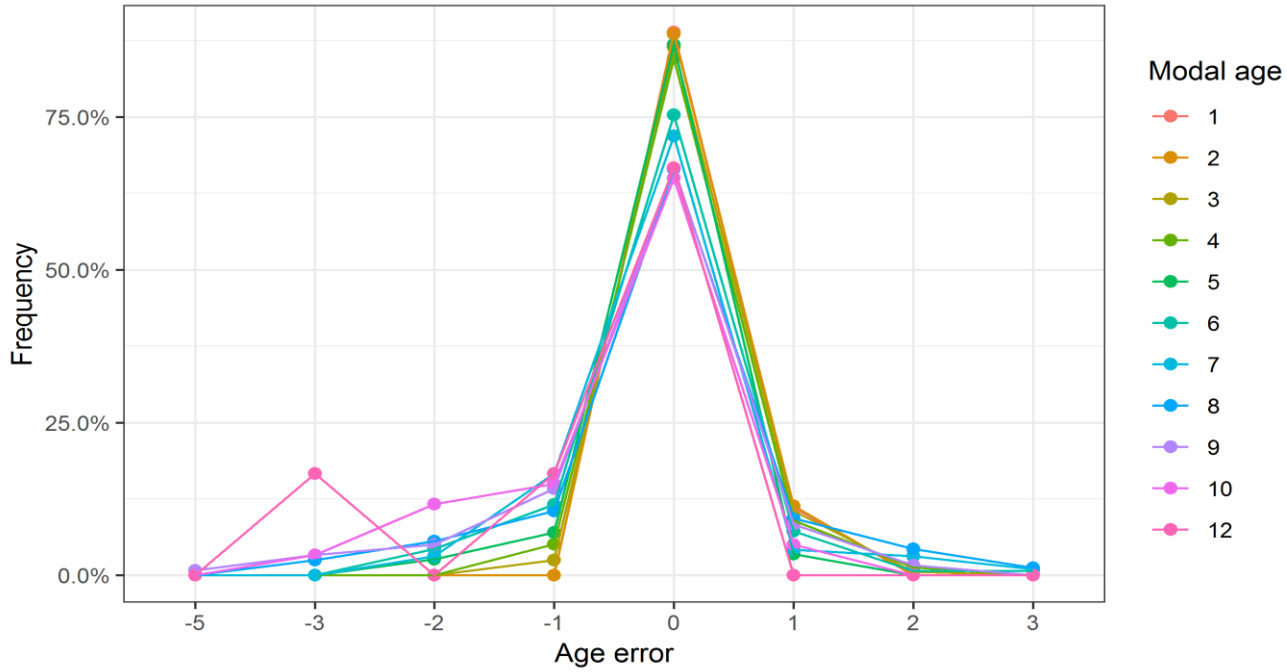


Figure 6.1.2.3: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

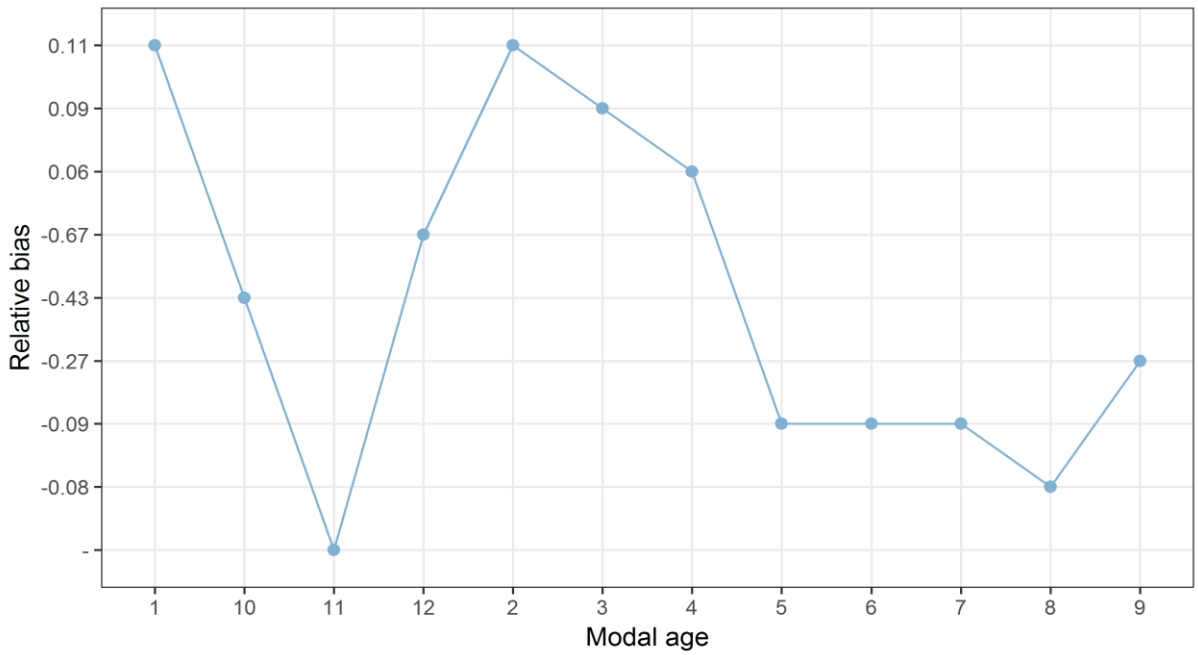


Figure 6.1.2.4: The relative bias by modal age as estimated by all age readers combined.

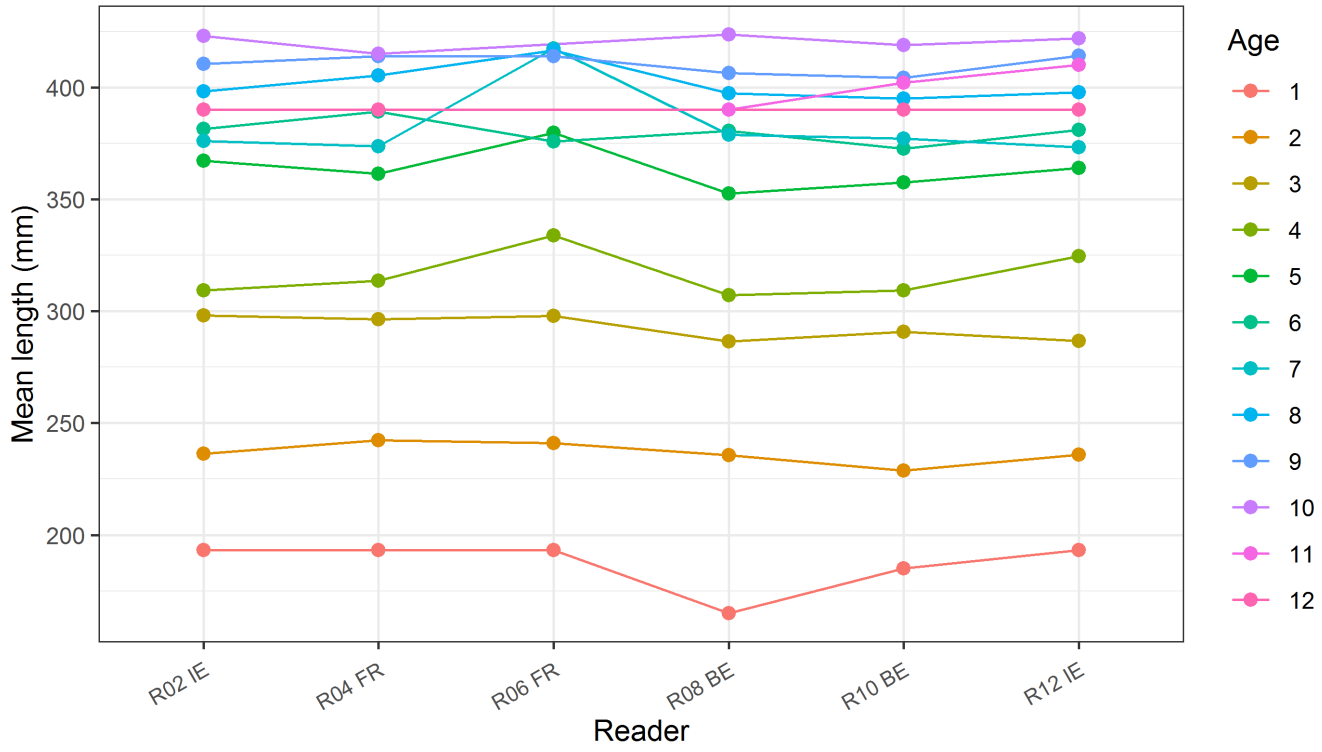


Figure 6.1.2.5: The mean length at age as estimated by each age reader.

6.1.4 Sectioned otoliths-All readers

The weighted average percentage agreement based on modal ages for all readers is 56 %, with the weighted average CV of 26 % and APE of 18 %.

Table 6.1.4.1: Summary of statistics; PA (%), CV (%) and APE (%).

CV	PA	APE
26 %	56 %	18 %

The weighted average percentage agreement based on modal ages for all readers is 56 %, with the weighted average CV of 26 % and APE of 18 %.

Table 6.1.4.2: 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. A rank is also assigned to each reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB	all
2	0 %	0 %	0 %	0 %	16 %	**43 %**
3	-	-	-	-	-	**24 %**
4	23 %	8 %	18 %	8 %	25 %	**31 %**
5	16 %	12 %	15 %	9 %	37 %	**31 %**
6	7 %	16 %	13 %	7 %	33 %	**36 %**
7	28 %	22 %	12 %	14 %	47 %	**37 %**
8	14 %	15 %	18 %	13 %	14 %	**20 %**
9	4 %	12 %	4 %	6 %	18 %	**16 %**
10	0 %	14 %	4 %	10 %	17 %	**17 %**
11	0 %	9 %	0 %	7 %	20 %	**16 %**
12	20 %	28 %	0 %	-	5 %	**25 %**
Weighted Mean	**13 %**	**13 %**	**12 %**	**9 %**	**25 %**	**26 %**

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 included at the bottom of the table is weighted according to number of age readings. A rank is also assigned to each reader.

Table 6.1.4.3: 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. A rank is also assigned to each reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB	all
2	100 %	100 %	100 %	100 %	0 %	**80 %**
3	100 %	0 %	100 %	100 %	0 %	**60 %**
4	70 %	90 %	50 %	90 %	0 %	**61 %**
5	55 %	70 %	64 %	82 %	27 %	**59 %**
6	83 %	17 %	33 %	83 %	17 %	**47 %**
7	80 %	40 %	60 %	20 %	20 %	**44 %**
8	83 %	8 %	83 %	64 %	33 %	**54 %**
9	88 %	0 %	88 %	71 %	62 %	**62 %**
10	100 %	0 %	80 %	60 %	20 %	**52 %**
11	100 %	0 %	100 %	50 %	0 %	**50 %**
12	50 %	0 %	100 %	100 %	0 %	**44 %**
Weighted Mean	**78 %**	**35 %**	**70 %**	**72 %**	**24 %**	**56 %**

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 and finally a rank is assigned to each reader.

Table 6.1.4.4: Relative bias table represents the relative bias per modal age per reader, the relative bias of all readers combined per modal age and a weighted mean of the relative bias per reader. A rank is also assigned to each reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB	all
2	0.00	0.00	0.00	0.00	2.50	**0.50**
3	0.00	-1.00	0.00	0.00	1.00	**0.00**
4	0.60	-0.10	0.70	0.10	3.11	**0.88**
5	0.64	-0.10	0.55	0.00	2.91	**0.80**
6	0.17	-1.17	0.33	0.17	4.33	**0.77**
7	1.00	-1.20	0.60	-0.40	3.40	**0.68**
8	0.42	-1.92	0.33	-0.18	1.42	**0.01**
9	0.12	-2.12	-0.12	0.00	1.12	**-0.20**
10	0.00	-3.00	0.20	-0.60	0.80	**-0.52**
11	0.00	-3.50	0.00	-0.50	-0.50	**-0.90**
12	2.00	-4.50	0.00	0.00	2.50	**0.00**
Weighted Mean	**0.45**	**-1.38**	**0.34**	**-0.10**	**2.27**	**0.32**

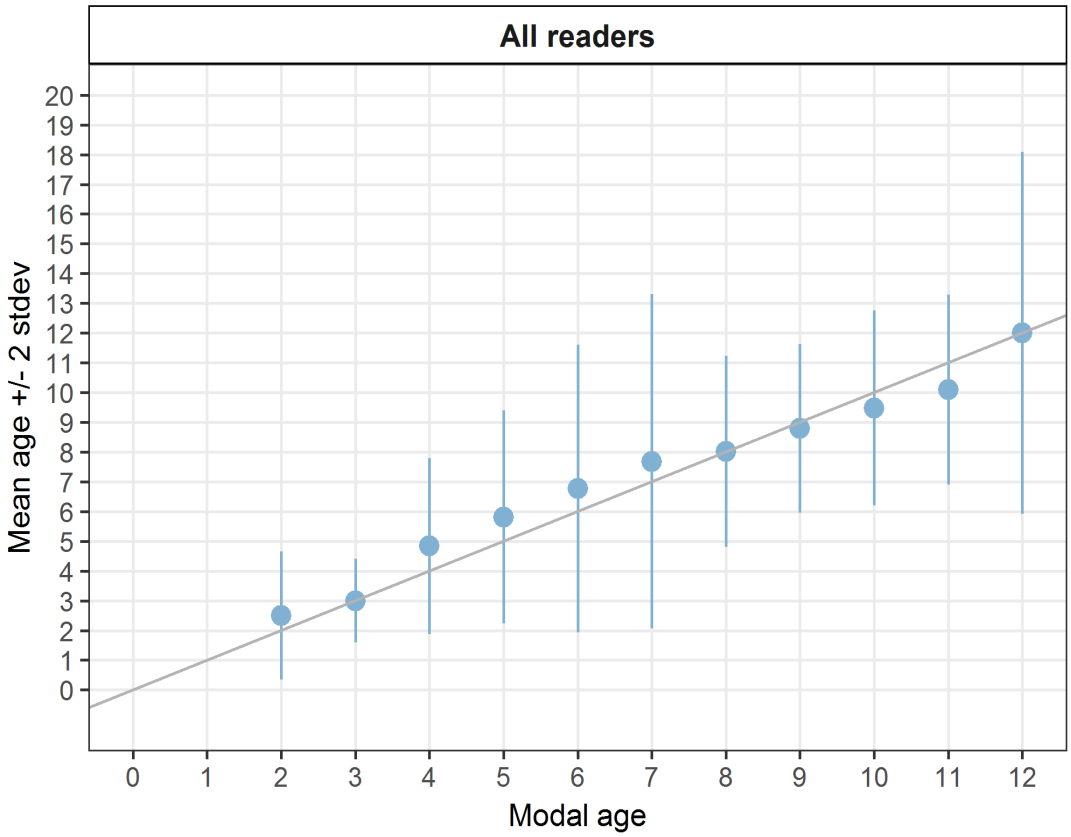


Figure 6.1.4.1:: Age bias plot for all readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated man age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age.

For each pair that is being compared, the differences between the readings per image are found and the frequency of each occurring difference is obtained. A rank value is calculated for the positive and the negative differences (R+ and R- in the Guus Eltink sheet). The value with the smallest rank is then used to calculate a z-value that determines the level of bias (not clear from Guus Eltink sheet how the equations are defined).

Table 6.1.4.5: 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)

Comparison	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB
R02 IE	-	**	-	**	**
R06 FR	**	.	**	**	**
R08 BE	-	**	-	**	**
R10 BE	**	**	**	.	**
R20 GB	**	**	**	**	.
Modal age	-	.	-	.	.

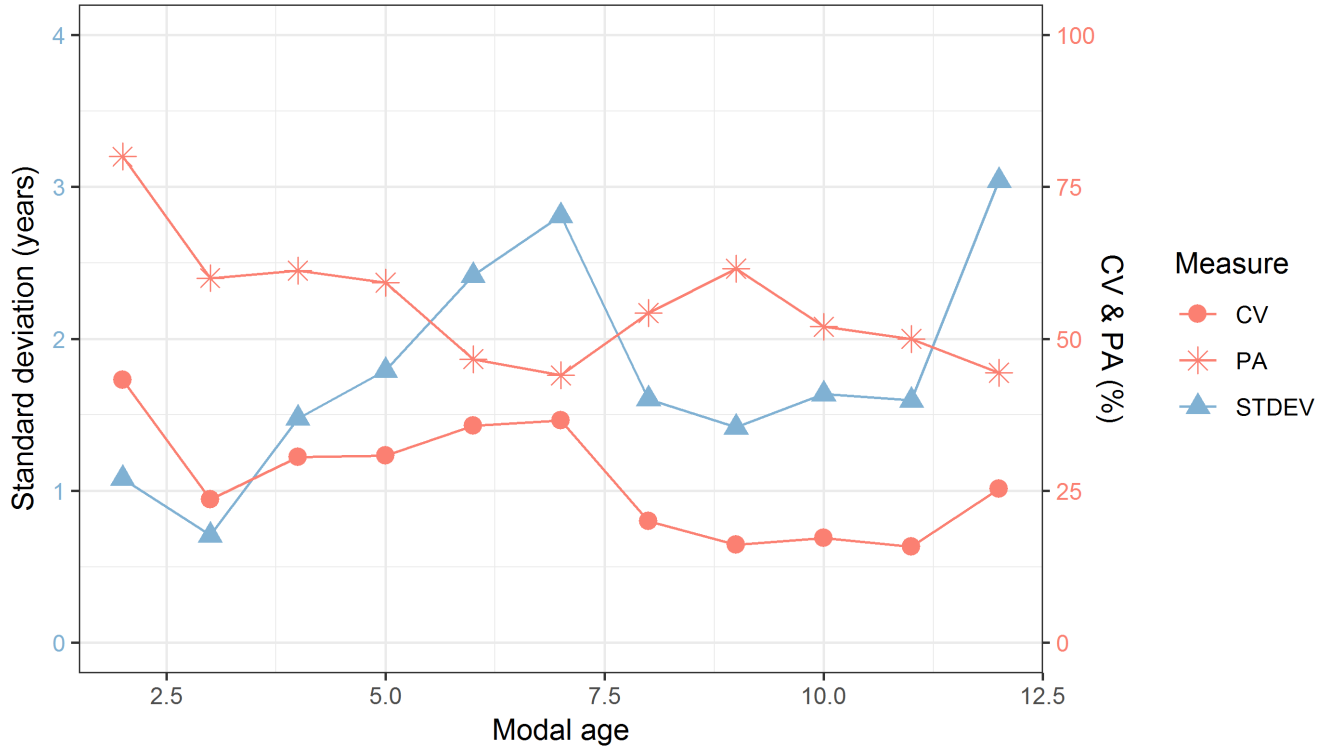


Figure 6.1.4.2: CV, PA and (STDEV (standard deviation) are plotted against modal age

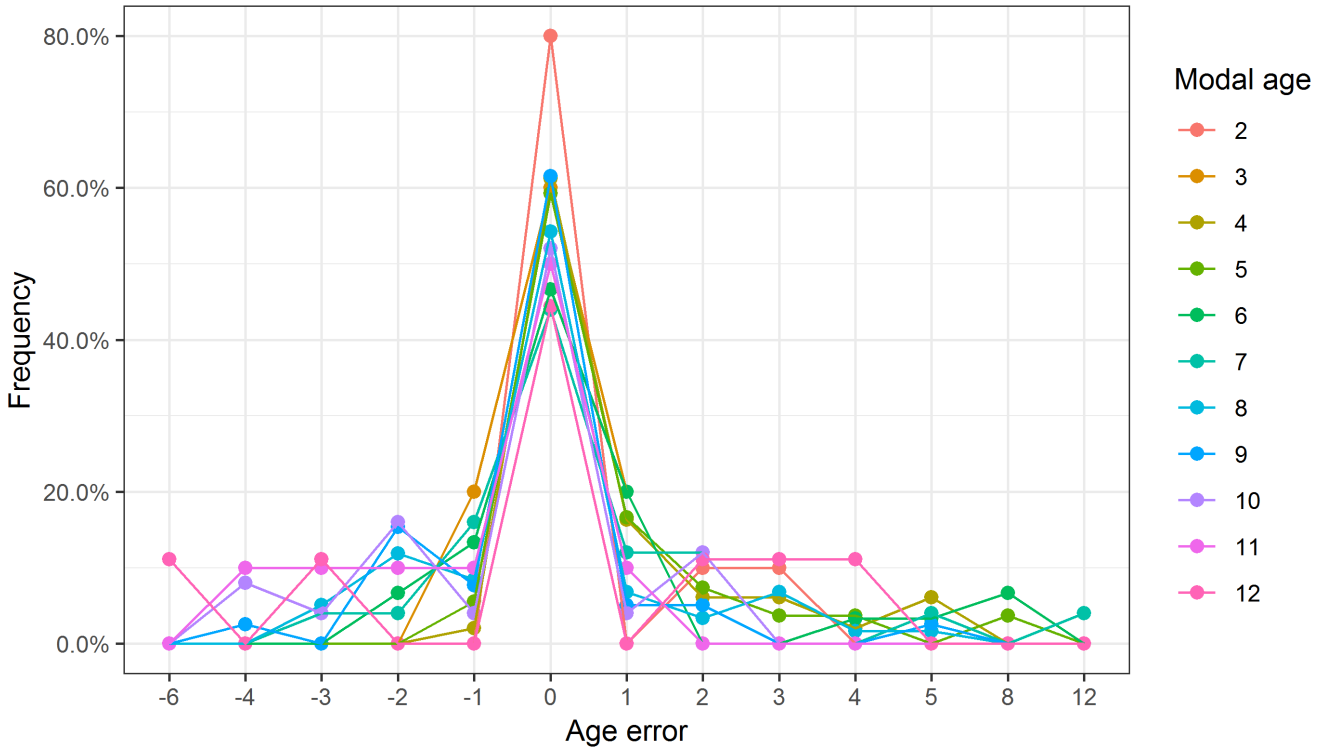


Figure 6.1.4.3: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

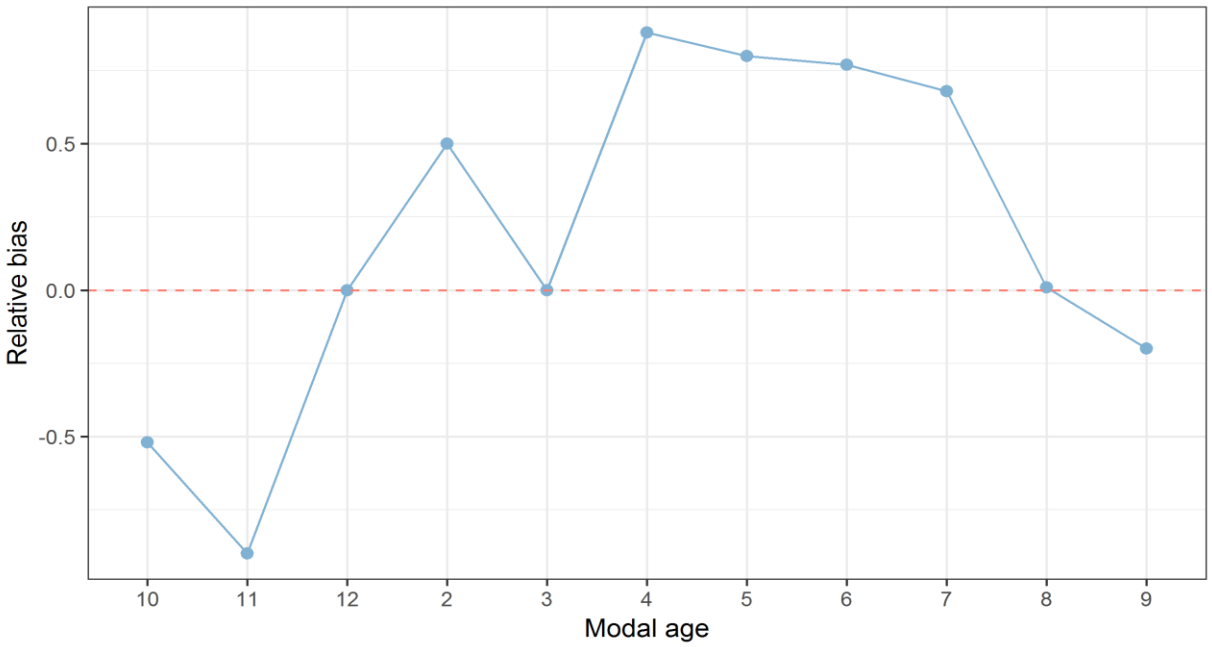


Figure 6.1.4.4: The relative bias by modal age as estimated by all age readers combined.

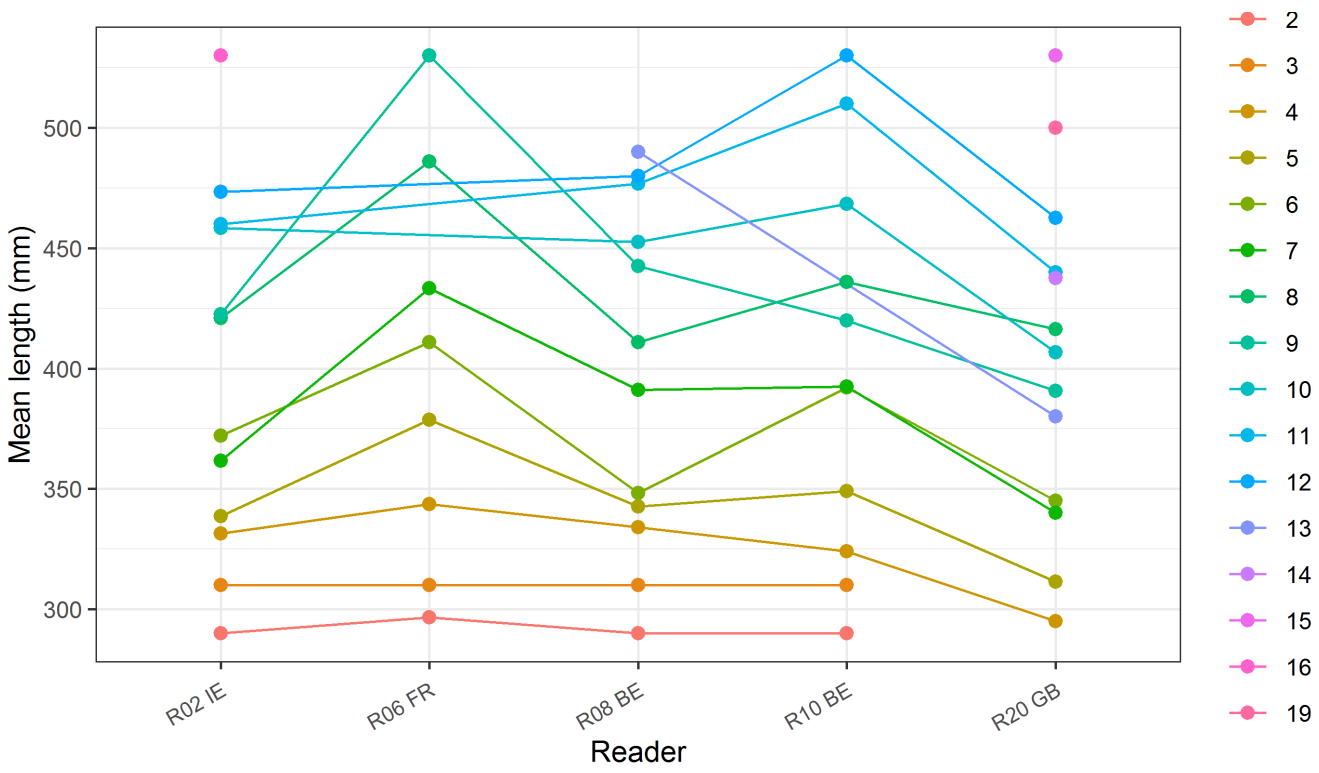


Figure 6.1.4.5: The mean length at age as estimated by each age reader.

6.1.5 Sectioned otoliths-Advanced readers

The weighted average percentage agreement based on modal ages for advanced readers is 64 %, with the weighted average CV of 17 % and APE of 10 %.

Table 6.1.5.1: Summary of statistics; PA (%), CV (%) and APE (%).

CV	PA	APE
17 %	64 %	10 %

Table 6.1.5.2: 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. A rank is also assigned to each reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	all
2	0 %	0 %	0 %	0 %	**0 %**
3	-	-	-	-	**18 %**
4	22 %	8 %	17 %	7 %	**17 %**
5	19 %	9 %	18 %	9 %	**17 %**
6	7 %	16 %	13 %	7 %	**14 %**
7	30 %	24 %	13 %	14 %	**23 %**
8	14 %	14 %	18 %	10 %	**19 %**
9	4 %	12 %	4 %	6 %	**13 %**
10	0 %	14 %	4 %	10 %	**16 %**
11	0 %	9 %	0 %	7 %	**16 %**
12	20 %	28 %	0 %	-	**27 %**
Weighted Mean	**14 %**	**12 %**	**12 %**	**8 %**	**17 %**

Table 6.1.5.3: 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. A rank is also assgned to each reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	all
2	100 %	100 %	100 %	100 %	**100 %**
3	100 %	0 %	100 %	100 %	**75 %**
4	64 %	91 %	45 %	91 %	**73 %**
5	42 %	82 %	50 %	75 %	**62 %**
6	83 %	17 %	33 %	83 %	**54 %**
7	75 %	50 %	75 %	25 %	**56 %**
8	82 %	9 %	91 %	70 %	**63 %**
9	88 %	0 %	88 %	71 %	**61 %**
10	100 %	0 %	80 %	60 %	**60 %**
11	100 %	0 %	100 %	50 %	**62 %**
12	50 %	0 %	100 %	100 %	**57 %**
Weighted Mean	**73 %**	**40 %**	**69 %**	**74 %**	**64 %**

Table 6.1.5.4: Relative bias table represents the relative bias per modal age and advanced reader, the relative bias of all advanced readers combined per modal age and a weighted mean of the relative bias per reader. A rank is also assigned to each reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	all
2	0.00	0.00	0.00	0.00	**0.00**
3	0.00	-1.00	0.00	0.00	**-0.25**
4	0.64	-0.09	0.73	0.09	**0.34**
5	1.00	0.00	0.92	0.25	**0.54**
6	0.17	-1.17	0.33	0.17	**-0.12**
7	1.25	-1.00	0.50	-0.25	**0.12**
8	0.45	-1.82	0.45	0.00	**-0.23**
9	0.12	-2.12	-0.12	0.00	**-0.53**
10	0.00	-3.00	0.20	-0.60	**-0.85**
11	0.00	-3.50	0.00	-0.50	**-1.00**
12	2.00	-4.50	0.00	0.00	**-0.62**
Weighted Mean	**0.55**	**-1.29**	**0.44**	**0.00**	**-0.07**

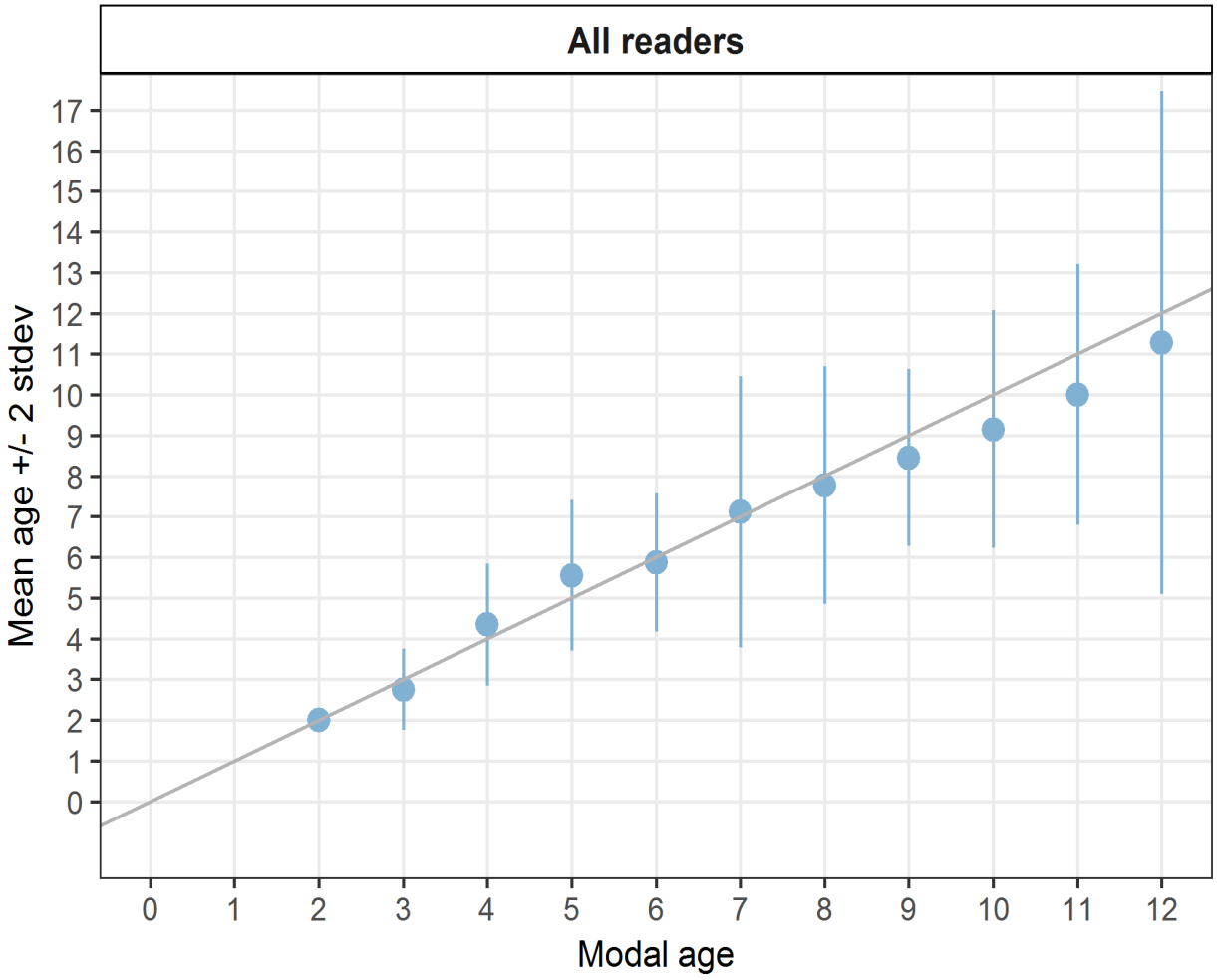


Figure 6.1.5.1: Age bias plot for advanced readers.

Age error matrices are calculated per area and only based on the age readings of the advanced readers.

Table 6.1.5.5: Age error matrix (AEM) for . The AEM shows the proportional distribution of age readings for each modal age. Age column should sum to one but due to rounding there might be small deviations in some cases. Only advanced readers are used for calculating the AEM.

Modal age	2	3	4	5	6	7	8	9	10	11	12
Age 2	1	0.25	-	-	-	-	-	-	-	-	-
Age 3	-	0.75	0.02273	-	-	-	-	-	-	-	-
Age 4	-	-	0.72727	0.02128	0.08333	0.0625	-	-	-	-	-
Age 5	-	-	0.15909	0.61702	0.16667	-	0.04651	0.03226	-	-	-
Age 6	-	-	0.06818	0.21277	0.54167	0.1875	0.13953	-	0.10	-	0.1429
Age 7	-	-	0.02273	0.08511	0.20833	0.5625	0.09302	0.19355	0.05	0.125	-
Age 8	-	-	-	0.06383	-	0.0625	0.62791	0.09677	0.15	0.125	-
Age 9	-	-	-	-	-	0.0625	0.02326	0.61290	0.05	-	0.1429
Age 10	-	-	-	-	-	-	0.02326	0.06452	0.60	0.125	-
Age 11	-	-	-	-	-	-	-	-	0.05	0.625	-
Age 12	-	-	-	-	-	0.0625	0.02326	-	-	-	0.5714
Age 13	-	-	-	-	-	-	0.02326	-	-	-	-
Age 16	-	-	-	-	-	-	-	-	-	-	0.1429

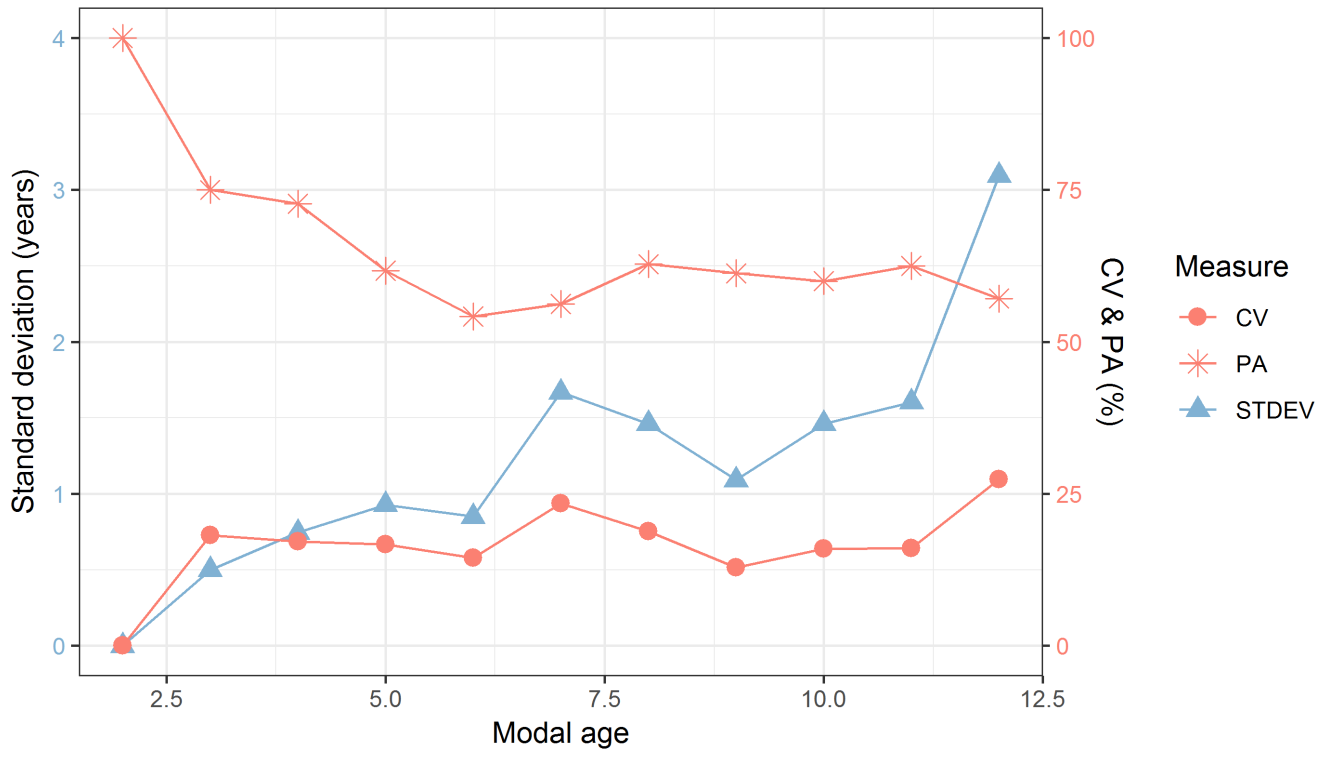


Figure 6.1.5.2: CV, PA and (STDEV (standard deviation) are plotted against modal age

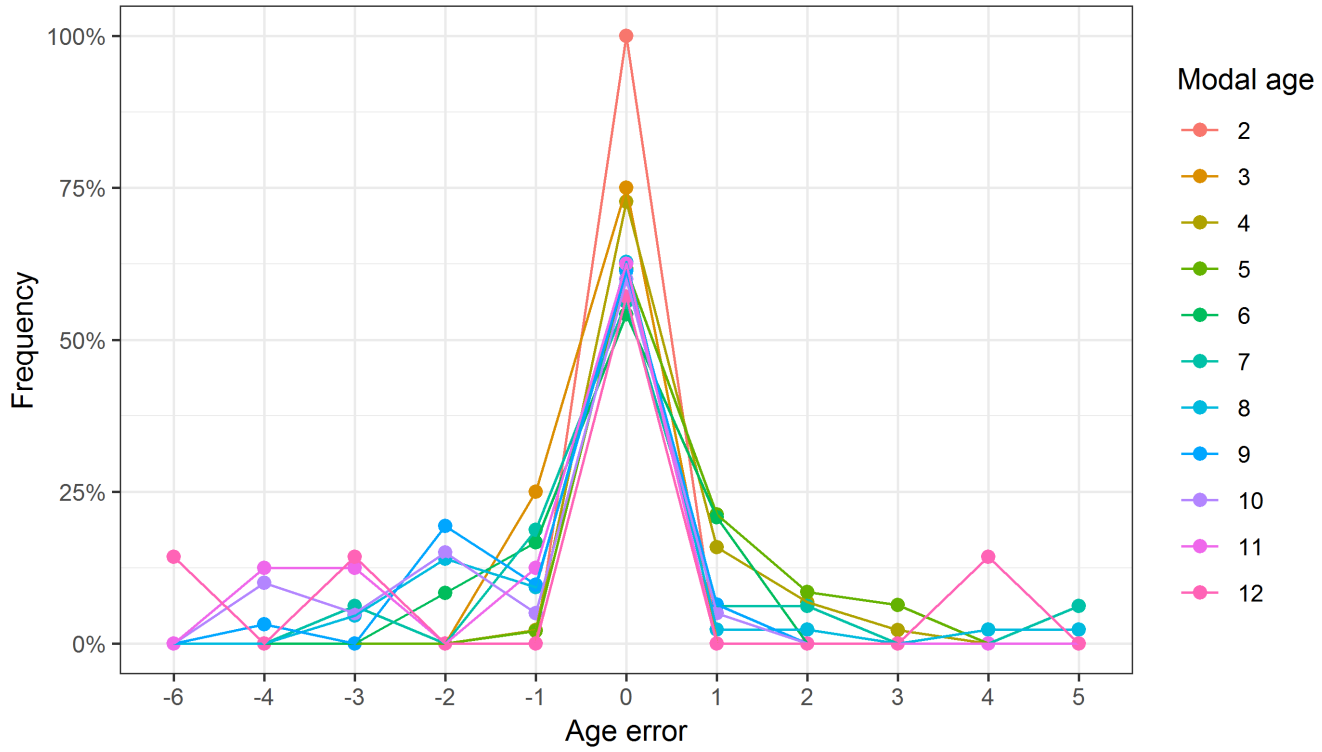


Figure 6.1.5.3: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

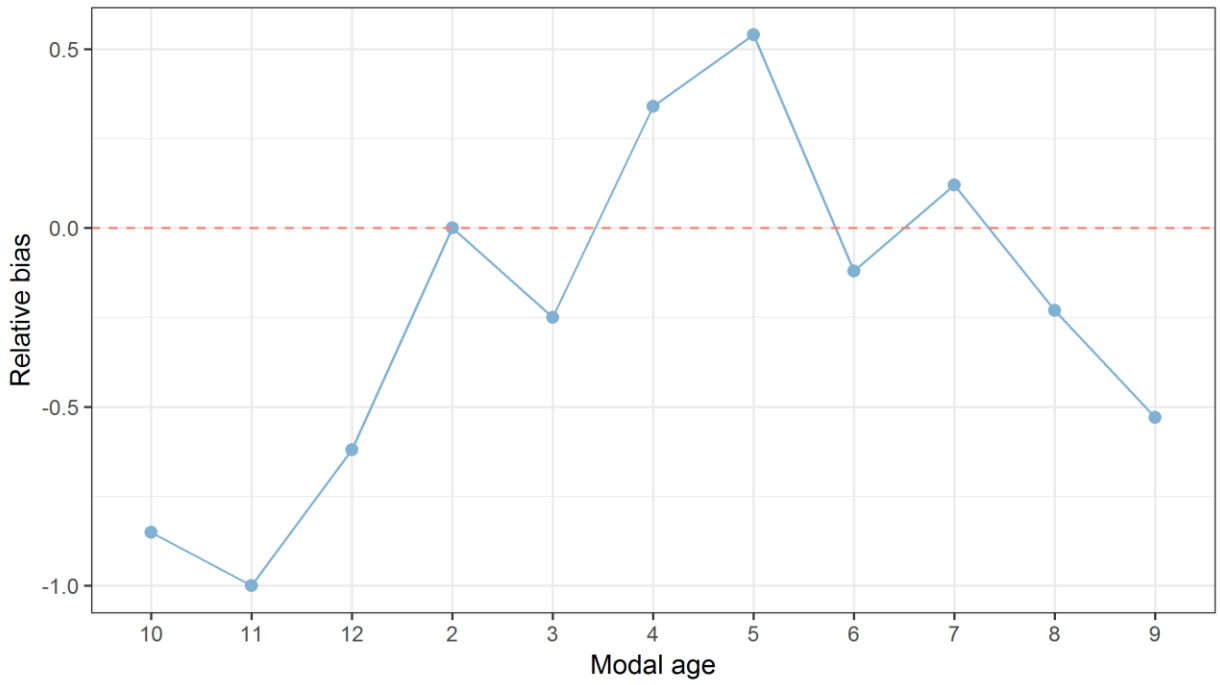


Figure 6.1.5.4: The relative bias by modal age as estimated by all age readers combined.

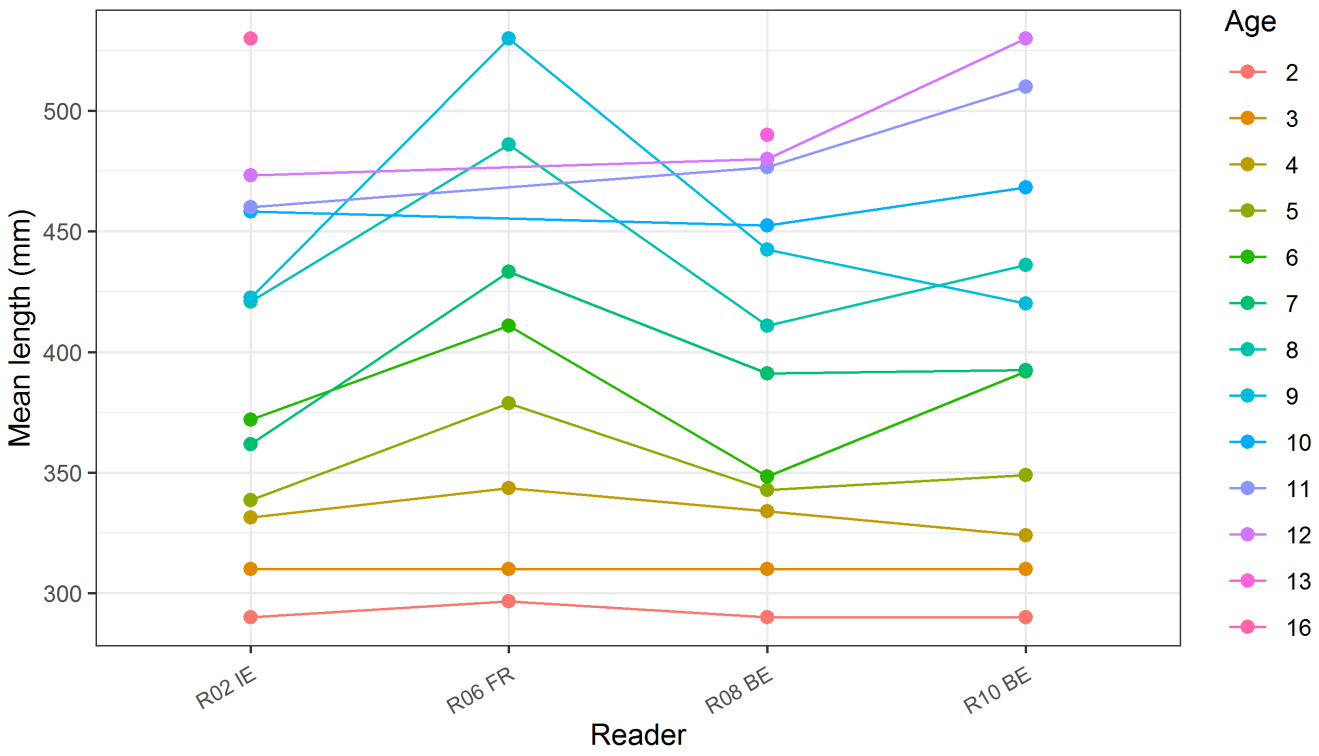


Figure 6.1.5.5: The mean length at age as estimated by each age reader.

6.2 Images-whole otoliths-age interpretation issues (ToR 3 and ToR 4)

6.2.1 Otoliths with 100% percentage agreement (PA)

Figure 6.2.1.1. PLE_018; 7j; 41cm, caught 31/01/2018. Modal age=8; PA=100%

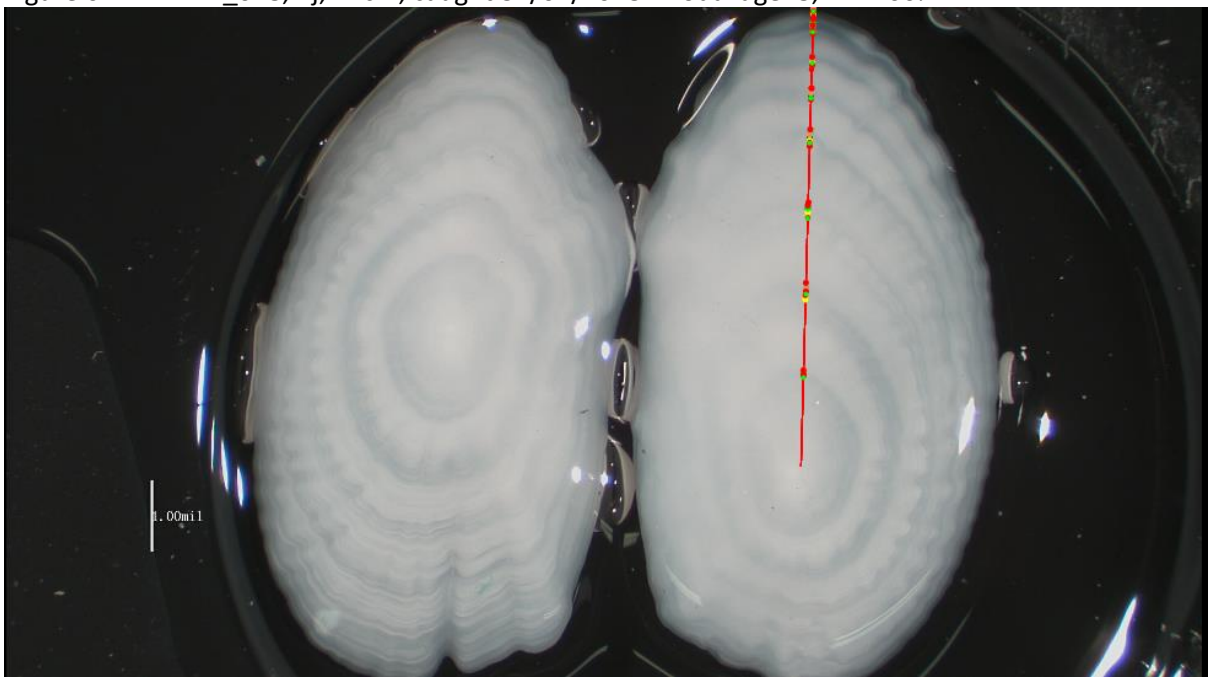


Figure 6.2.1.2. PLE_002; 7j; 33cm; caught 12/01/2018. Modal age=6; PA=100%

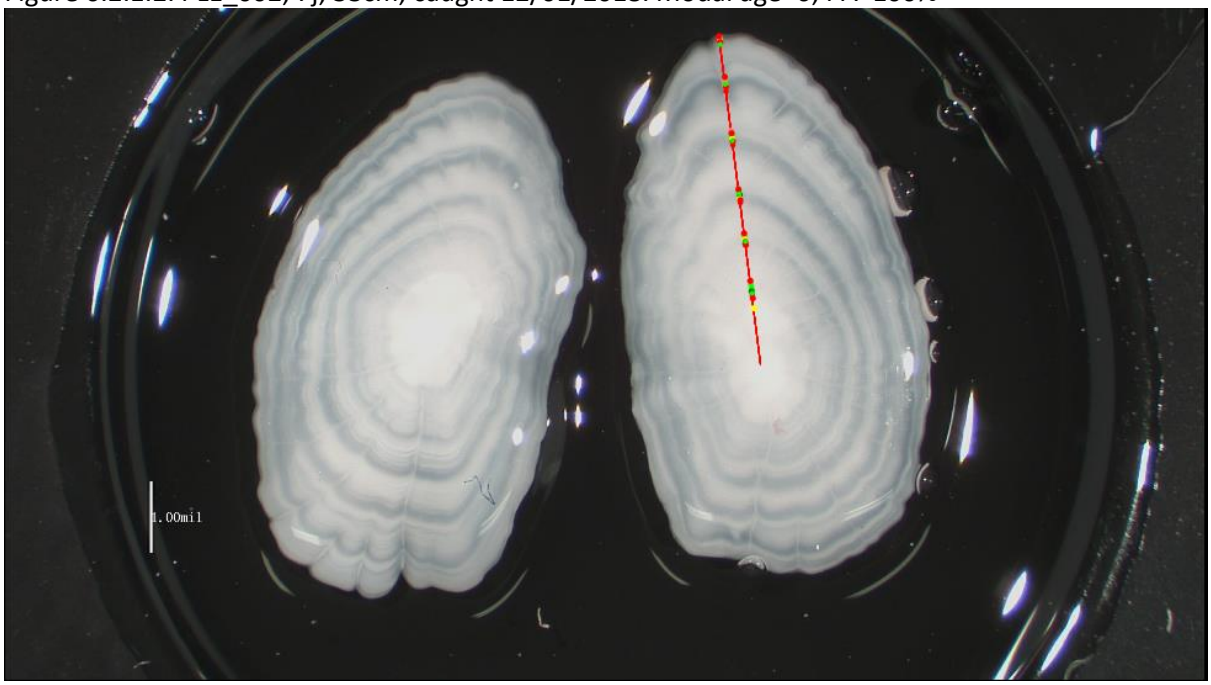


Figure 6.2.1.3. PLE_138; 7j; 45cm; caught 01/09/2018. Modal age=8; PA=100%

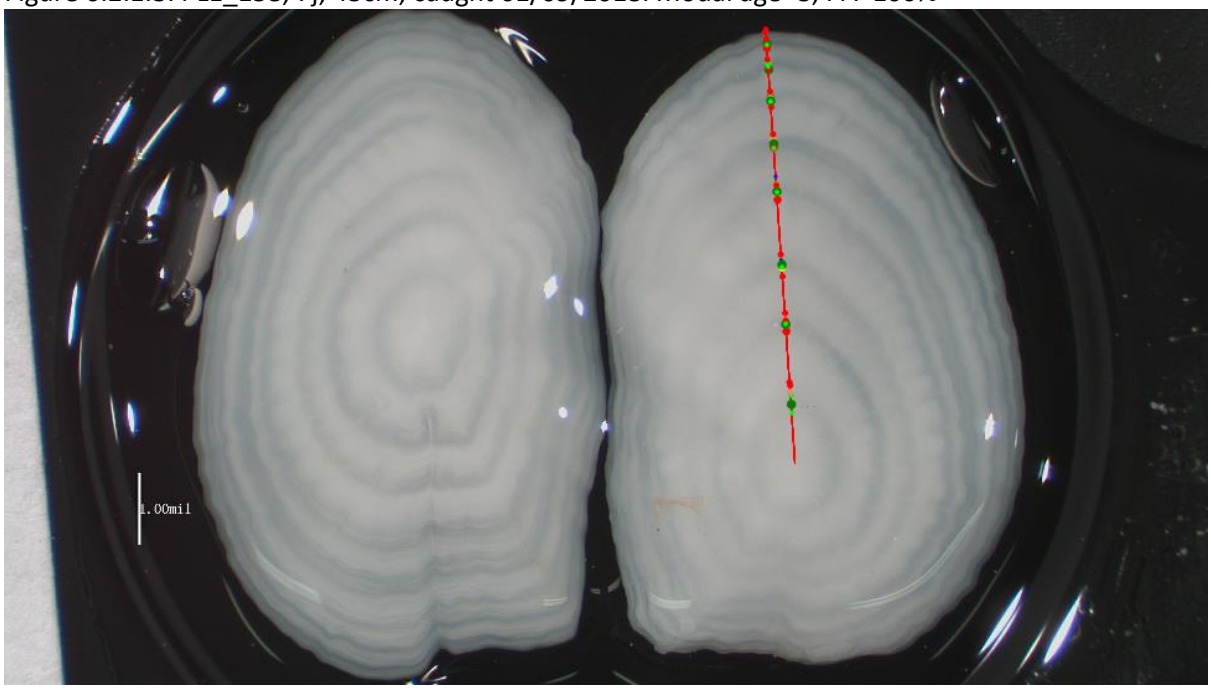
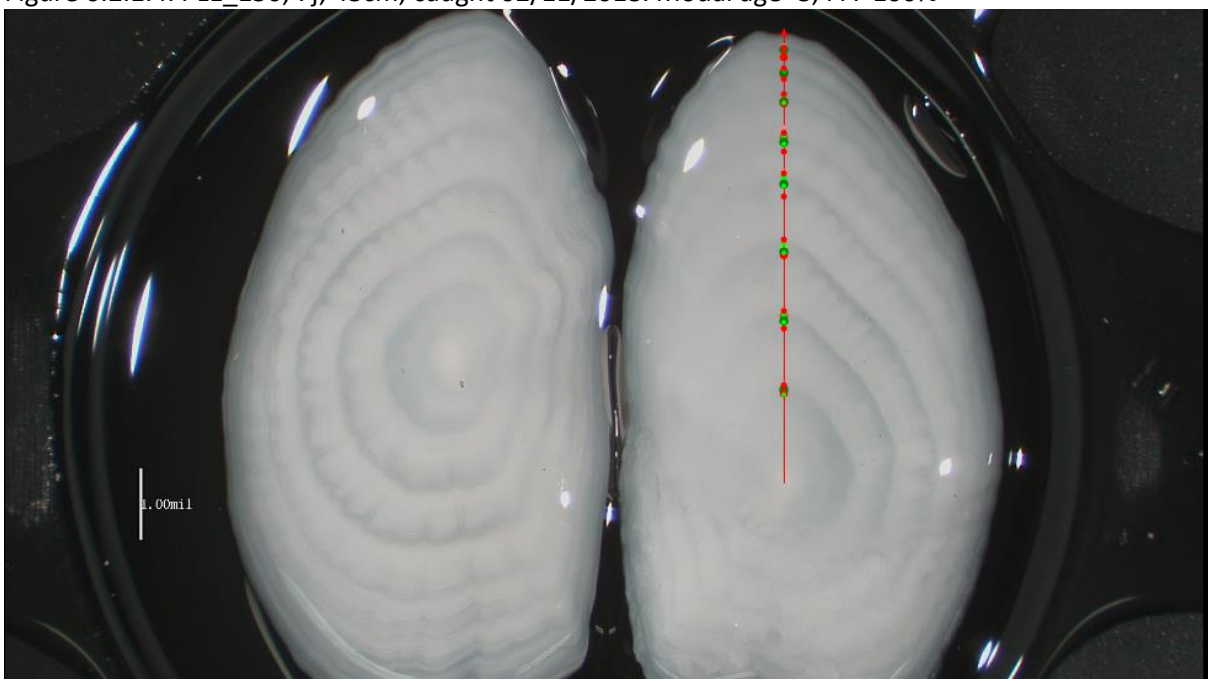


Figure 6.2.1.4. PLE_150; 7j; 43cm; caught 02/11/2018. Modal age=8; PA=100%



6.2.2 First annuli

Figure 6.2.2.1. PLE_077; 7j; 19cm; Male; caught 13/02/2018. Modal age=2; PA=60%. Two translucent zones close together should be counted as first annulus.

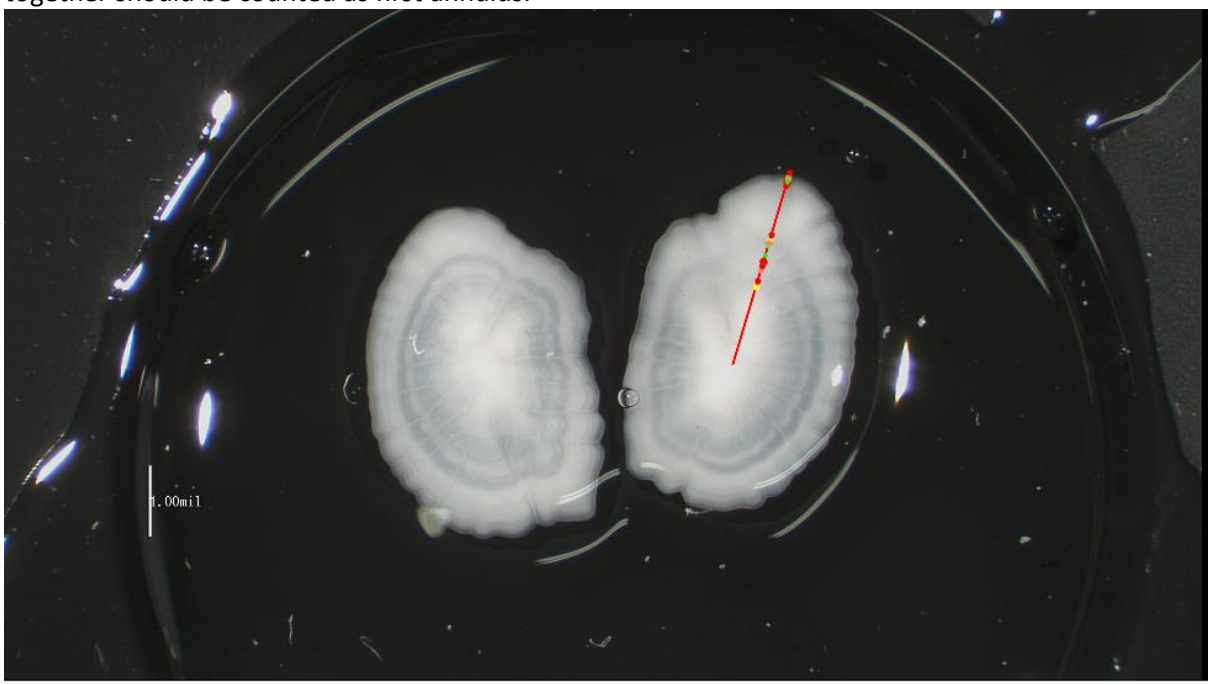


Figure 6.2.2.2. PLE_083; 7j; 19cm; Male; caught 15/03/2018. Modal age=2; PA=60%. Two translucent zones close together should be counted as first annulus.

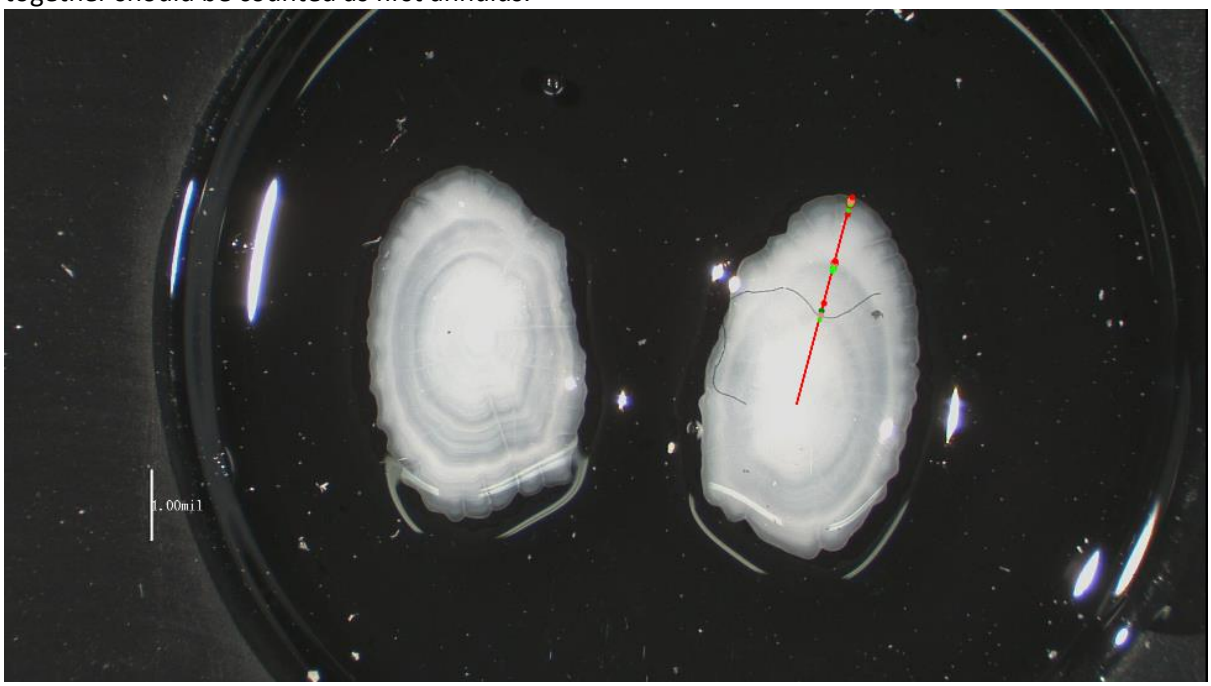


Figure 6.2.2.3. PLE_168; 7j; 25cm; Male; caught 22/11/2018. Modal age=1; PA=50%. Age range 1-3. Diffuse first annulus with two translucent rings close together. As fish caught late in q4 the last translucent zone should not be counted.

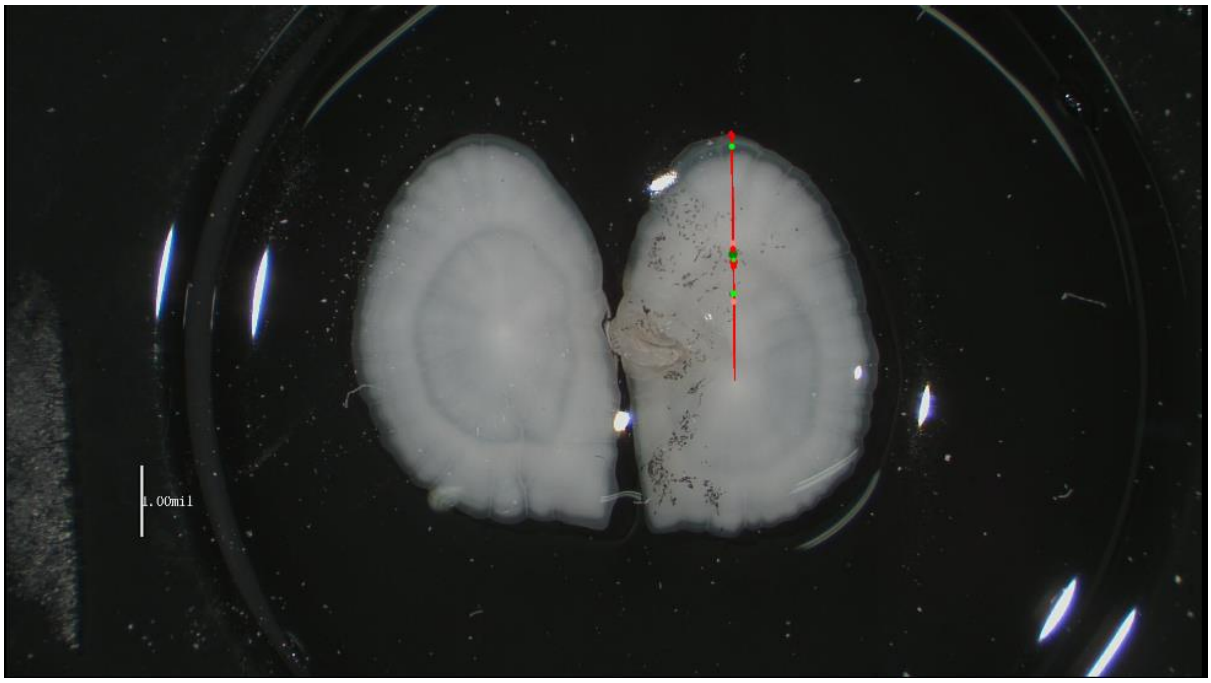


Figure 6.2.2.4. PLE_170; 7j; 21cm; Male; caught 22/11/2018. Modal age=1; PA=60%. Two translucent zones close together should be counted as first annulus.

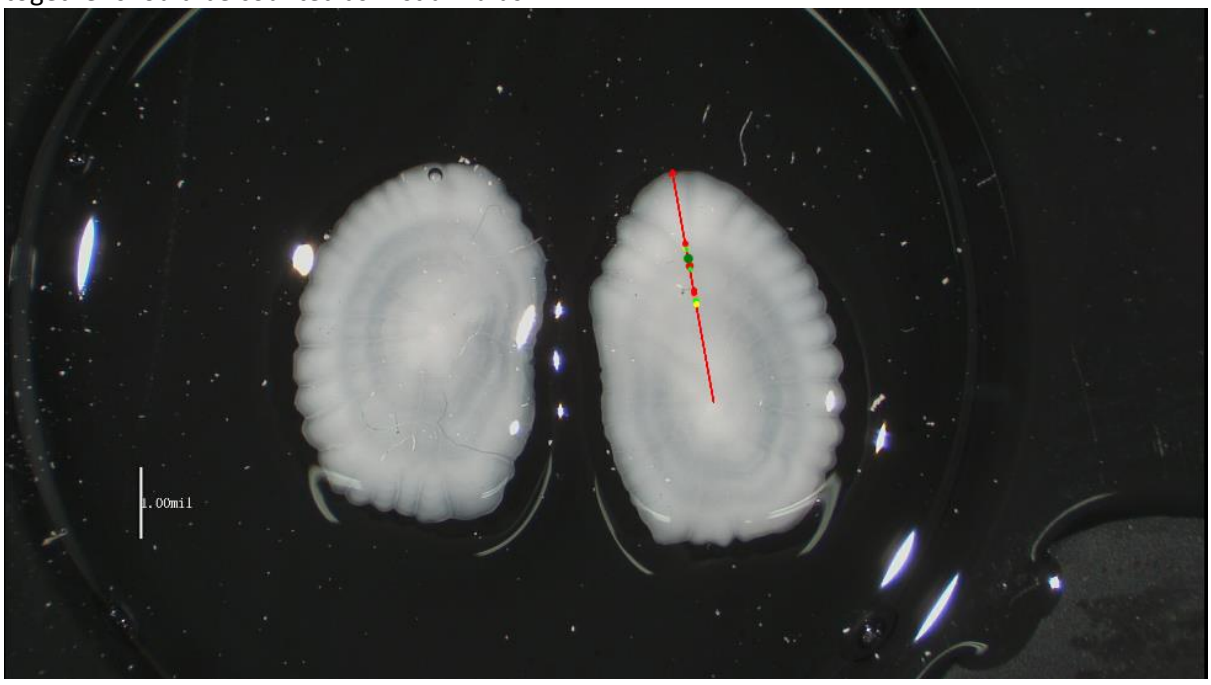


Figure 6.2.2.5. PLE_160; 7j; 29cm; Female; caught 22/11/2018. Modal age=2; PA=50%. Two translucent zones close together should be counted as first annulus.

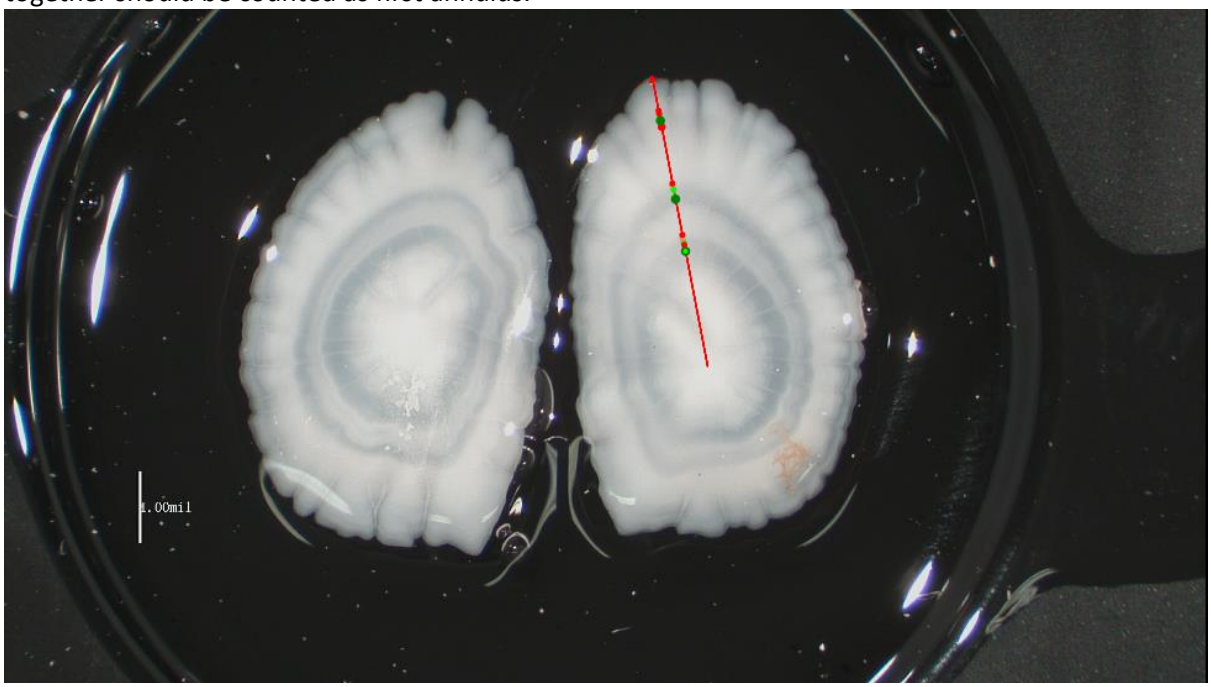


Figure 6.2.2.6. PLE_178; 7h; 45cm; Female; caught 19/11/2016. Modal age=6; PA=50%. Age range 5-6. Interpretation differences were caused by size of first translucent ring: some readers counted it as first annulus. Furthermore as the edge of right otolith is opaque some readers included the last winter ring in age determination.

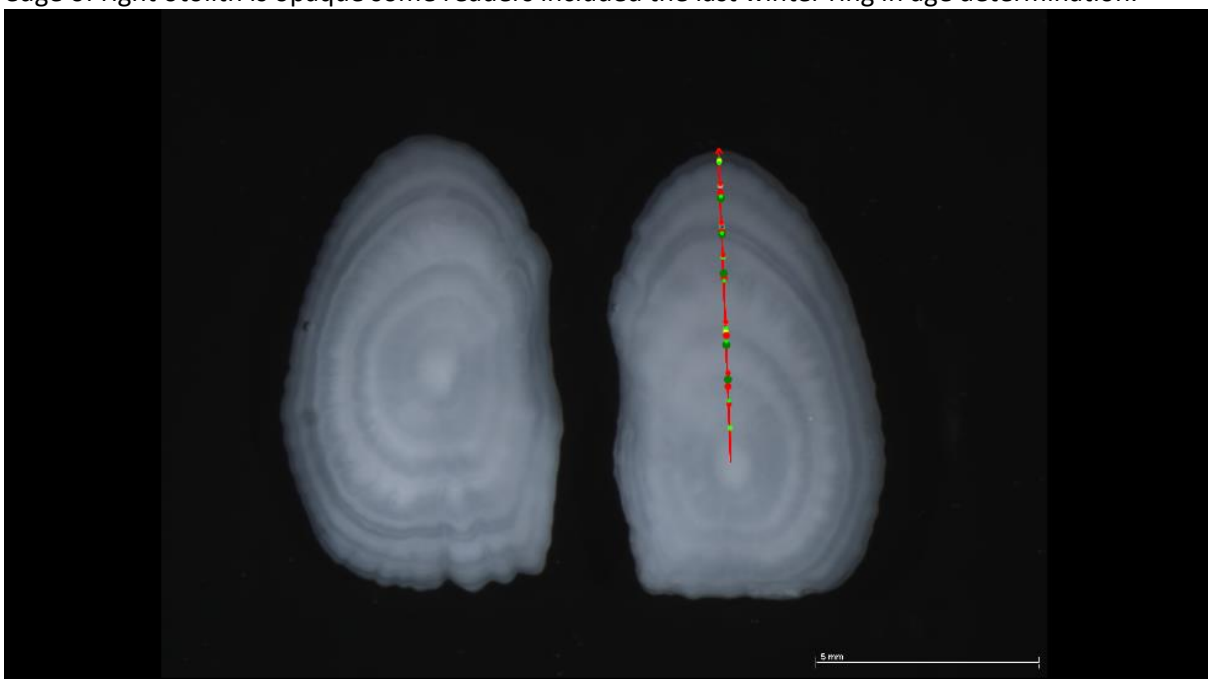


Figure 6.2.2.7. PLE_026; 7j; 38cm; caught 20/02/2018. Modal age=9; PA=50%. Age range 7-10. Main difference in age determination was including or excluding first small translucent zone.

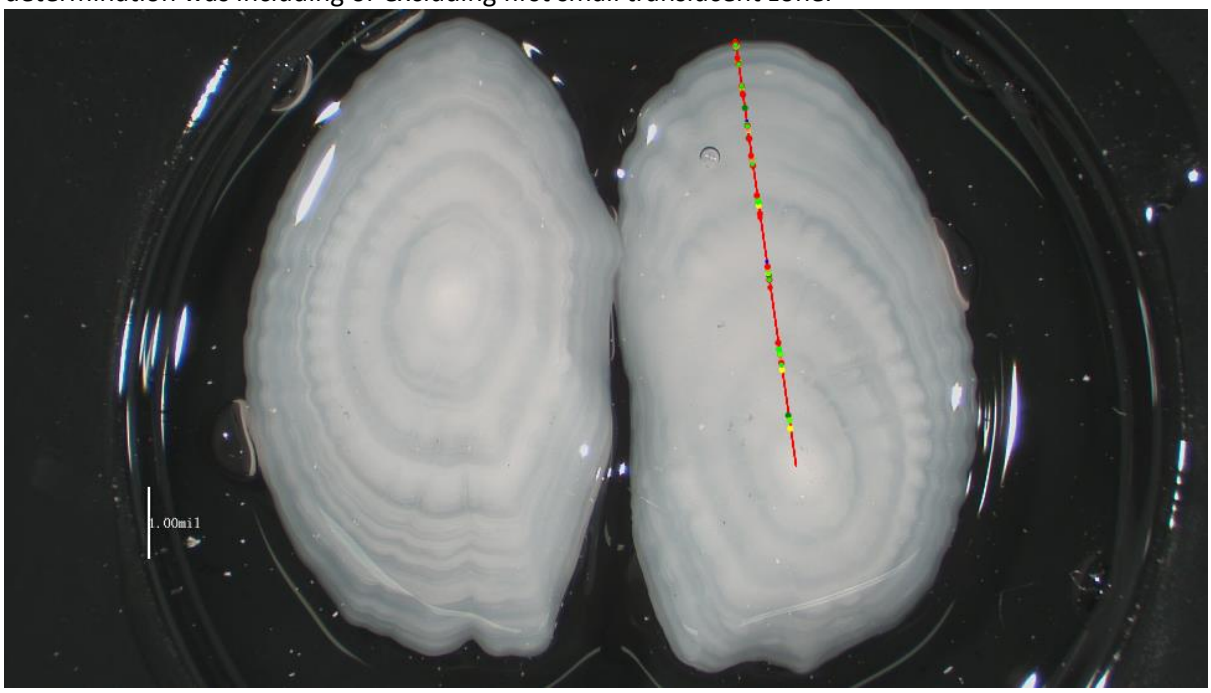
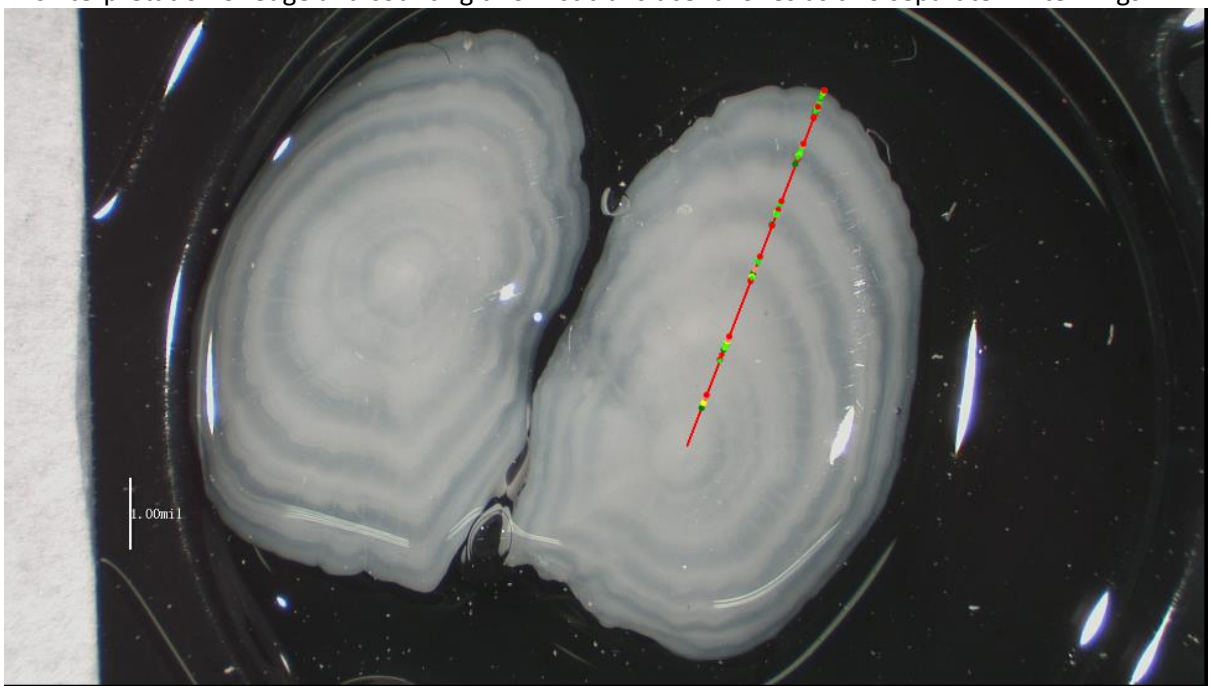


Figure 6.2.2.8. PLE_052; 7j; 33cm; caught 23/03/2018. Modal age=6; PA=40%. Age range 5-7. Low PA achieved due to misinterpretation of edge and counting two first translucent zones as two separate winter rings.



6.2.3 Irregular growth otoliths: splits/double rings

Figure 6.2.3.1. PLE_159; 7j; 27cm; Female; caught 22/11/2018. Modal age=2; PA=50%. Otoliths with irregular growth. Translucent zones 2nd and 3rd close together. Half readers interpreted as split and another half as 2 separate winter rings.

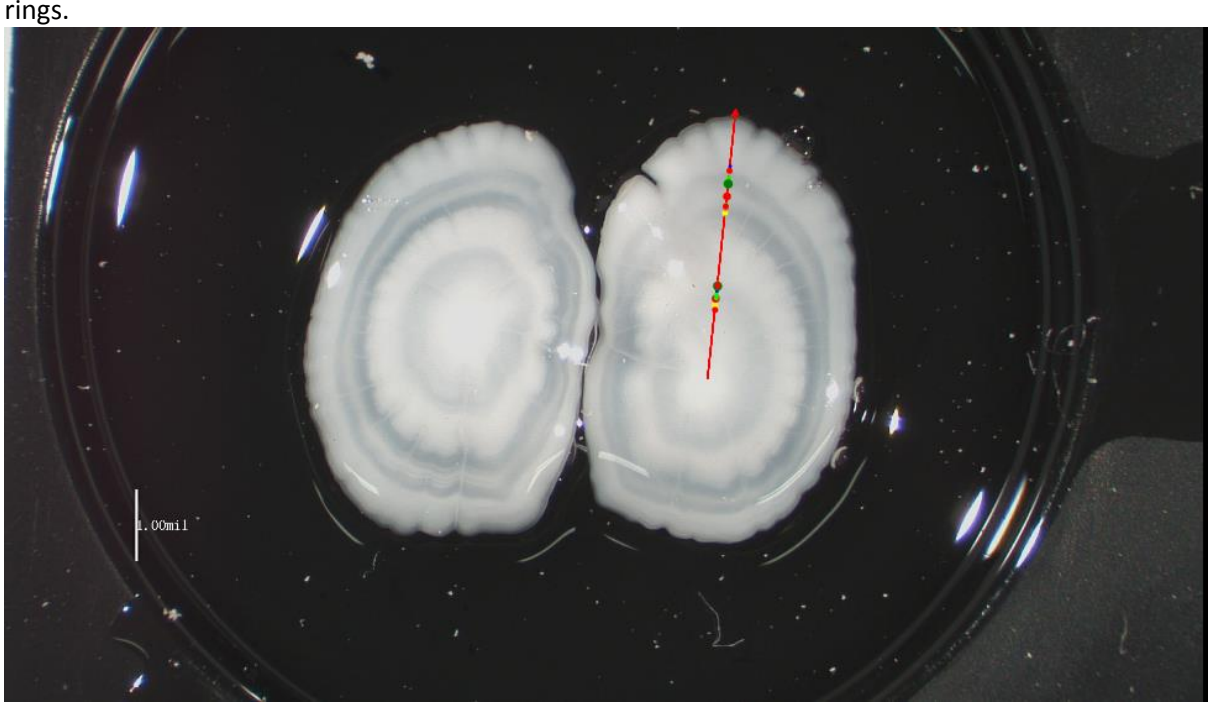


Figure 6.2.3.2. PLE_029; 7j; 36cm; caught 23/02/2018. Modal age=5; PA=50%. Age range 4-6. Two possible splits: a) first annulus might consist of two translucent zones; b) translucent zones 4 and 5 as more prominent split. True age might be close to 4.

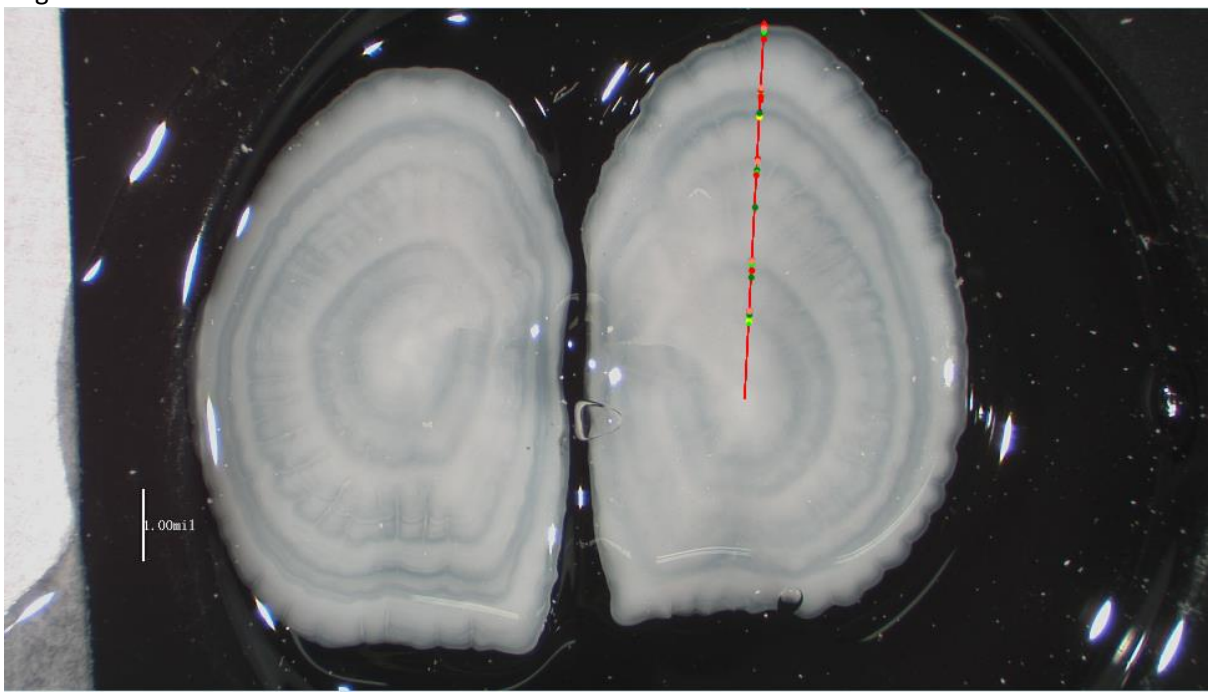


Figure 6.2.3.3. PLE_035; 7j; 39cm; caught 23/02/2018. Modal age=6; PA=60%. Translucent zones 2 and 3 close together and represent split. Some readers interpreted as 2 separate annuli.

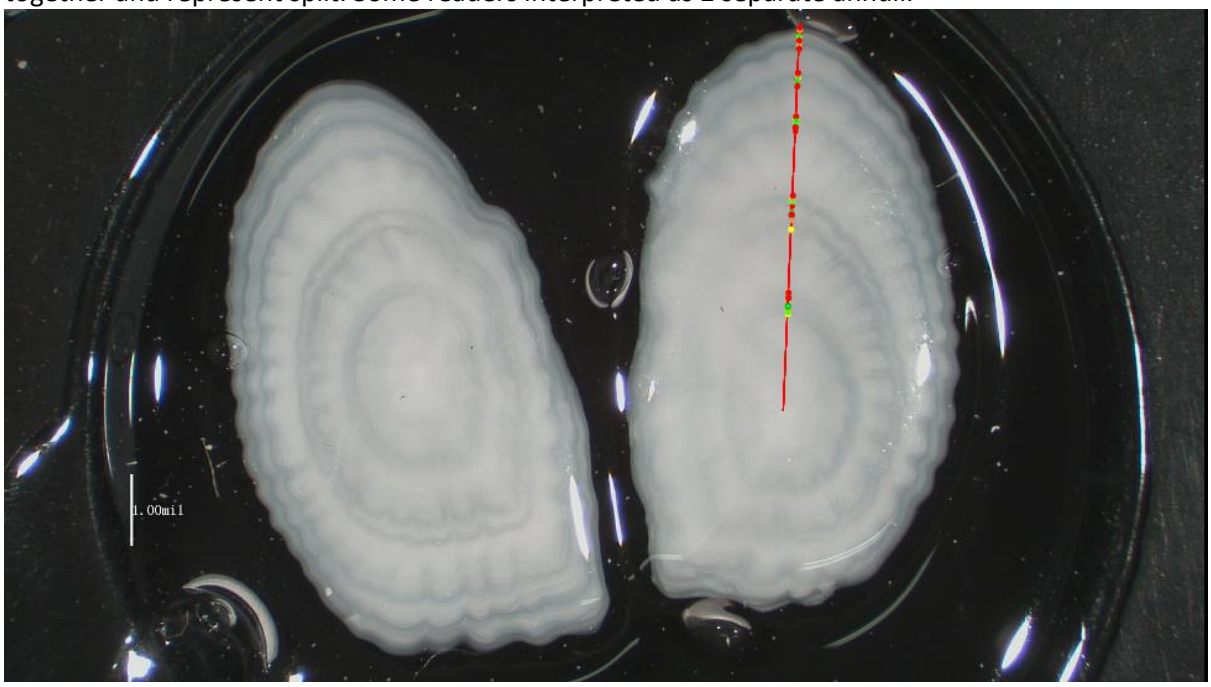


Figure 6.2.3.4. PLE_071; 7j; 31cm; Female; caught 17/03/2018. Modal age=4; PA=50%. Second last weak translucent zone either included or omitted in age determination.

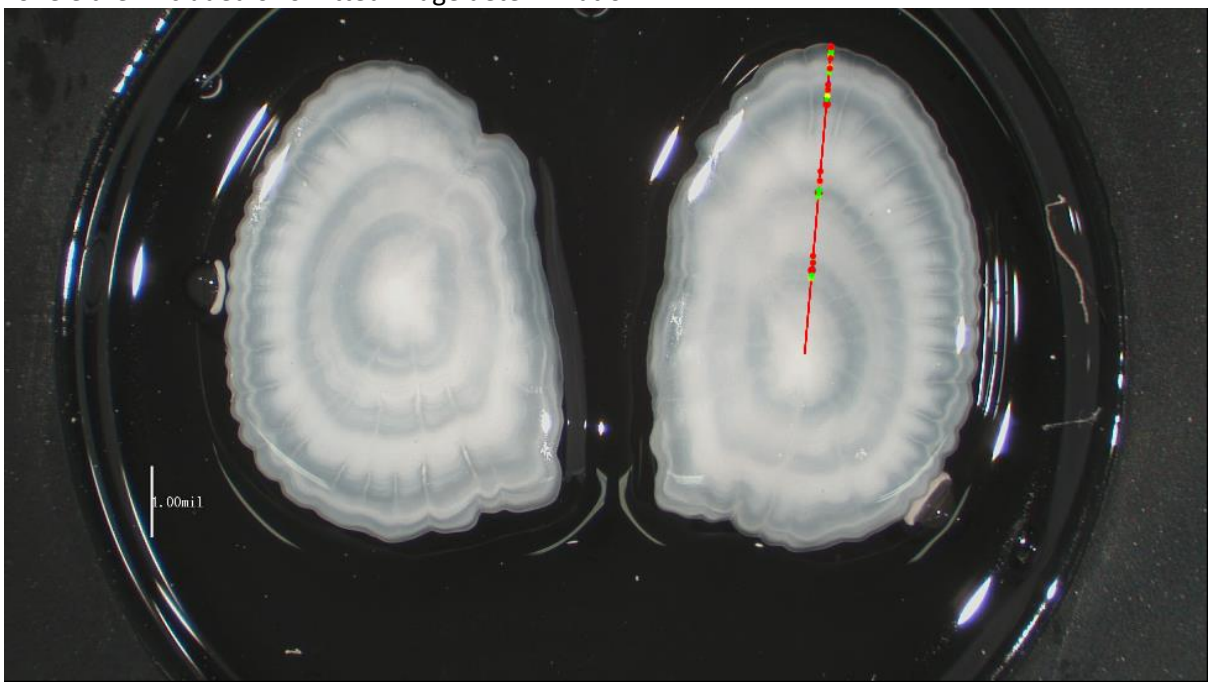


Figure 6.2.3.5. PLE_020; 7j; 40cm; caught 09/02/2018. Modal age=6; PA=67%. Age range 5-7. Translucent zones 2,3 and 4 caused confusion. Most readers interpreted zones 2&3 as split.

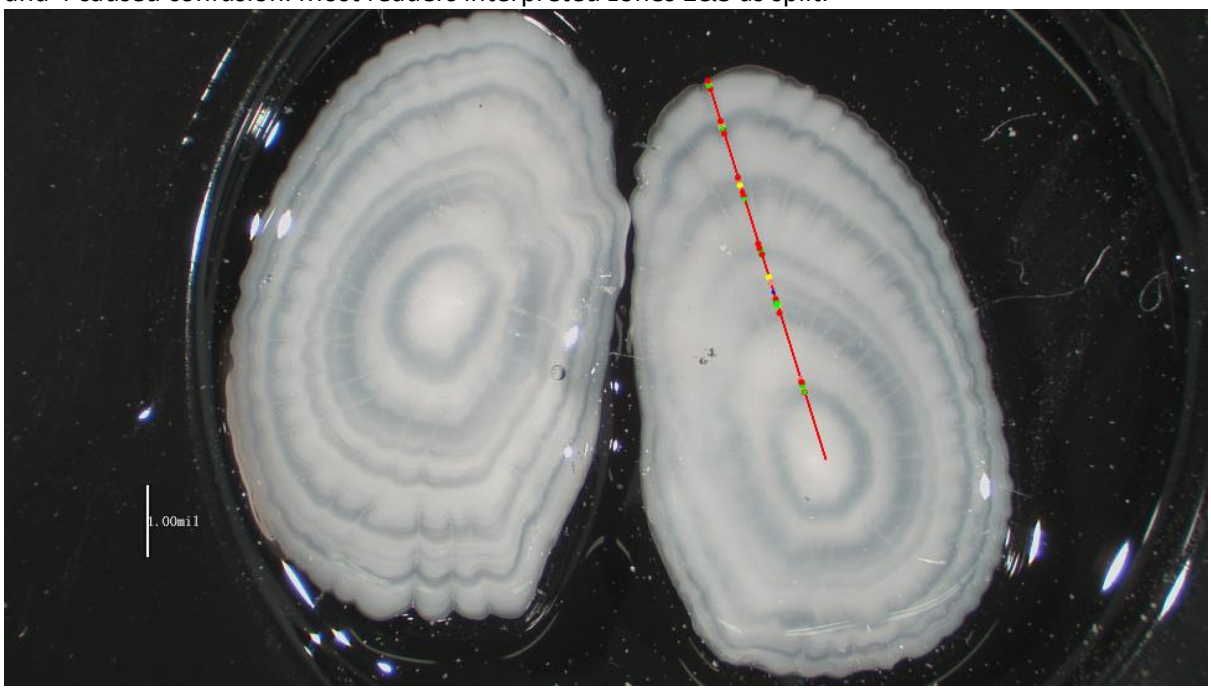


Figure 6.2.3.6. PLE_012; 7j; 36cm; caught 31/01/2018. Modal age=5; PA=80%. Example of double rings: splits repeated each year.

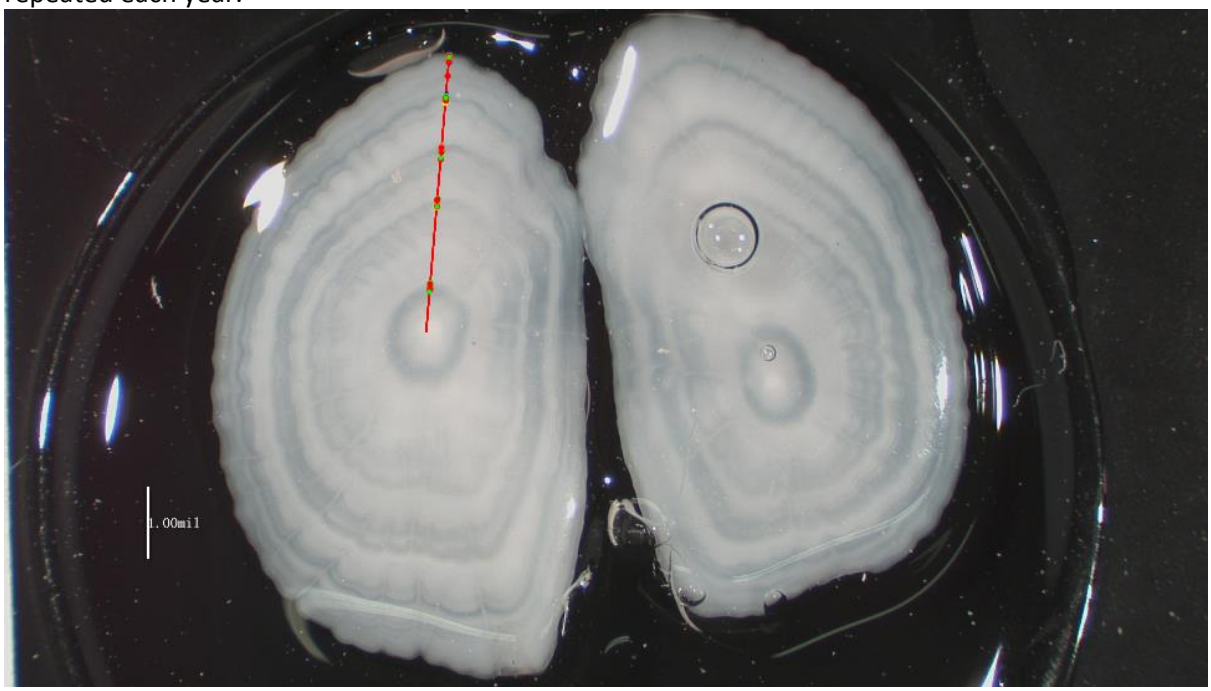


Figure 6.2.3.7. PLE_122; 7j; 33cm; Female; caught 17/08/2018. Modal age 4; PA=60%. Most age readers interpreted last annulus as split.

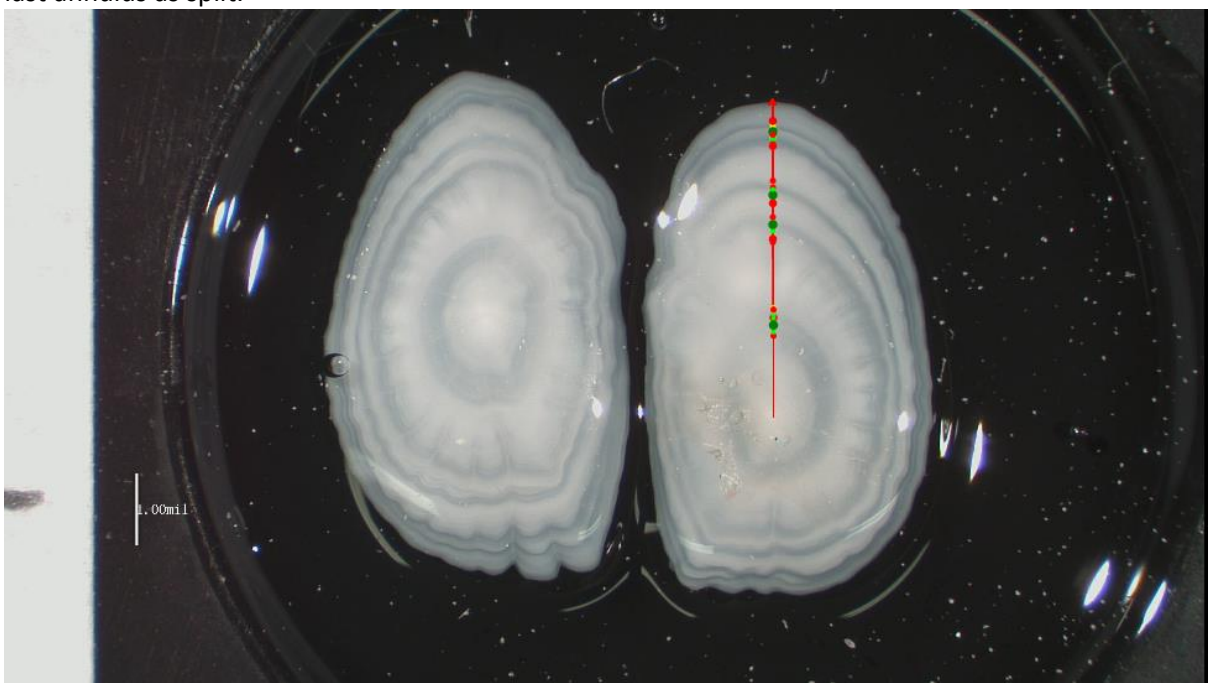


Figure 6.2.3.8. PLE_137; 7j; 32cm; Female; caught 07/09/2018. Modal age=3; PA=50%. Last winter ring split. Clear 3 years old on left otolith.

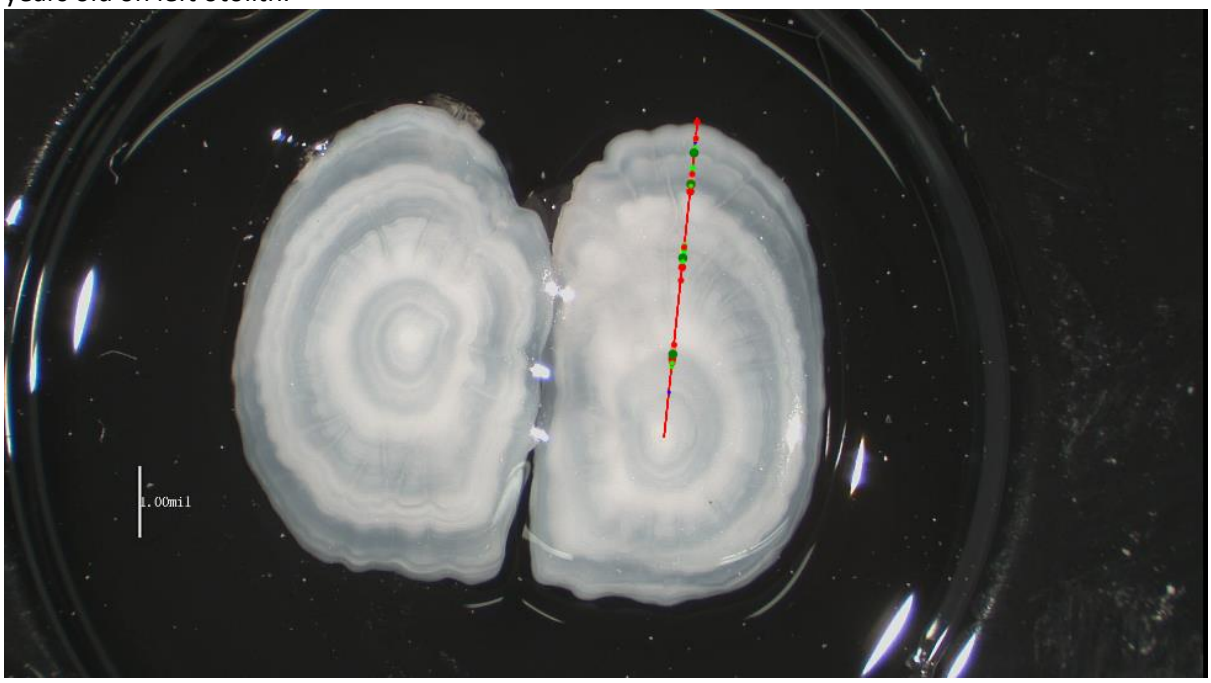


Figure 6.2.3.9. PLE_147; 7j; 36cm; caught 26/10/2018. Modal age=8; PA=30%. Age range 6-9. Difficult otolith with AQ2 readability. First 3 translucent zones caused confusion among readers.

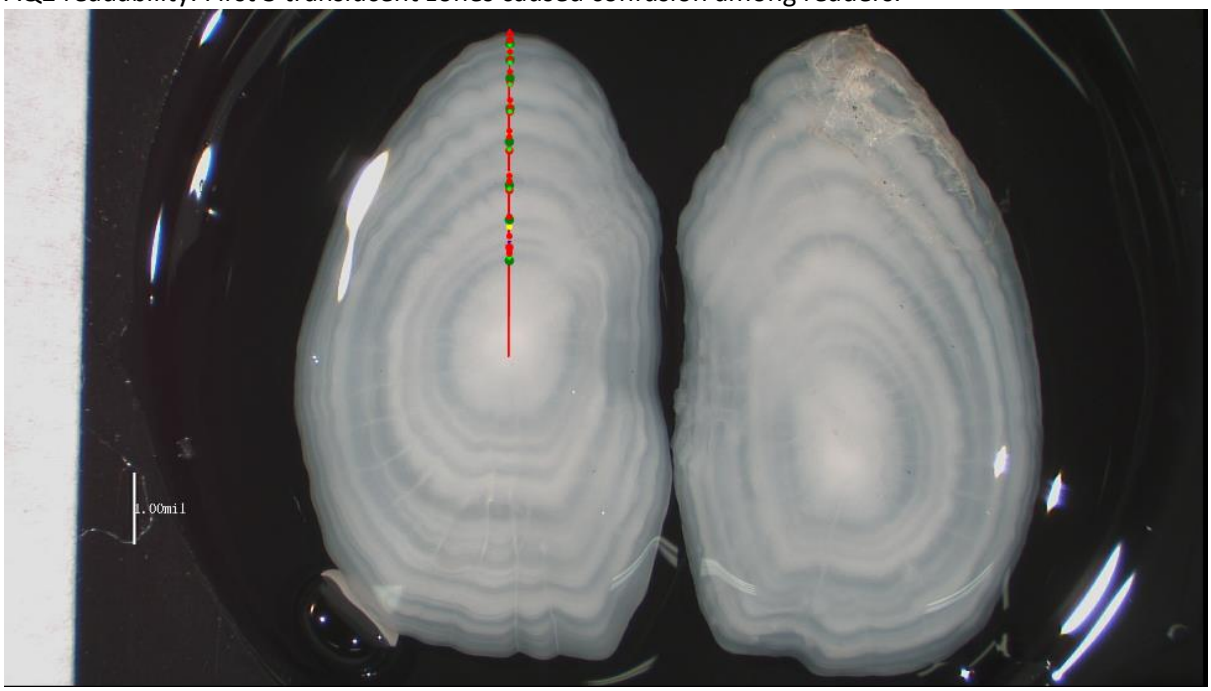


Figure 6.2.3.10. PLE_151; 7j; 41cm; Female; caught 02/11/2018. Modal age=9; PA=50%. Age range 8-10. Splits causing age misinterpretation on right otolith. Left otolith easier to read.

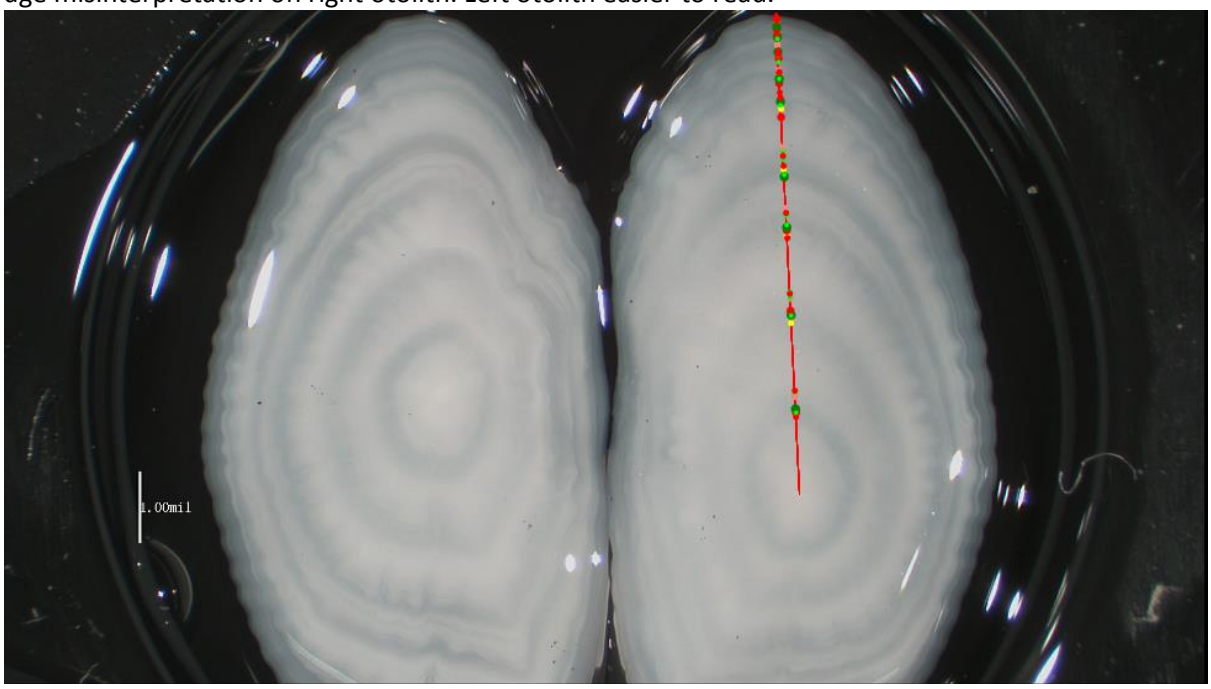


Figure 6.2.3.11. PLE_153; 7j; 42cm; Female; caught 27/11/2018. Modal age=8; PA=50%. Age range 8-11. Otolith with repeated splits. Modal age confirmed on left otolith: both anterior and posterior axis.

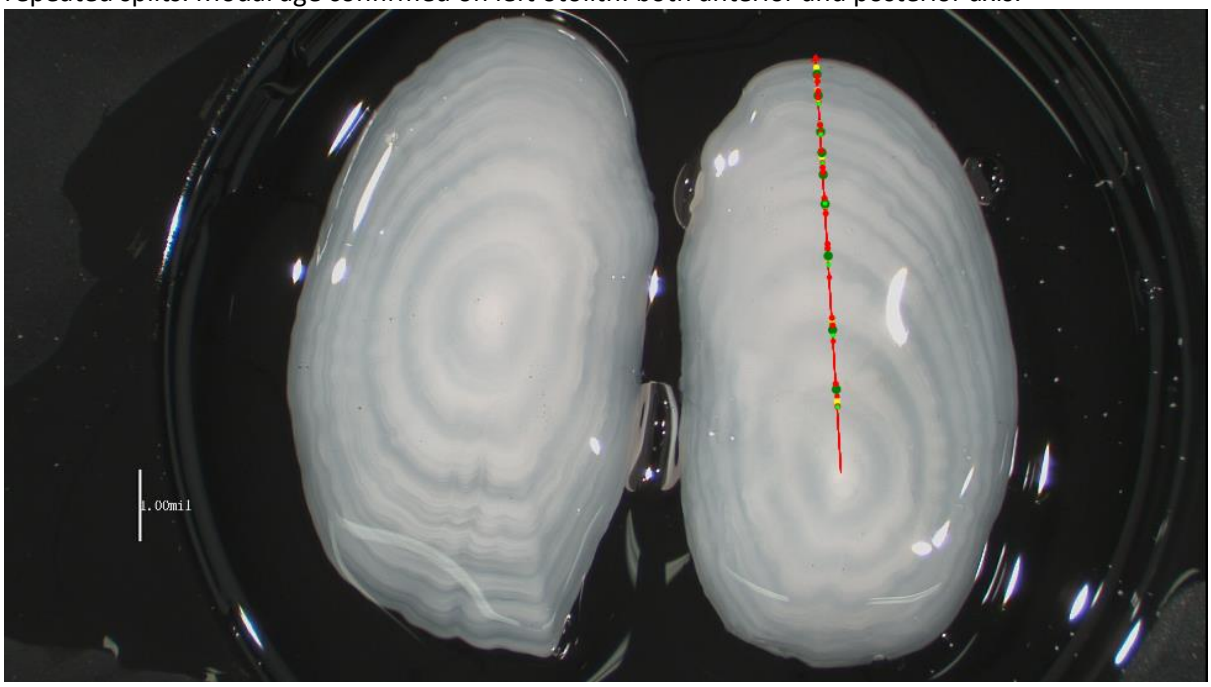


Figure 6.2.3.12. PLE_186; 7h; 27cm; Female; caught 25/11/2016. Modal age=3; PA=50%. Age range 3-5. Splits shown in first and second annuli.

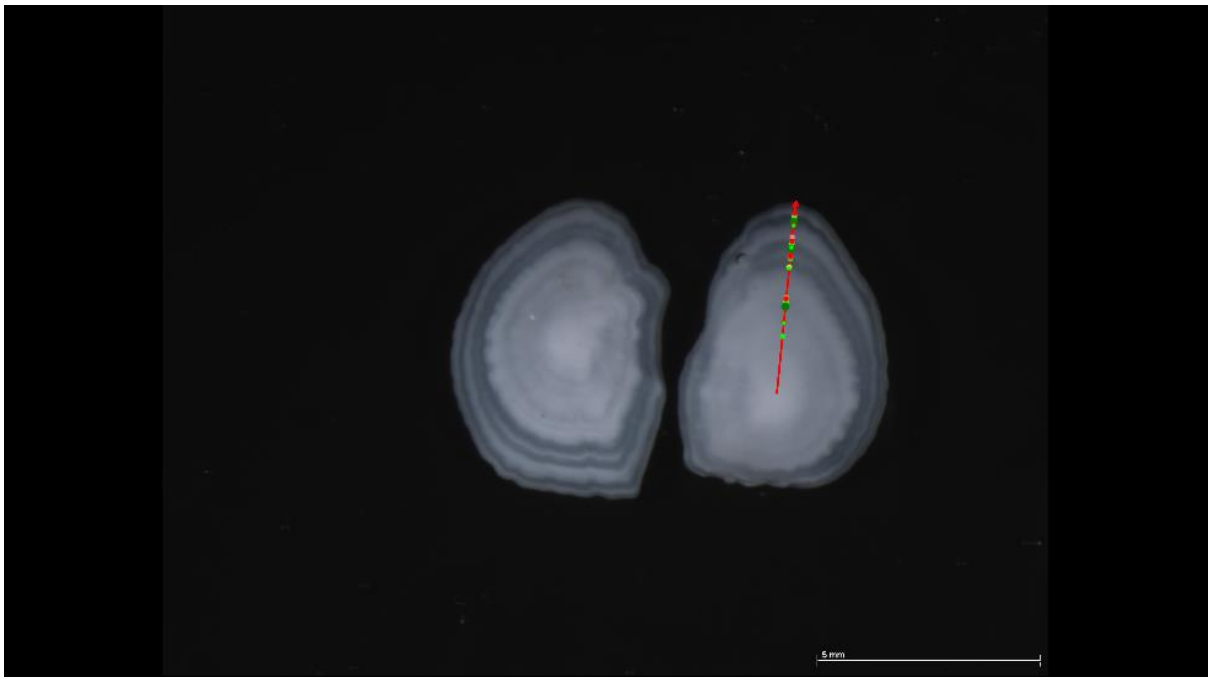
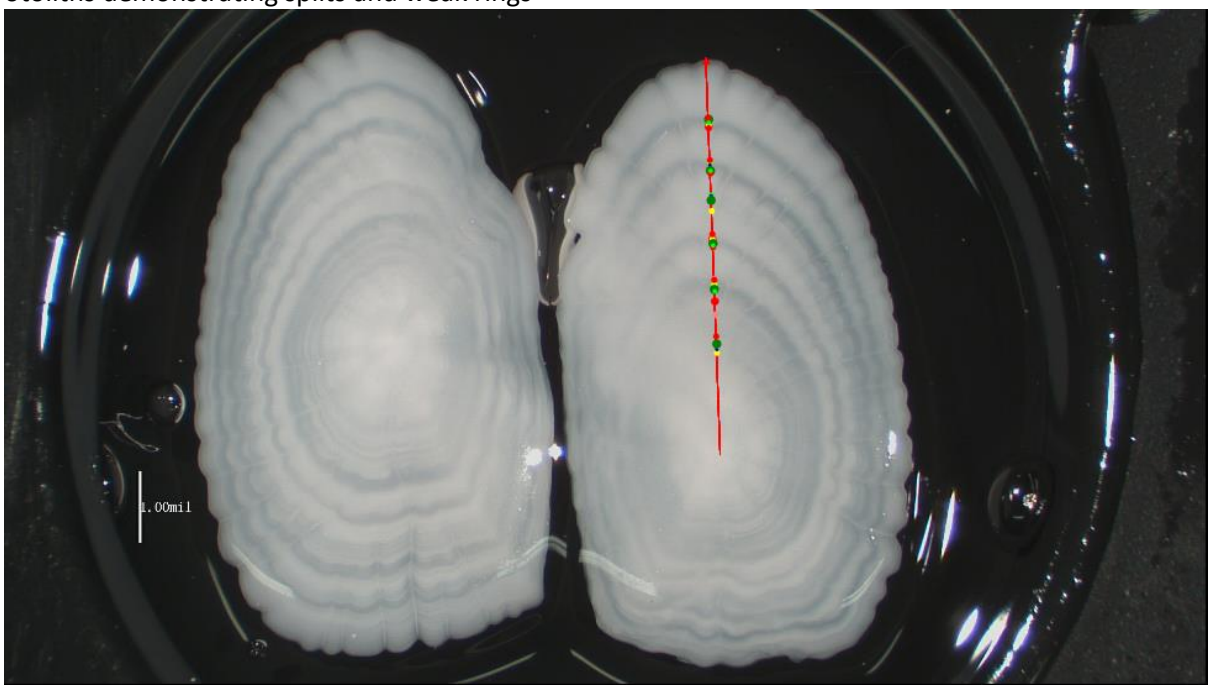


Figure 6.2.3.13. PLE_165; 7j; 37cm; Female; caught 26/11/2018. Modal age=4; PA=50%. Age range 4-6. Difficult otoliths demonstrating splits and weak rings



6.2.4 Q3 edge interpretation

Figure 6.2.4.1. PLE_087; 7j; 28cm; caught 05/07/2018. Modal age=3; PA=60%. Early q3 otolith. Translucent zone close to the edge visible. Some readers discounted this last translucent zone even though fish would have another 6 months to grow till the end of the year.

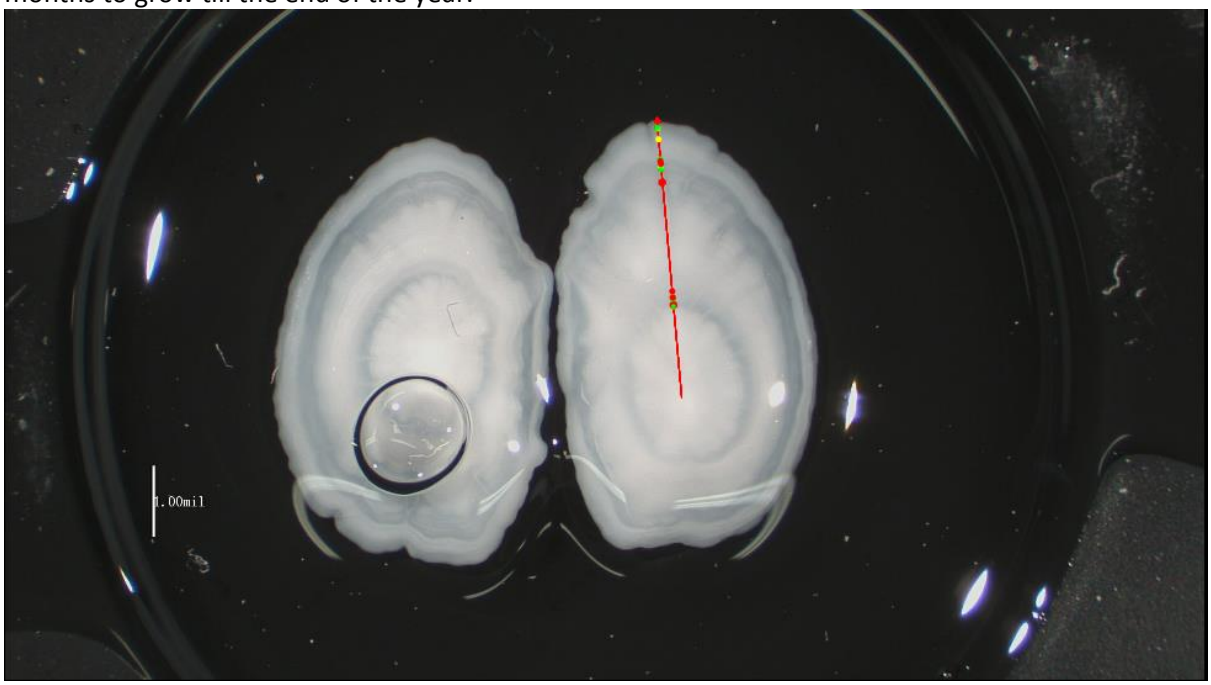


Figure 6.2.4.2. PLE_092; 7j; 44cm; caught 10/07/2018. Modal age 9; PA=60%. Last translucent zone discounted by some readers despite large size fish and early in q3 time of capture. Translucent zone is followed by opaque growth as shown in Figure 6.2.4.2a. As per interpretation guidelines older fish lay down opaque layer later in the season.

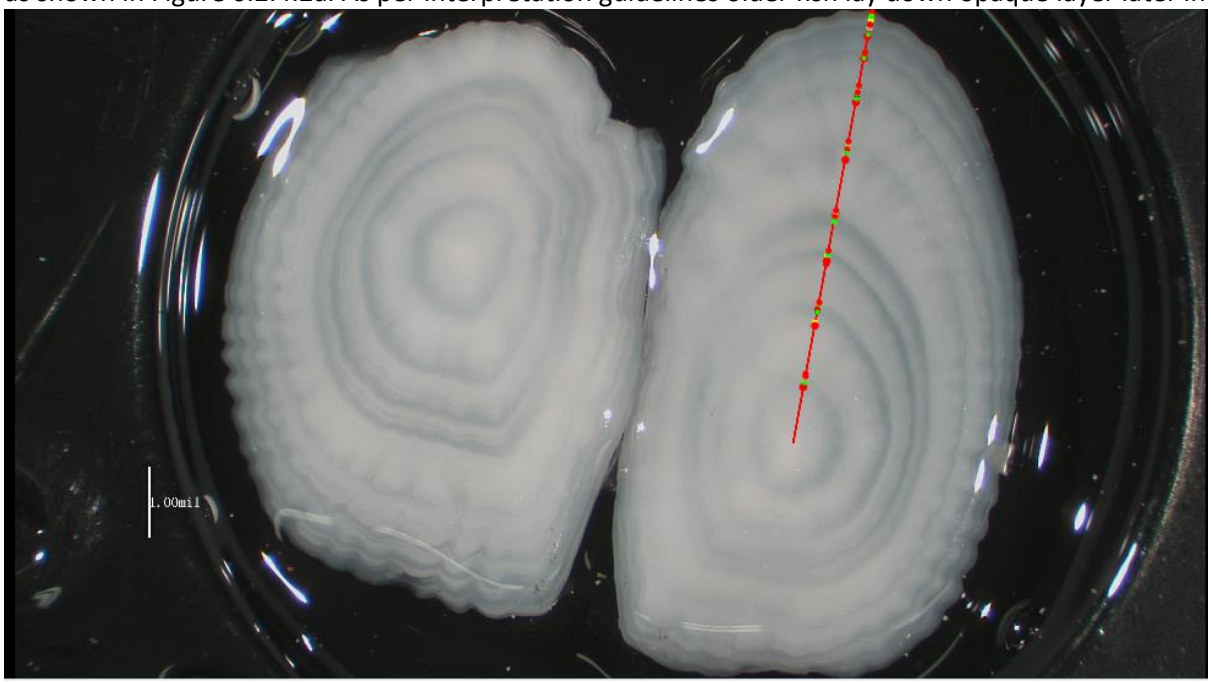


Figure 6.2.4.2a. Translucent zone followed by opaque growth –early q3 otolith.

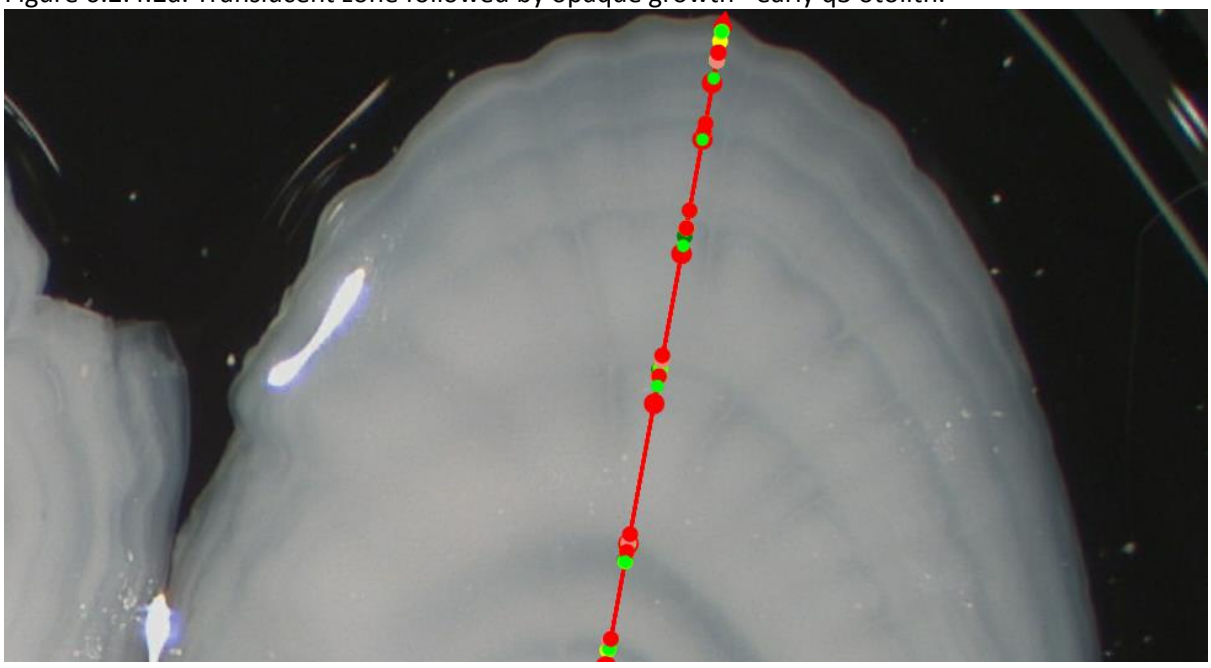


Figure 6.2.4.3. PLE_097; 7j; 41cm; caught 10/07/2019. Modal age= 5; PA=40%.Age range 3-5. In addition to possible split issue many readers applied n-1 rule and discounted last translucent zone despite there is opaque growth at the edge: Figure 6.2.4.3a. Fish was caught early in q3 and would grow for another 6 months till 1st of January.

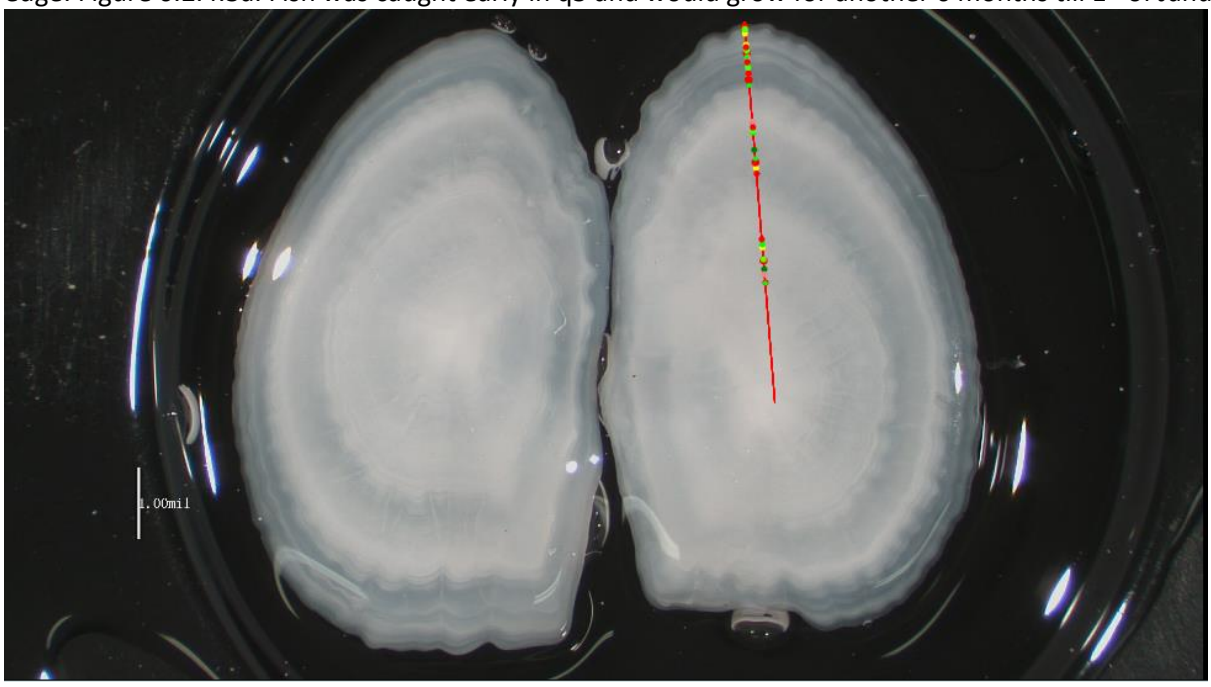


Figure 6.2.4.3. Opaque growth following translucent zone at the edge of early q3 otolith.

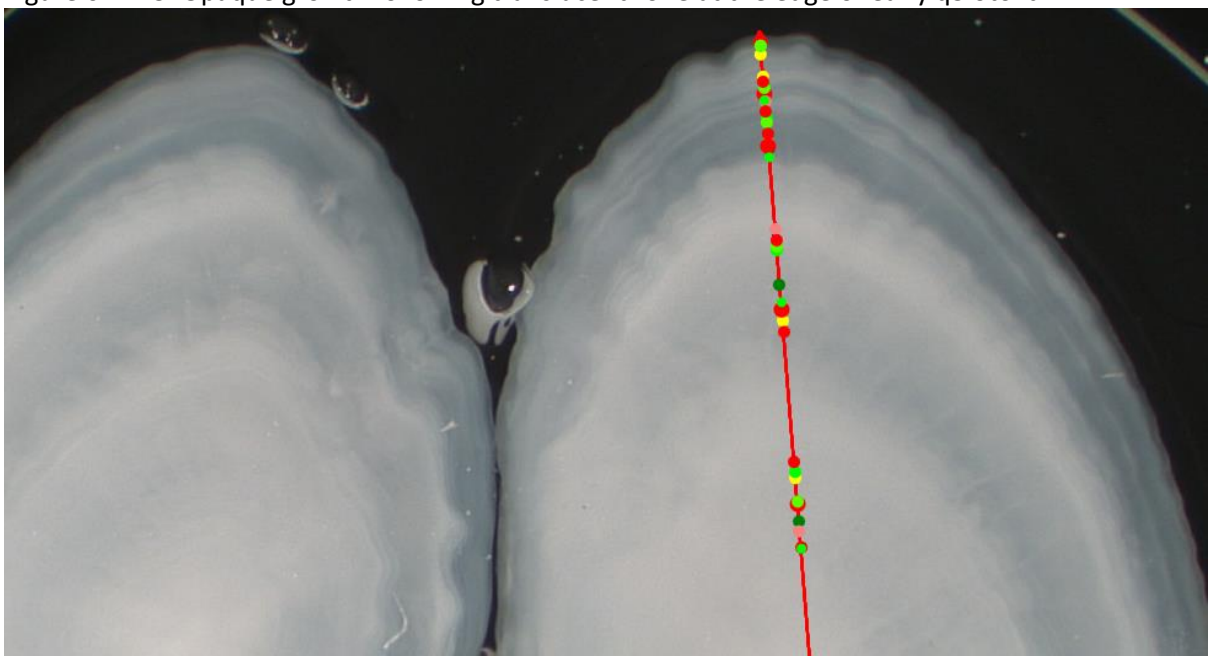


Figure 6.2.4.4. PLE_108; 7j; 49cm; caught 03/08/2018. Modal age=5; PA=50%. Some readers applied n-1 rule and discounted the last translucent zone despite the fact opaque edge formed at the edge-clearly visible on left otolith: Figure 6.2.4.4a

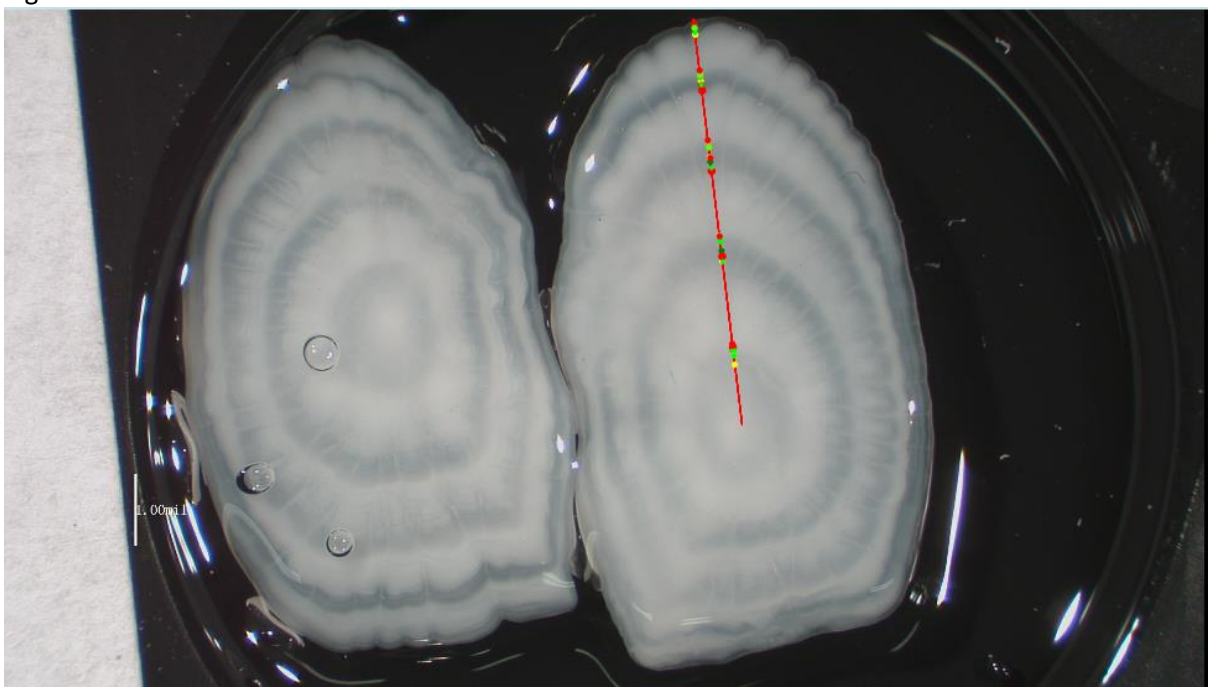
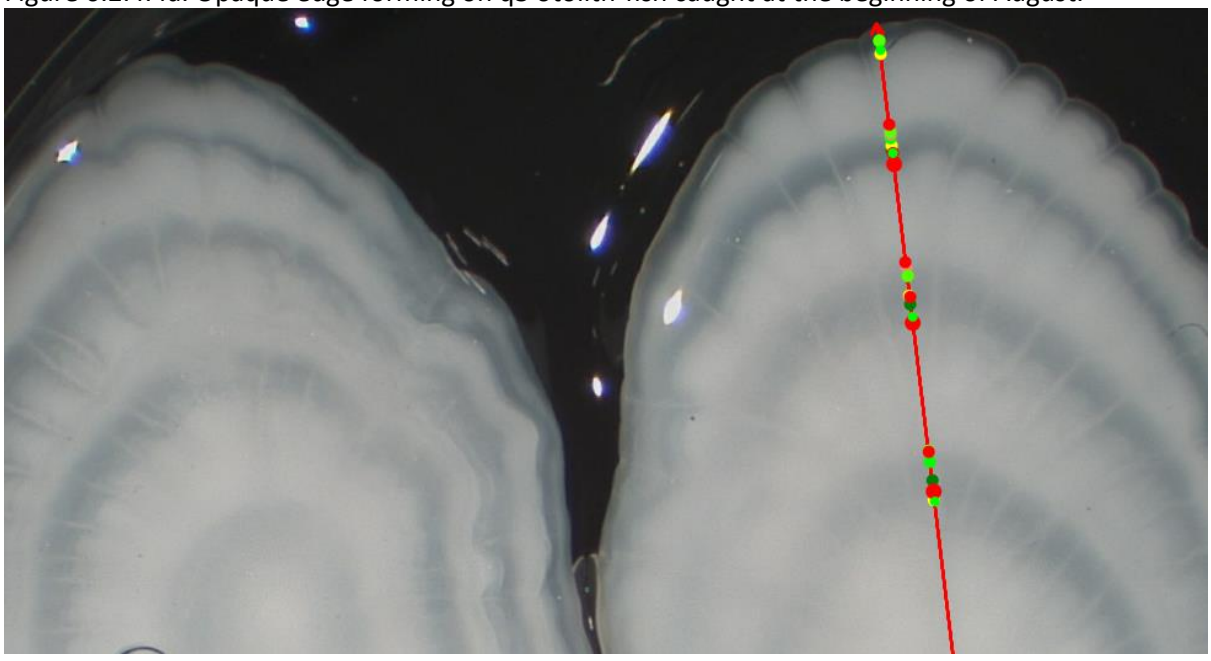


Figure 6.2.4.4a. Opaque edge forming on q3 otolith-fish caught at the beginning of August.



6.3 Images- sectioned otoliths age interpretation issues (ToR 3 and ToR 4)

6.3.1 Otoliths with 100% percentage agreement (PA)

Figure 6.3.1.1. PLE_213; 7h; 34cm; Female; caught 01/04/2018. Modal age=5; PA=100%

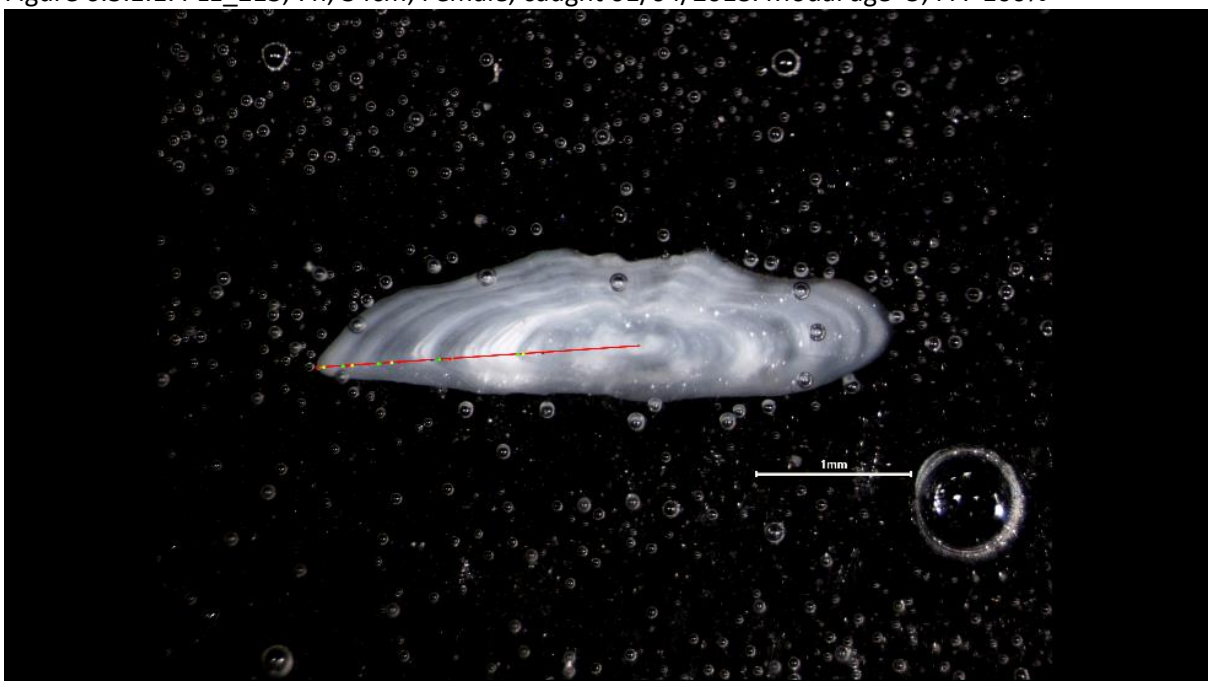
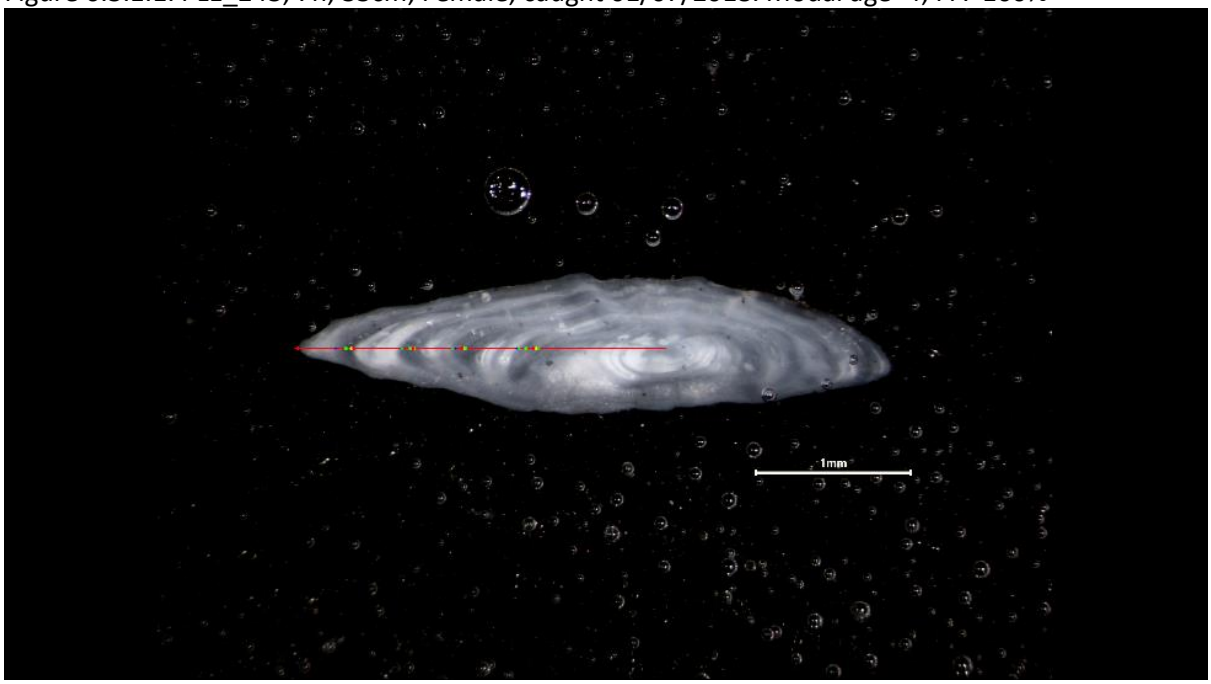


Figure 6.3.1.1. PLE_243; 7h; 33cm; Female; caught 01/07/2018. Modal age=4; PA=100%



6.3.2 Differences in ageing interpretation for sectioned otoliths

Figure 6.3.2.1. PLE_255; 7h; 30cm; Male; caught 01/07/2018. Modal age=2; PA=80%. One reader annotating 5 winter rings.

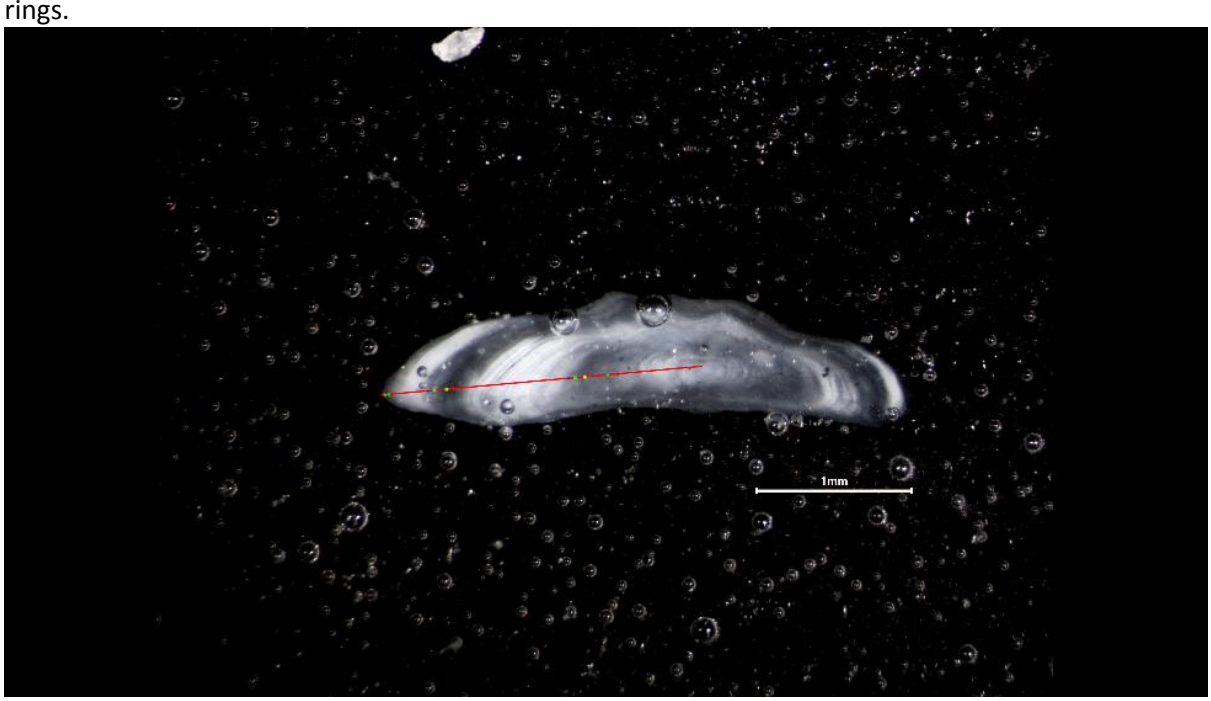


Figure 6.3.2.2. PLE_199; 7h; 42cm; Female; caught 01/04/2018. Modal age=5; PA=60%. Age range 5-8.

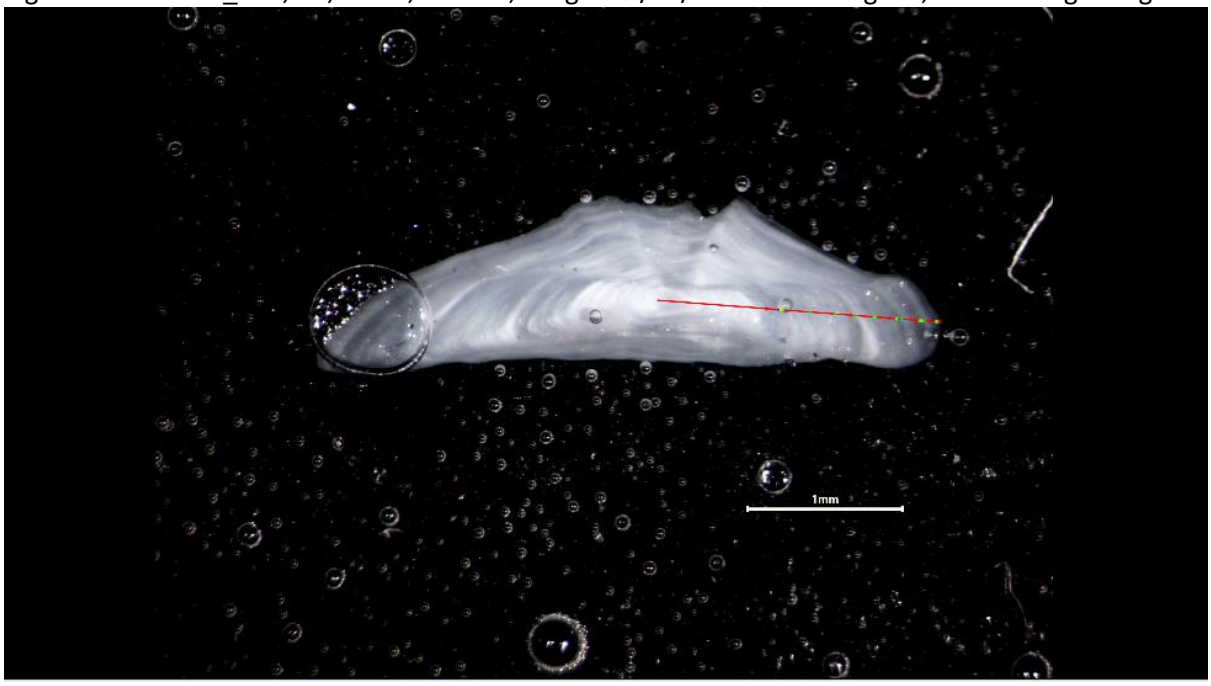


Figure 6.3.2.3. PLE_211; 7h; 33cm; Female; caught 01/04/2018. Modal age=5; PA=80%. One reader annotated 7 winter rings.

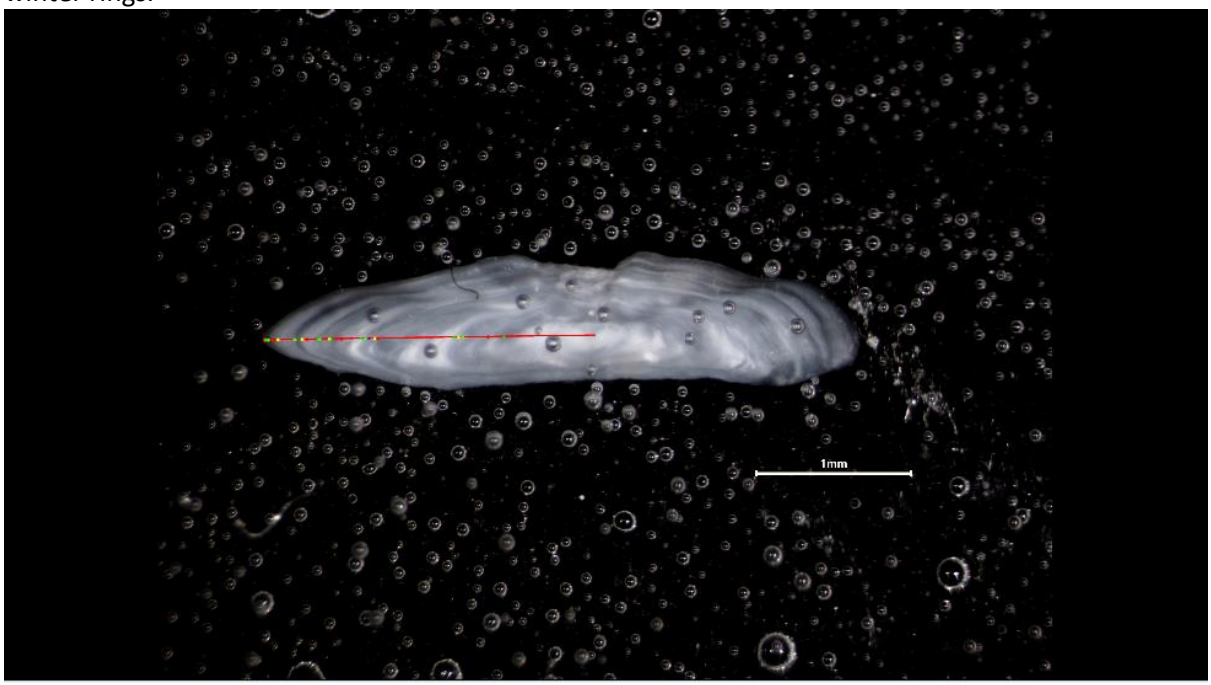


Figure 6.3.2.4. PLE_216; 7h; 37cm; Male; caught 01/04/2018. Modal age 5; PA=40%. One reader annotated as many as 13 winter rings.

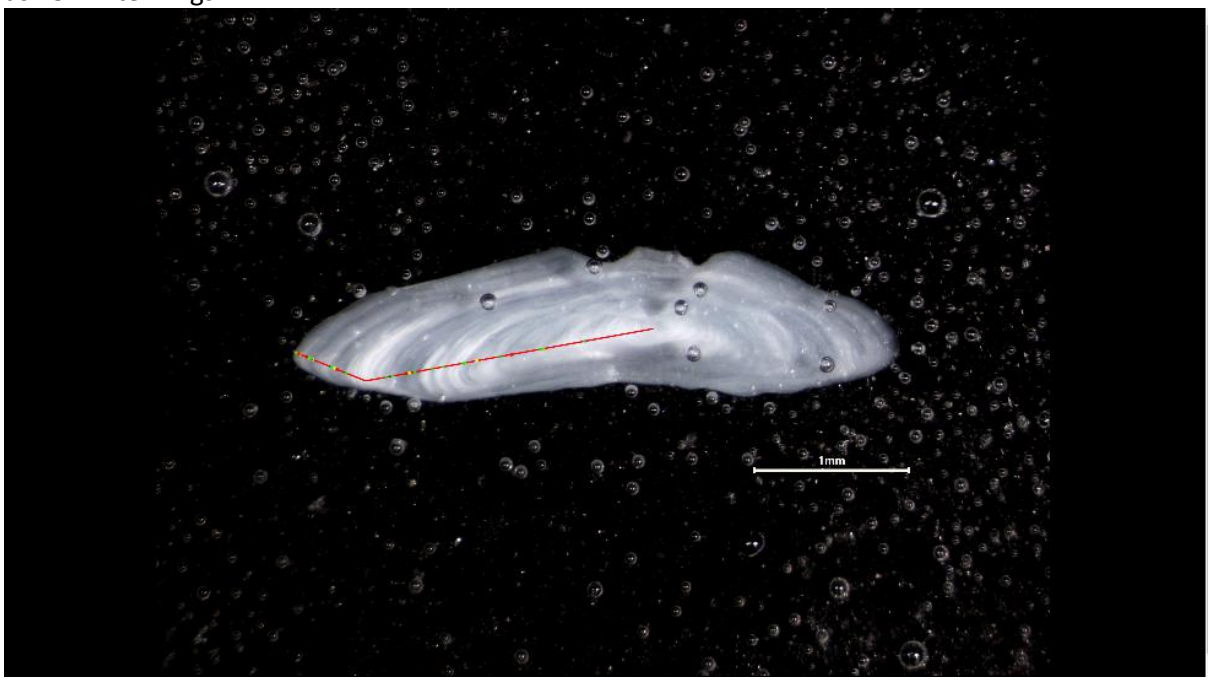


Figure 6.3.2.5. PLE_231; 7h; 42cm; Female; caught 01/07/2018. Modal age=6; PA=40%. One reader annotated 14 winter rings.

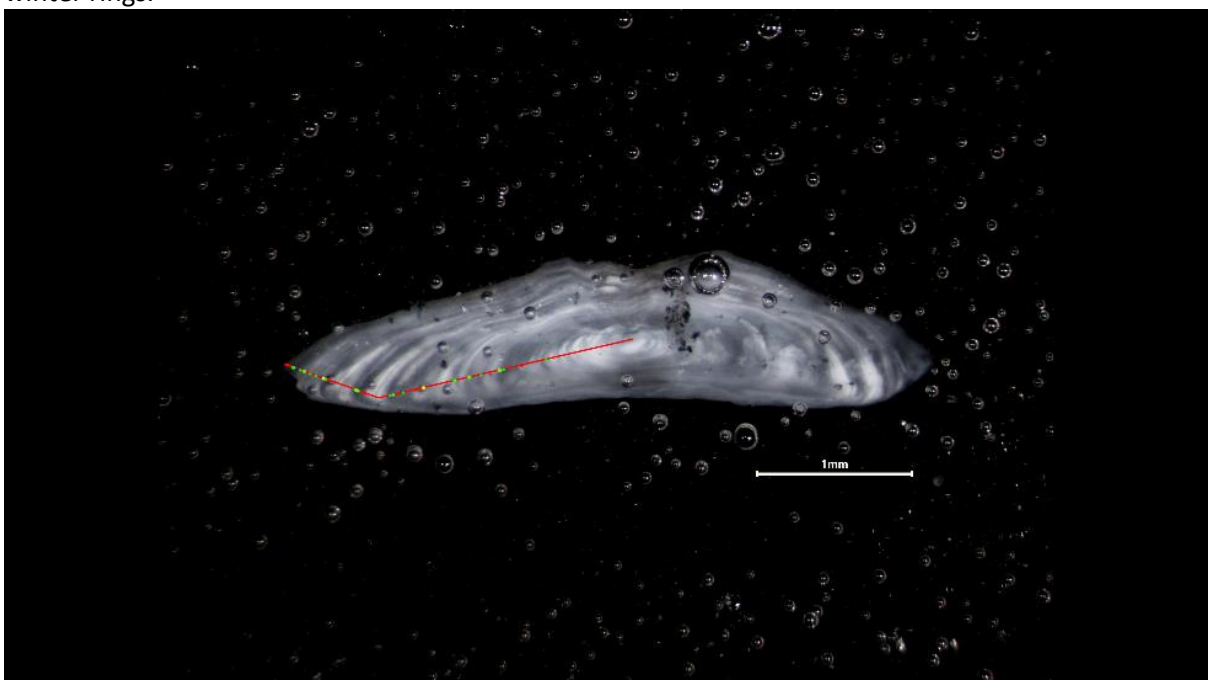


Figure 6.3.2.6. PLE_227; 7h; 47cm; Female; caught 01/07/2018. Modal age=6; PA=40%. One reader annotated 14 winter rings.

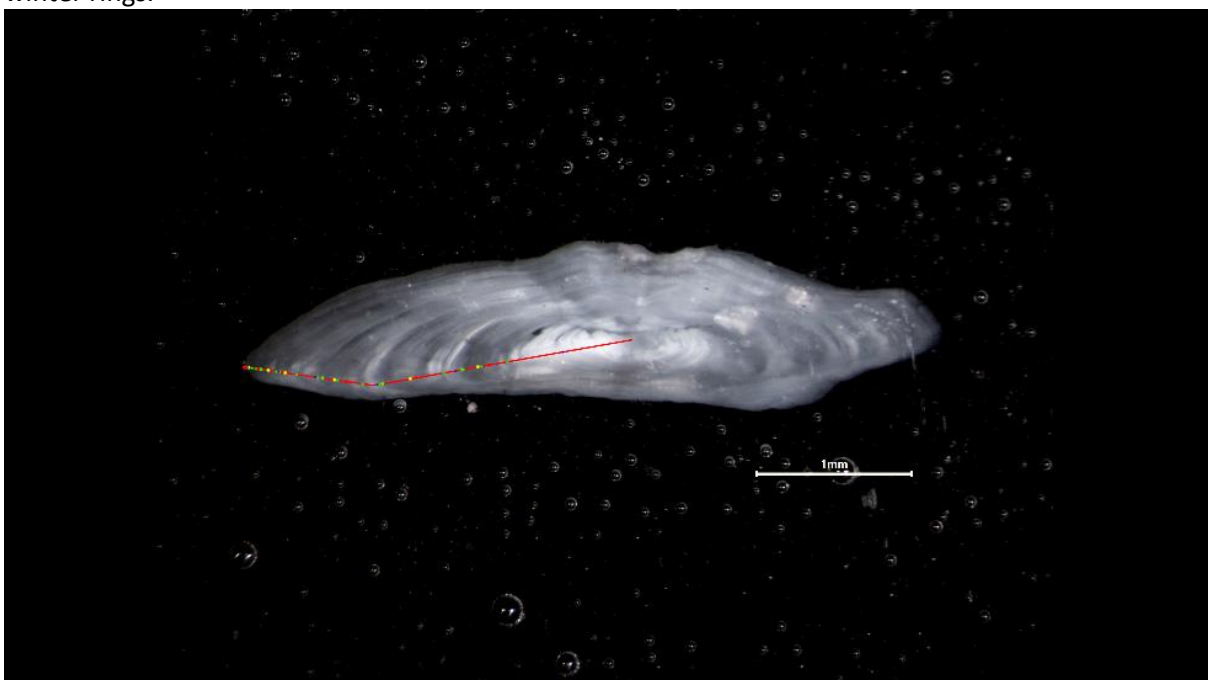


Figure 6.3.2.7. PLE_221; 7h; 46cm; Female; caught 01/07/2018. Modal age 8; PA=60%. Age range 6-11

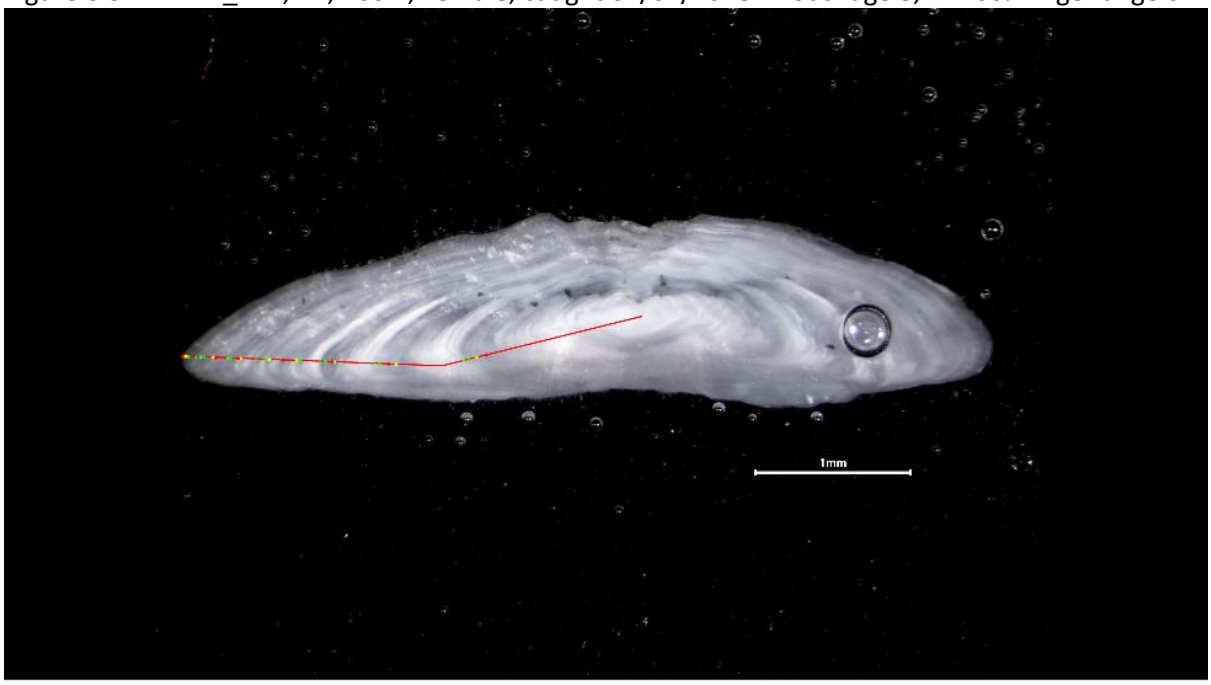
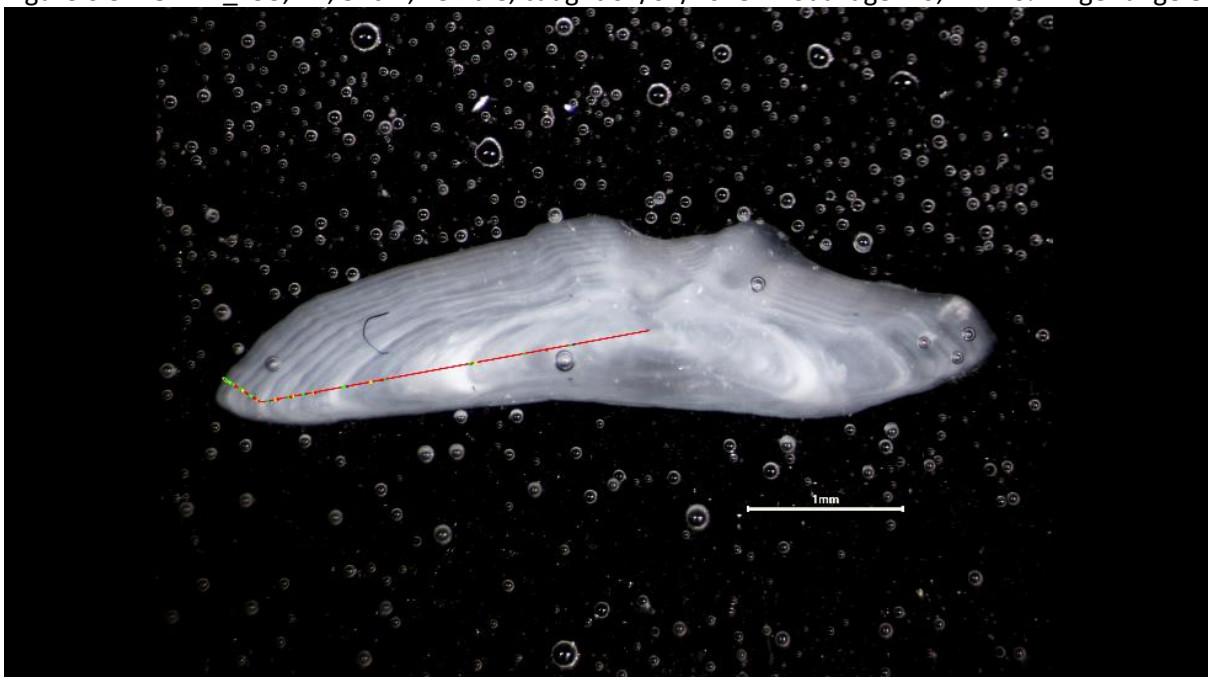


Figure 6.3.2.8. PLE_193; 7h; 51cm; Female; caught 01/04/2018. Modal age=10; PA=40%. Age range 8-12.



6.4 Discussion

The statistics representing age reading performance were calculated for all readers combined and for experienced readers only. All areas were included and calculations were carried separately for each preparation method. As expected agreement was higher and variance (APE & CV) was lower for advanced readers compared to all readers regardless of preparation method.

In all cases the statistics were significantly better for whole otoliths than for sectioned otoliths.

The average percentage agreement of 76% and CV of 13% was reached by all readers annotating whole otoliths. There was slight improvement when only advanced readers were combined: PA=78%; CV=12%.

The results of present exchange for whole otoliths are in line with the statistics achieved during WKARP back in 2010: PA=76%; CV=9% for ICES area 4 and PA=71%; CV=15% for ICES area 3a.

However in case of sectioned otoliths for all readers the average percentage agreement (56%) and CV (18%) is not satisfactory. There was little improvement when only advanced readers are included PA=64%; CV=10%.

The statistics achieved during WKARP 2010 for sectioned otoliths were significantly higher and similar to whole otoliths.

Most of participating institutes are reading whole plaice otoliths for 7.h-k stock with the exception of UK-CEFAS where either sections or broken and burnt method are used. Many age readers did not feel confident with annotating sectioned otoliths as either they had limited experience or were not at all familiar with this preparation method.

It is believed that exclusively using uploaded images in SmartDots may pose some disadvantages in age interpretation as readers are not able to re-adjust the focus on different levels of the otoliths.

However in present exchange all readers were satisfied with image quality and the percentage of AQ1 readability was high -79% for whole and 78 for sectioned. Only small percentage of all readings: 2.3% for whole and 3.8% for sections were reported by few participants as cases of very difficult or unreadable otoliths (AQ3).

SmartDots provides the tool to zoom on otoliths and therefore once the quality and resolution of uploaded images is high and all translucent and opaque zones are clearly visible the reading of images should not affect age interpretation. Also the pinned reading lines in SmartDdots were widely accepted by all readers.

The fact all readers had to use the same images and the same reading axis should improve the consistency of results and avoid the bias of selecting different reading lines or excessively zooming in or out.

WGBIOP (WGBIOP 2018 Guidelines for Workshops on Age Reading Calibration) recommends that target and threshold statistics are formulated for each species and stock. The statistics refer to the percentage agreement, the CV and the bias. The target value is the value you would like to achieve and know is possible based on exchange and workshop results. The threshold value is the minimum value required before a reader is qualified to supply data to working groups and can if necessary be derived by discussion between expert readers. Usually, a CV of 5% is set as a threshold for sufficient data quality (Campana 2001).

The results of present exchange indicate the proposed threshold statistics are not achieved by all experienced readers. This is related to the interpretation differences described in section 6.2 and the main discrepancies were caused by differences in irregular growth and edge interpretation.

Age readers encountered the same issues during Plaice Ageing Workshop back in 2010 (WKARP 2010). At the time the Ageing Manual for Plaice was included in the report with specific interpretation guidelines for plaice stock in Celtic Sea. It is believed if the readers consistently adhere to those rules the statistics will improve and the proposed threshold should be achievable for whole plaice otoliths in 7.h-k.

Sectioning is considered to be the best method to age fish especially for older specimens as otoliths can change the growth direction and older otoliths tend to get thicker instead of longer and wider. This phenomenon is described as 'cliff edge effect' and may cause underestimation of ages in whole otoliths especially if there is little or no otolith growth in the horizontal plane.

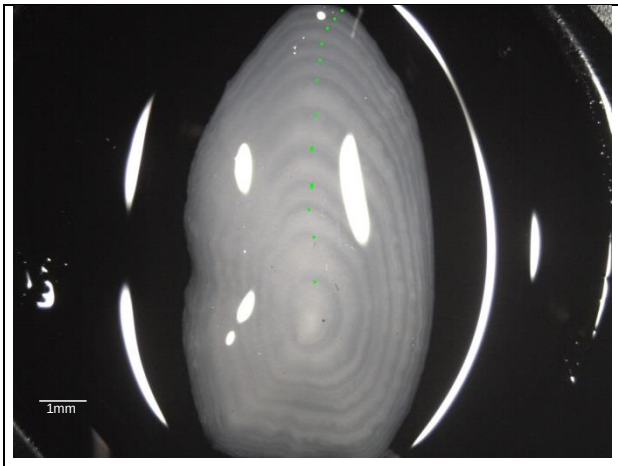
However, the results of WKARP 2010 for North Sea (4) and Skagerrak-Kattegat (3a) plaice suggested that sectioning otoliths is not necessary if age is less than 10. It was concluded that as growth rates differ between areas it is likely that the age at which sectioning is necessary will also differ between areas. Further examination of whole versus sectioned otoliths in older fish (by area) was recommended.

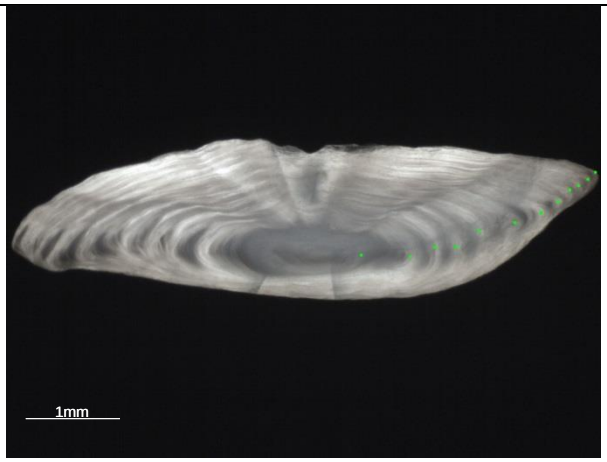
For the present exchange samples did not include paired otoliths with different treatment methods: one otolith sectioned and 1 whole. However back in 2010 Ireland carried out detailed study on whole versus sectioned otoliths for 7a, 7b, 7g and 7j divisions plaice stocks and the results were presented at the workshop. Pair-wise comparisons of both otoliths of a fish, 1 sectioned and 1 whole, revealed no age reading bias related to preparation method. In the majority of the cases where discrepancies in results were observed, the difference was not more than 1 year. Most common problems were low readability, edge interpretation, false rings, splits and checks that caused the under- or overestimation of the ages by 1 year regardless of the preparation method. A 'cliff edge' effect was observed in the older otoliths, but it did not lead to underestimation of the ages while reading whole otoliths. The growth patterns observed on the sections were mirrored in the whole otoliths especially on the nucleus-anterior axis (Figure 6.2.1). However, the number of 10+ otoliths included in this study was limited. It was concluded that for plaice in divisions 7a, 7b, 7g and 7j ranging from 1 to 10 years old, otolith sectioning is not necessary

As plaice in 7.h-k is considered as fast growing stock specimens of age higher than 10 years are rare and represent small percentage of total catch. There were only 9 plaice specimens of 10+ age group among total of 1782 otoliths sampled during Irish IBTS surveys since 2003 until present. For all 956 7j plaice samples collected in 2018 in Ireland at fish market only 5 specimens were older than 10 years. Therefore using whole otoliths for ageing plaice in 7.h-k divisions should not result in underestimation of ages.

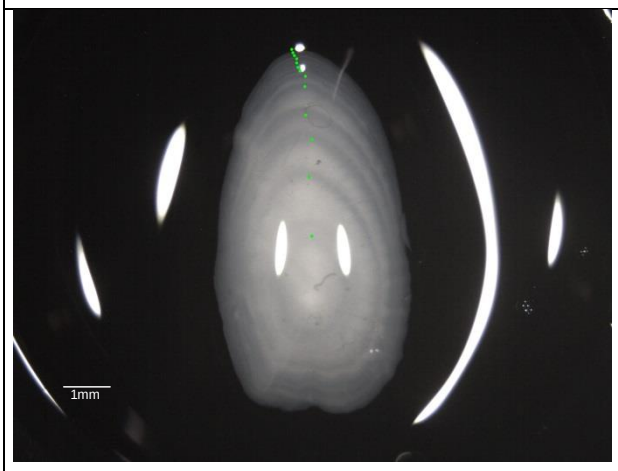
Using 2 different preparation methods for ageing the same stock may cause confusion and bias in interpretation of ages. Due to low reader agreement on 'sectioned' otoliths it is recommended that WGBIOP review the methods used to age plaice for stock assessment purposes in 7h-k and identify how to ensure consistency between institutes.

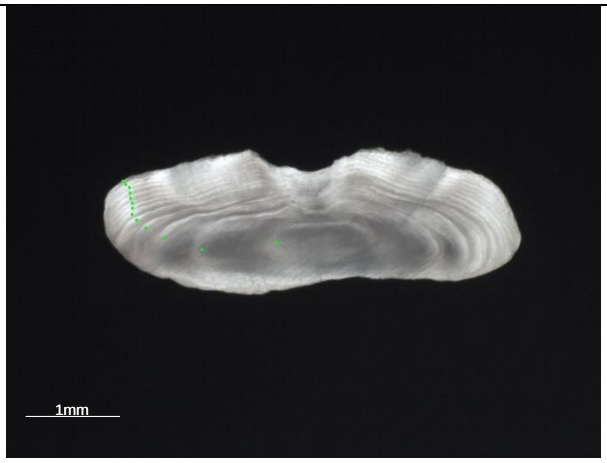
Figure 6.2.1. Pairs of otoliths from VIIa and VIIb which show a ‘cliff edge’ effect (WKARP 2010).





7A_Jan_44cm_Age=12





7B_Feb_35cm_Age=13

6.5 Conclusion

Whole otoliths are commonly used for age determination for 7.h-k plaice stock with the exception of one institute.

Overall agreement between advanced readers of whole plaice otoliths is good with average percentage agreement (PA) of 78% and variance CV=12% and APE=7%

Overall agreement between advanced readers of sectioned plaice otoliths is significantly lower with average percentage agreement (PA) of 64% and variance CV=17% and APE=10%.

The results for whole otoliths are in line with WKARP 2010 results and no improvement was noticed.

The results for sectioned otoliths are significantly worse compared to WKARP 2010.

During present exchange age readers encountered the same issues which were highlighted during plaice ageing workshop back in 2010 (WKARP 2010). Irregular growth and edge interpretation were the main reasons for discrepancies in age determination.

Although the Ageing Manual for Plaice was included in the WKARP 2010 report with specific interpretation guidelines for plaice stock in Celtic Sea some readers did not consistently adhere to those rules.

Due to limited 27.7.h samples, it was not possible to investigate any possible differences in the age readings or growth of fish caught in 27.7.h and 27.7.j.

The analysis of distance of winter marks from the core of otolith show that globally the winter rings are similarly placed by most readers. This means that the growth pattern is correctly identified.

7 References

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Rijnsdorp AD, van Leeuwen PI, Visser TAM (1990) On the validity and precision of back-calculation of growth from otoliths of the plaice, *Pleuronectes platessa* L. Fisheries Research 9: 97-117

Vitale, F., Worsøe Clausen, L., and Ní Chonchúir, G. (Eds.) 2019. Handbook of fish age estimation protocols and validation methods. ICES Cooperative Research Report No. 346. 180 pp. http://doi.org/10.17895/ices.pub.5221

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8 Annex 1. Additional results

8.1 Results all readers-whole otoliths

Data Overview

Table 9.1.1: Summary of statistics; PA (%), CV (%) and APE (%).

CV	PA	APE
13 %	76 %	8 %

Table 9.1.2: Data overview including modal age and statistics per sample.

Fish ID	Event ID	Image ID	length	sex	Catch date	ICES area	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR	Modal age	PA %	CV %	APE %
PLE_001	159	17635	380		12/01/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_002	159	17636	330		12/01/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	6	6	6	6	100	0	0
PLE_003	159	17637	430		12/01/2018 00:00:00	27.7.j	7	7	6	7	6	7	6	7	7	7	7	70	7	6
PLE_004	159	17638	350		12/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	5	5	100	0	0
PLE_005	159	17639	400		12/01/2018 00:00:00	27.7.j	8	9	8	9	8	8	8	8	8	8	8	80	5	4
PLE_006	159	17640	410		12/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	5	5	100	0	0
PLE_007	159	17641	410		15/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	6	5	5	5	5	90	6	4
PLE_008	159	17642	320		15/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	5	5	100	0	0
PLE_009	159	17643	340		15/01/2018 00:00:00	27.7.j	8	8	7	8	8	9	8	8	8	8	8	80	6	2
PLE_010	159	17644	400		15/01/2018 00:00:00	27.7.j	6	6	6	6	7	6	6	-	7	6	6	78	7	6
PLE_011	159	17645	410		15/01/2018 00:00:00	27.7.j	9	9	8	9	8	9	8	10	10	9	9	50	8	6
PLE_012	159	17646	360		31/01/2018 00:00:00	27.7.j	5	5	5	6	5	5	5	5	5	6	5	80	8	6
PLE_013	159	17647	420		31/01/2018 00:00:00	27.7.j	9	9	8	9	9	9	8	9	9	9	9	80	5	4
PLE_014	159	17648	340		31/01/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_015	159	17649	320		31/01/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_016	159	17650	370		31/01/2018 00:00:00	27.7.j	8	7	7	8	8	8	7	9	8	8	8	60	8	6
PLE_017	159	17651	430		31/01/2018 00:00:00	27.7.j	9	9	6	9	9	8	8	9	9	9	9	70	11	8
PLE_01	159	1765	410		31/01/201	27.7.j	8	8	8	8	8	8	8	8	8	8	8	10	0	0

8		2		8 00:00:00													0			
PLE_01	159	1765	410	09/02/201	27.7.j	5	3	5	5	5	5	5	5	5	5	5	90	13	8	
9		3		8 00:00:00																
PLE_02	159	1765	400	09/02/201	27.7.j	6	5	6	6	7	6	5	-	6	6	6	67	10	7	
0		4		8 00:00:00																
PLE_02	159	1765	350	09/02/201	27.7.j	4	4	4	5	4	4	4	4	4	4	4	90	8	4	
1		5		8 00:00:00																
PLE_02	159	1765	360	09/02/201	27.7.j	7	7	6	7	7	7	7	6	7	6	7	70	7	6	
2		6		8 00:00:00																
PLE_02	159	1765	460	20/02/201	27.7.j	10	10	9	10	10	10	10	10	10	10	10	90	3	2	
3		7		8 00:00:00																
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4		8		8 00:00:00													0			
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5		9		8 00:00:00																
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6		0		8 00:00:00																
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7		1		8 00:00:00																
PLE_02	159	1766	310	20/02/201	27.7.j	7	7	6	5	7	7	5	7	7	8	7	60	15	12	
8		2		8 00:00:00																
PLE_02	159	1766	360	23/02/201	27.7.j	5	5	4	6	6	6	4	5	5	5	5	50	14	11	
9		3		8 00:00:00																
PLE_03	159	1766	380	23/02/201	27.7.j	8	7	6	8	8	8	7	8	8	8	8	70	9	7	
0		4		8 00:00:00																
PLE_03	159	1766	340	23/02/201	27.7.j	8	8	8	8	8	8	8	8	8	8	8	10	0	0	
1		5		8 00:00:00													0			
PLE_03	159	1766	350	23/02/201	27.7.j	9	9	8	9	10	9	8	9	9	8	9	60	7	5	
2		6		8 00:00:00																
PLE_03	159	1766	370	23/02/201	27.7.j	5	5	5	5	5	5	5	5	5	5	5	10	0	0	
3		7		8 00:00:00													0			
PLE_03	159	1766	370	23/02/201	27.7.j	7	7	6	7	7	7	7	7	6	7	7	80	6	5	
4		8		8 00:00:00																
PLE_03	159	1766	390	23/02/201	27.7.j	6	6	5	7	7	6	6	6	7	6	6	60	10	8	
5		9		8 00:00:00																
PLE_03	159	1767	320	23/02/201	27.7.j	6	5	6	6	6	6	6	6	6	6	6	90	5	3	
6		0		8 00:00:00																
PLE_03	159	1767	400	23/02/201	27.7.j	8	8	7	8	8	8	7	8	8	8	8	80	5	4	
7		1		8 00:00:00																
PLE_03	159	1767	450	23/02/201	27.7.j	10	8	8	10	10	9	7	8	10	10	10	50	13	11	
8		2		8 00:00:00																
PLE_03	159	1767	410	23/02/201	27.7.j	9	10	8	9	11	11	9	9	8	9	9	50	11	9	
9		3		8 00:00:00																
PLE_04	159	1767	390	13/03/201	27.7.j	10	10	8	10	10	10	10	10	10	11	10	80	7	4	
0		4		8 00:00:00																
PLE_04	159	1767	290	13/03/201	27.7.j	3	3	3	3	3	3	3	3	3	3	3	10	0	0	
1		5		8 00:00:00													0			
PLE_04	159	1767	410	13/03/201	27.7.j	10	10	7	10	10	10	7	10	9	10	10	70	13	11	
2		6		8 00:00:00																
PLE_04	159	1767	400	14/03/201	27.7.j	9	9	7	10	9	10	9	9	10	9	9	60	10	6	
3		7		8 00:00:00																
PLE_04	159	1767	390	14/03/201	27.7.j	12	12	9	11	12	12	9	12	12	12	12	70	11	9	
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PLE_04	159	1767	380	14/03/201	27.7.j	7	7	6	7	7	7	6	7	7	7	7	80	6	5	
5		9		8 00:00:00																
PLE_04	159	1768	410	22/03/201	27.7.j	6	6	6	6	6	6	7	6	6	6	6	90	5	3	
6		0		8 00:00:00																
PLE_04	159	1768	320	22/03/201	27.7.j	7	6	6	7	7	7	6	7	7	7	7	70	7	6	
7		1		8 00:00:00																

PLE_048	159	17682	460		22/03/2018 00:00:00	27.7.j	10	8	7	10	10	9	7	10	10	10	10	60	14	12
PLE_049	159	17683	380		22/03/2018 00:00:00	27.7.j	9	9	6	8	9	9	6	9	9	9	9	70	15	12
PLE_050	159	17684	340		22/03/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	5	4	4	90	8	4
PLE_051	159	17685	320		22/03/2018 00:00:00	27.7.j	4	3	3	4	4	4	4	4	3	4	4	70	13	11
PLE_052	159	17686	330		23/03/2018 00:00:00	27.7.j	6	6	5	5	6	7	6	5	7	7	6	40	14	10
PLE_053	159	17687	400		23/03/2018 00:00:00	27.7.j	8	7	6	8	8	7	7	8	6	8	8	50	11	10
PLE_054	159	17688	390		23/03/2018 00:00:00	27.7.j	8	6	5	8	8	8	6	8	8	8	8	70	16	13
PLE_055	159	17689	480		23/03/2018 00:00:00	27.7.j	8	8	7	8	9	10	7	9	7	8	8	40	12	9
PLE_056	159	17690	450		28/03/2018 00:00:00	27.7.j	9	9	8	9	9	10	8	9	9	9	9	70	6	4
PLE_057	159	17691	420		28/03/2018 00:00:00	27.7.j	9	9	7	9	9	9	8	9	9	9	9	80	8	6
PLE_058	159	17692	300		28/03/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_059	159	17693	370		28/03/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	7	6	7	7	80	6	5
PLE_060	159	17694	280	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_061	159	17695	240	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_062	159	17696	230	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_063	159	17697	210	F	23/02/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_064	159	17698	260	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_065	159	17699	250	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_066	159	17700	310	F	28/02/2018 00:00:00	27.7.j	7	7	6	8	7	7	5	7	9	7	7	60	15	9
PLE_067	159	17701	410	F	13/03/2018 00:00:00	27.7.j	7	7	5	7	7	7	6	7	7	7	7	80	10	7
PLE_068	159	17702	320	F	15/03/2018 00:00:00	27.7.j	4	4	4	5	4	4	4	4	3	3	4	70	15	9
PLE_069	159	17703	170	F	15/03/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_070	159	17704	410	F	16/03/2018 00:00:00	27.7.j	8	8	7	8	8	8	8	8	8	8	8	90	4	2
PLE_071	159	17705	310	F	17/03/2018 00:00:00	27.7.j	5	4	4	5	5	4	4	5	4	5	4	50	12	11
PLE_072	159	17706	180	F	17/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_073	159	17707	110	F	17/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_074	159	17708	180	M	17/03/2018 00:00:00	27.7.j	2	3	2	2	2	2	2	2	7	5	2	70	60	43
PLE_075	159	17709	300	F	17/03/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_076	159	17710	230	F	17/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_07	159	1771	190	M	23/02/201	27.7.j	2	2	2	3	3	2	2	2	3	3	2	60	22	20

7		1			8 00:00:00															
PLE_078	159	17712	230	M	23/02/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_079	159	17713	270	M	23/02/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_080	159	17714	280	M	23/02/2018 00:00:00	27.7.j	7	7	6	7	7	7	6	7	7	7	7	80	6	5
PLE_081	159	17715	230	M	15/03/2018 00:00:00	27.7.j	4	4	3	4	4	4	4	2	4	4	4	80	18	13
PLE_082	159	17716	200	M	15/03/2018 00:00:00	27.7.j	4	4	3	4	4	4	4	4	4	4	4	90	8	5
PLE_083	159	17717	190	M	15/03/2018 00:00:00	27.7.j	2	3	2	3	2	3	2	2	3	2	2	60	22	20
PLE_084	159	17718	160	M	15/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_085	159	17719	290	M	15/03/2018 00:00:00	27.7.j	8	7	5	9	9	8	5	9	8	10	8	30	22	16
PLE_086	159	17720	120	M	17/03/2018 00:00:00	27.7.j	1	1	1	1	1	1	1	1	2	1	1	90	29	16
PLE_087	159	17721	280		05/07/2018 00:00:00	27.7.j	3	3	2	2	3	3	2	2	2	2	2	60	22	20
PLE_088	159	17722	320		05/07/2018 00:00:00	27.7.j	5	5	4	5	5	5	4	5	4	5	5	70	10	9
PLE_089	159	17723	280		05/07/2018 00:00:00	27.7.j	3	4	3	3	3	3	3	3	3	3	3	90	10	6
PLE_090	159	17724	390		05/07/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	5	5	100	0	0
PLE_091	159	17725	440		10/07/2018 00:00:00	27.7.j	10	10	8	10	10	10	9	10	10	10	10	80	7	5
PLE_092	159	17726	440		10/07/2018 00:00:00	27.7.j	9	9	8	9	9	8	8	8	8	8	8	60	6	6
PLE_093	159	17727	390		10/07/2018 00:00:00	27.7.j	6	6	6	6	6	6	5	6	6	6	6	90	5	3
PLE_094	159	17728	380		10/07/2018 00:00:00	27.7.j	9	6	6	9	9	8	7	9	8	8	9	40	15	12
PLE_095	159	17729	400		10/07/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	6	5	90	6	4
PLE_096	159	17730	470		10/07/2018 00:00:00	27.7.j	9	9	8	9	9	9	8	9	9	8	9	70	6	5
PLE_097	159	17731	410		10/07/2018 00:00:00	27.7.j	5	4	3	5	5	4	4	5	3	4	4	40	19	15
PLE_098	159	17732	390		10/07/2018 00:00:00	27.7.j	10	10	9	11	11	10	10	10	10	10	10	70	6	4
PLE_099	159	17733	410		30/07/2018 00:00:00	27.7.j	10	9	8	9	10	10	8	9	9	9	9	50	8	6
PLE_100	159	17734	300	F	30/07/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_101	159	17735	260	F	30/07/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	3	2	2	90	15	9
PLE_102	159	17736	270	M	30/07/2018 00:00:00	27.7.j	4	4	4	4	5	4	5	4	4	4	4	80	10	8
PLE_103	159	17737	250	F	30/07/2018 00:00:00	27.7.j	3	3	3	3	2	3	3	3	2	2	3	70	18	16
PLE_104	159	17738	290	M	30/07/2018 00:00:00	27.7.j	6	6	4	6	6	5	5	6	5	7	6	50	15	12
PLE_105	159	17739	360	F	03/08/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	5	5	100	0	0
PLE_106	159	17740	330	F	03/08/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	4	4	4	100	0	0

PLE_107	159	17741	460	F	03/08/2018 00:00:00	27.7.j	8	8	6	8	9	8	7	8	7	8	8	60	11	8
PLE_108	159	17742	490	F	03/08/2018 00:00:00	27.7.j	5	5	4	5	5	4	4	5	4	4	4	50	12	11
PLE_109	159	17743	360	F	03/08/2018 00:00:00	27.7.j	6	6	4	6	6	6	5	4	6	5	6	60	16	13
PLE_110	159	17744	440	F	03/08/2018 00:00:00	27.7.j	6	6	4	6	7	7	5	6	5	5	6	40	17	13
PLE_111	159	17745	380	F	07/08/2018 00:00:00	27.7.j	5	6	5	5	5	6	5	5	5	5	5	80	8	6
PLE_112	159	17746	430	F	07/08/2018 00:00:00	27.7.j	8	8	7	8	8	8	7	8	7	8	8	70	6	5
PLE_113	159	17747	300	M	07/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_114	159	17748	360	F	07/08/2018 00:00:00	27.7.j	3	3	3	4	3	4	3	3	3	3	3	80	13	10
PLE_115	159	17749	290	F	07/08/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	5	5	5	5	100	0	0
PLE_116	159	17750	310	F	09/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_117	159	17751	420	F	09/08/2018 00:00:00	27.7.j	7	7	5	8	8	8	7	7	8	7	7	50	13	9
PLE_118	159	17752	330	F	09/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_119	159	17753	360	F	09/08/2018 00:00:00	27.7.j	7	7	6	7	10	8	8	9	7	9	7	40	16	13
PLE_120	159	17754	310	F	09/08/2018 00:00:00	27.7.j	3	3	3	4	4	3	3	3	2	3	3	70	18	12
PLE_121	159	17755	400		17/08/2018 00:00:00	27.7.j	9	9	8	9	9	9	9	8	9	8	9	70	6	5
PLE_122	159	17756	330	F	17/08/2018 00:00:00	27.7.j	4	4	4	5	5	4	5	4	4	5	4	60	12	11
PLE_123	159	17757	310	F	17/08/2018 00:00:00	27.7.j	2	2	2	3	3	2	2	2	2	2	2	80	19	15
PLE_124	159	17758	360	F	17/08/2018 00:00:00	27.7.j	6	6	5	7	8	6	6	6	6	7	6	60	13	10
PLE_125	159	17759	430	F	17/08/2018 00:00:00	27.7.j	8	9	8	8	10	8	8	9	8	8	8	70	8	7
PLE_126	159	17760	390		17/08/2018 00:00:00	27.7.j	10	10	9	10	10	9	10	10	9	10	10	70	5	4
PLE_127	159	17761	390		21/08/2018 00:00:00	27.7.j	9	9	8	9	9	9	9	9	9	9	9	90	4	2
PLE_128	159	17762	400		21/08/2018 00:00:00	27.7.j	8	8	7	8	8	8	8	8	8	8	8	90	4	2
PLE_129	159	17763	340		21/08/2018 00:00:00	27.7.j	5	5	4	5	5	4	4	5	4	4	4	50	12	11
PLE_130	159	17764	370		21/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	3	3	3	100	0	0
PLE_131	159	17765	460		21/08/2018 00:00:00	27.7.j	9	9	7	9	10	9	9	9	9	9	9	80	8	4
PLE_132	159	17766	430		21/08/2018 00:00:00	27.7.j	10	9	8	10	11	10	10	10	10	10	10	70	8	5
PLE_133	159	17767	390	F	06/09/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	3	4	3	3	90	10	6
PLE_134	159	17768	360	F	06/09/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_135	159	17769	440	F	06/09/2018 00:00:00	27.7.j	7	7	7	9	9	7	7	7	7	7	7	80	11	9
PLE_13	159	1777	350	F	06/09/201	27.7.j	4	4	4	6	6	4	5	4	4	6	4	60	20	18

6		0			8 00:00:00															
PLE_137	159	17771	320	F	07/09/2018 00:00:00	27.7.j	3	3	3	5	4	4	4	3	3	4	3	50	19	17
PLE_138	159	17772	450	F	07/09/2018 00:00:00	27.7.j	8	8	8	8	8	8	8	8	8	8	8	100	0	0
PLE_139	159	17773	370	F	04/09/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	4	3	4	4	90	8	5
PLE_140	159	17774	470		17/09/2018 00:00:00	27.7.j	6	6	5	6	6	6	6	6	5	6	6	80	7	6
PLE_141	159	17775	440		04/10/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	6	7	8	7	70	8	5
PLE_142	159	17776	390		04/10/2018 00:00:00	27.7.j	6	6	5	7	9	6	6	6	6	8	6	60	18	14
PLE_143	159	17777	460		05/10/2018 00:00:00	27.7.j	9	9	7	9	9	8	9	8	9	9	9	70	8	7
PLE_144	159	17778	390		05/10/2018 00:00:00	27.7.j	6	6	5	6	7	6	6	6	6	6	6	80	8	3
PLE_145	159	17779	370		26/10/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	6	6	6	6	100	0	0
PLE_146	159	17780	420		26/10/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	7	7	7	7	90	5	3
PLE_147	159	17781	360		26/10/2018 00:00:00	27.7.j	8	7	6	9	9	8	7	6	8	9	8	30	15	12
PLE_148	159	17782	470		26/10/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	6	6	5	6	90	5	3
PLE_149	159	17783	440		02/11/2018 00:00:00	27.7.j	9	9	9	9	10	9	9	9	9	9	9	90	3	2
PLE_150	159	17784	430	F	02/11/2018 00:00:00	27.7.j	8	8	8	8	8	8	8	8	8	8	8	100	0	0
PLE_151	159	17785	410	F	02/11/2018 00:00:00	27.7.j	9	8	8	10	10	9	9	9	8	9	9	50	8	6
PLE_152	159	17786	460	F	02/11/2018 00:00:00	27.7.j	8	6	-	9	10	8	7	12	8	8	8	44	21	15
PLE_153	159	17787	420	F	27/11/2018 00:00:00	27.7.j	8	8	8	10	11	9	8	8	10	9	8	50	12	10
PLE_154	159	17788	420	F	28/11/2018 00:00:00	27.7.j	7	6	5	7	7	7	5	7	7	7	7	70	13	11
PLE_155	159	17789	290	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_156	159	17790	280	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_157	159	17791	270	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_158	159	17792	310	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_159	159	17793	270	F	22/11/2018 00:00:00	27.7.j	2	2	2	3	3	2	2	3	3	3	2	50	21	20
PLE_160	159	17794	290	F	22/11/2018 00:00:00	27.7.j	2	2	2	3	3	3	2	3	2	3	2	50	21	20
PLE_161	159	17795	260	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	2	2	2	2	100	0	0
PLE_162	159	17796	430	F	26/11/2018 00:00:00	27.7.j	9	10	8	9	10	9	8	9	9	9	9	60	7	4
PLE_163	159	17797	380	F	26/11/2018 00:00:00	27.7.j	4	4	4	4	5	4	3	4	3	4	4	70	15	9
PLE_164	159	17798	360	F	26/11/2018 00:00:00	27.7.j	8	8	5	8	11	8	5	7	8	8	8	60	23	15
PLE_165	159	17799	370	F	26/11/2018 00:00:00	27.7.j	6	4	4	6	6	6	4	4	6	4	4	50	21	20

PLE_166	159	17800	380	F	26/11/2018 00:00:00	27.7.j	8	8	6	8	7	8	6	7	8	8	8	60	11	10
PLE_167	159	17801	360	F	29/11/2018 00:00:00	27.7.j	7	8	6	7	9	8	5	-	7	8	7	33	17	13
PLE_168	159	17802	250	M	22/11/2018 00:00:00	27.7.j	1	1	1	2	1	1	1	3	2	1	1	70	50	40
PLE_169	159	17803	290	M	22/11/2018 00:00:00	27.7.j	9	9	4	9	9	7	5	8	9	9	9	60	24	19
PLE_170	159	17804	210	M	22/11/2018 00:00:00	27.7.j	1	1	1	1	2	1	1	2	2	2	1	60	37	34
PLE_171	159	17805	370	M	27/11/2018 00:00:00	27.7.j	7	8	6	9	10	8	6	8	9	9	8	30	17	12
PLE_172	159	17616	380	F	21/11/2013 00:00:00	27.7.h	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_173	159	17615	390	F	21/11/2013 00:00:00	27.7.h	4	3	3	4	4	5	4	4	4	4	4	70	15	9
PLE_174	159	17617	340	F	11/11/2016 00:00:00	27.7.h	4	4	4	5	5	4	4	5	5	5	4	50	12	11
PLE_175	159	17618	350	M	14/11/2016 00:00:00	27.7.h	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_176	159	17619	290	M	14/11/2016 00:00:00	27.7.h	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_177	159	17620	380	F	14/11/2016 00:00:00	27.7.h	3	3	3	3	4	3	3	3	4	3	3	80	13	10
PLE_178	159	17621	450	F	19/11/2016 00:00:00	27.7.h	6	6	5	6	6	5	5	6	4	5	6	50	13	11
PLE_179	159	17622	230	F	25/11/2016 00:00:00	27.7.h	4	3	3	4	4	3	3	4	3	3	3	60	15	14
PLE_180	159	17623	270	M	25/11/2016 00:00:00	27.7.h	4	3	3	4	4	3	3	4	3	3	3	60	15	14
PLE_181	159	17624	260	M	25/11/2016 00:00:00	27.7.h	3	3	3	3	3	3	2	3	2	2	3	70	18	16
PLE_182	159	17625	240	F	25/11/2016 00:00:00	27.7.h	3	3	3	3	3	3	3	3	2	3	3	90	11	6
PLE_183	159	17626	230	F	25/11/2016 00:00:00	27.7.h	4	4	4	5	5	4	4	5	4	3	4	60	15	11
PLE_184	159	17627	280	F	25/11/2016 00:00:00	27.7.h	4	4	3	4	4	3	4	4	3	3	4	60	14	13
PLE_185	159	17628	290	F	25/11/2016 00:00:00	27.7.h	4	4	4	4	4	4	4	4	4	4	4	100	0	0
PLE_186	159	17629	270	F	25/11/2016 00:00:00	27.7.h	3	4	3	4	4	3	3	5	4	3	3	50	19	17
PLE_187	159	17630	320	F	25/11/2016 00:00:00	27.7.h	5	5	3	5	6	5	5	6	5	5	5	70	16	8
PLE_188	159	17631	290	F	25/11/2016 00:00:00	27.7.h	3	3	2	3	3	3	3	3	3	3	3	90	11	6
PLE_189	159	17632	350	F	25/11/2016 00:00:00	27.7.h	5	5	4	5	5	5	4	5	5	5	5	80	9	7
PLE_190	159	17633	370	F	29/11/2016 00:00:00	27.7.h	6	6	5	6	6	6	5	6	6	6	6	80	7	6
PLE_191	159	17634	380	M	29/11/2016 00:00:00	27.7.h	6	6	6	6	6	6	6	6	5	6	6	90	5	3

Table 9.1.3: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings per reader and per modal age are summarized at the end of the table.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR	total
1	3	3	3	3	3	3	3	3	3	3	**30**
2	20	20	20	20	20	20	20	20	20	20	**200**
3	26	26	26	26	26	26	26	26	26	26	**260**

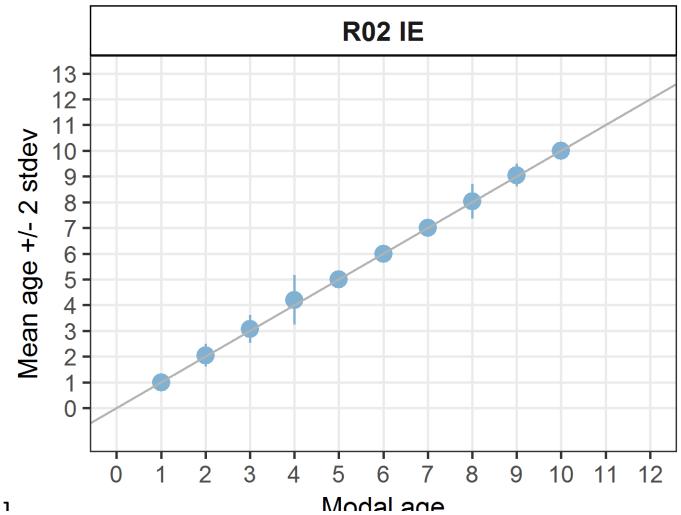
4	30	30	30	30	30	30	30	30	30	30	**300**
5	17	17	17	17	17	17	17	17	17	17	**170**
6	21	21	21	21	21	21	21	19	21	21	**208**
7	17	17	17	17	17	17	17	16	17	17	**169**
8	27	27	26	27	27	27	27	27	27	27	**269**
9	20	20	20	20	20	20	20	20	20	20	**200**
10	9	9	9	9	9	9	9	9	9	9	**90**
11	0	0	0	0	0	0	0	0	0	0	**0**
12	1	1	1	1	1	1	1	1	1	1	**10**
Total	**191**	**191**	**190**	**191**	**191**	**191**	**191**	**188**	**191**	**191**	**1906**

Table 9.1.4: Age composition by reader gives a summary of number of readings per reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR
1	3	3	3	2	2	3	3	1	0	**2**
2	19	17	21	16	17	17	21	20	22	**19**
3	25	30	32	25	24	28	25	26	29	**29**
4	27	28	31	24	25	29	30	26	26	**24**
5	21	20	27	27	24	18	30	24	22	**23**
6	22	24	33	21	19	20	23	21	16	**16**
7	18	19	15	16	18	18	22	15	21	**16**
8	24	21	23	22	18	28	22	23	25	**31**
9	21	20	5	25	21	17	10	21	19	**20**
10	10	8	0	11	17	11	5	9	10	**9**
11	0	0	0	2	5	1	0	0	0	**1**
12	1	1	0	0	1	1	0	2	1	**1**
Total	**191**	**191**	**190**	**191**	**191**	**191**	**191**	**188**	**191**	**191**

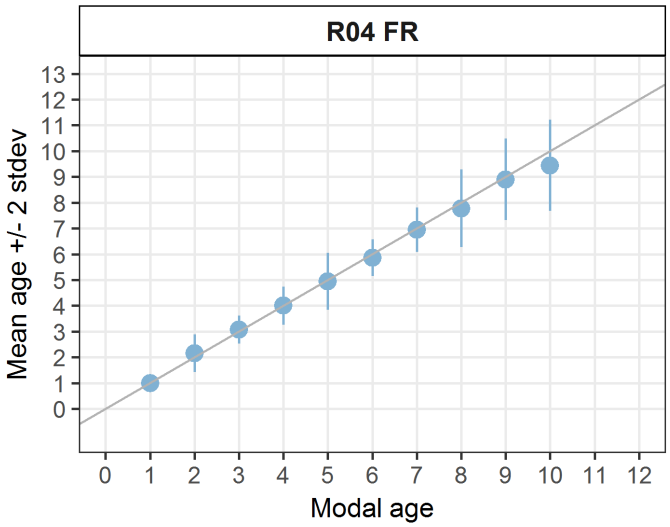
Table 9.1.5: Mean length at age per reader is calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	R14 FR	R16 GB-SCT	R22 GB	R24 FR
1	193 mm	193 mm	193 mm	165 mm	185 mm	193 mm	193 mm	120 mm	-	**185 mm**
2	236 mm	242 mm	241 mm	236 mm	229 mm	236 mm	240 mm	232 mm	242 mm	**240 mm**
3	298 mm	296 mm	298 mm	286 mm	291 mm	287 mm	299 mm	297 mm	295 mm	**290 mm**
4	309 mm	314 mm	334 mm	307 mm	309 mm	324 mm	326 mm	318 mm	325 mm	**330 mm**
5	367 mm	362 mm	380 mm	353 mm	358 mm	364 mm	357 mm	357 mm	368 mm	**360 mm**
6	381 mm	389 mm	376 mm	380 mm	373 mm	381 mm	377 mm	381 mm	379 mm	**381 mm**
7	376 mm	374 mm	417 mm	379 mm	377 mm	373 mm	411 mm	375 mm	377 mm	**366 mm**
8	398 mm	405 mm	417 mm	397 mm	395 mm	398 mm	409 mm	401 mm	392 mm	**400 mm**
9	410 mm	414 mm	414 mm	406 mm	404 mm	414 mm	420 mm	409 mm	404 mm	**406 mm**
10	423 mm	415 mm	-	424 mm	419 mm	422 mm	412 mm	420 mm	425 mm	**413 mm**
11	-	-	-	390 mm	402 mm	410 mm	-	-	-	**390 mm**
12	390 mm	390 mm	-	-	390 mm	390 mm	-	425 mm	390 mm	**390 mm**
Weighted Mean	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**

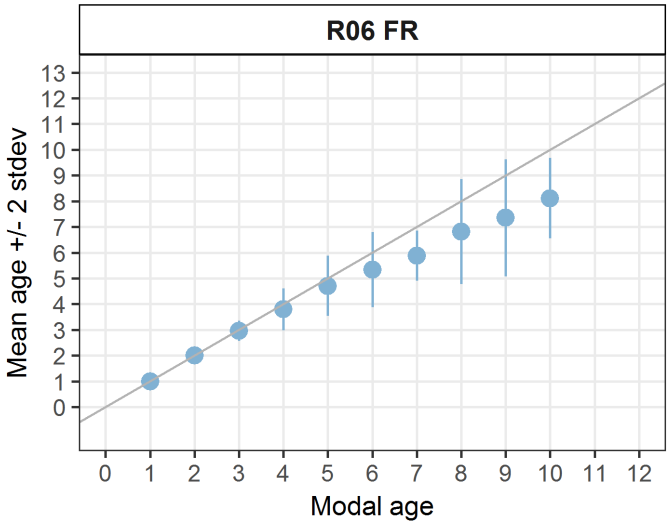

R02 IE
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

[[1]]

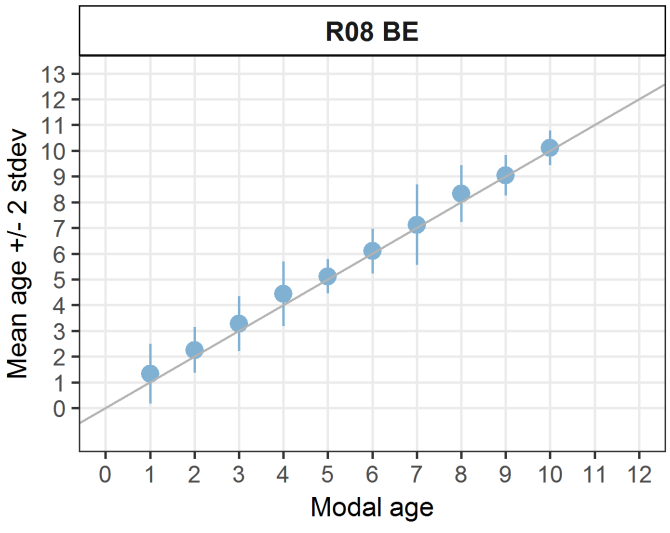
[[2]]


R04 FR
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

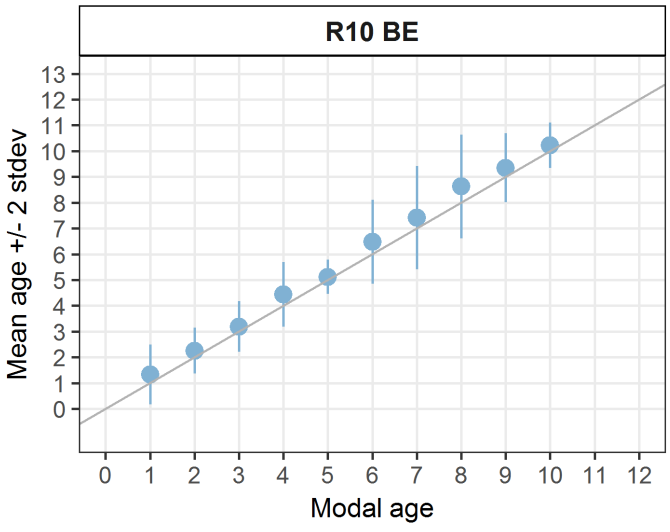
[[3]]


R06 FR
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

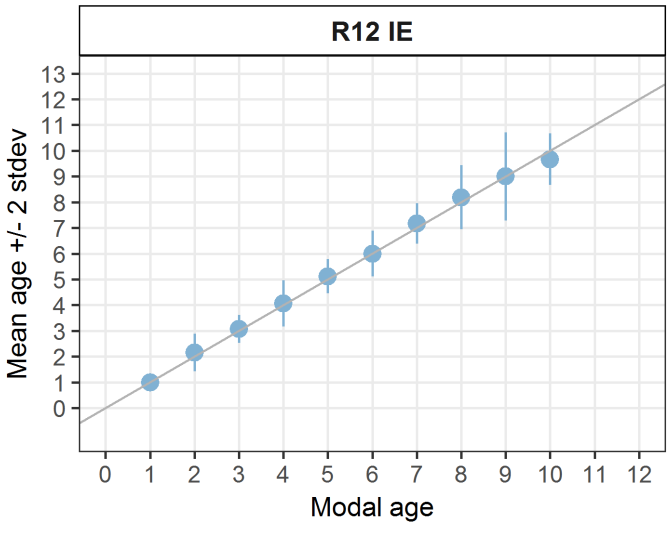
[[4]]


R08 BE
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 7 8 9 10 11 12 13

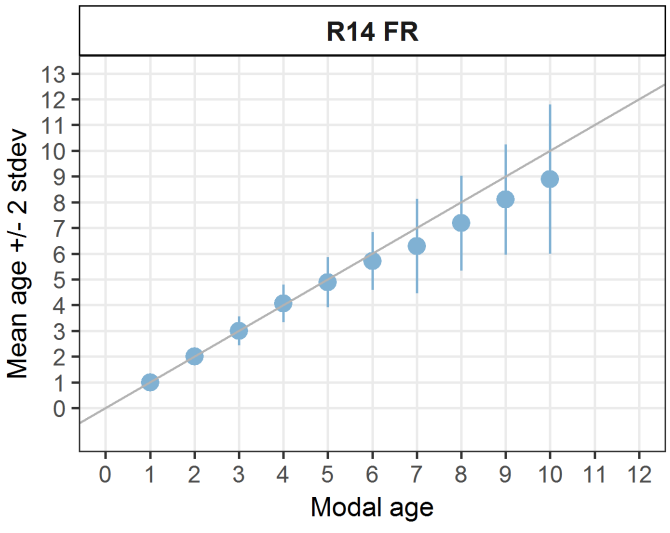
[[5]]


R10 BE
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 7 8 9 10 11 12 13

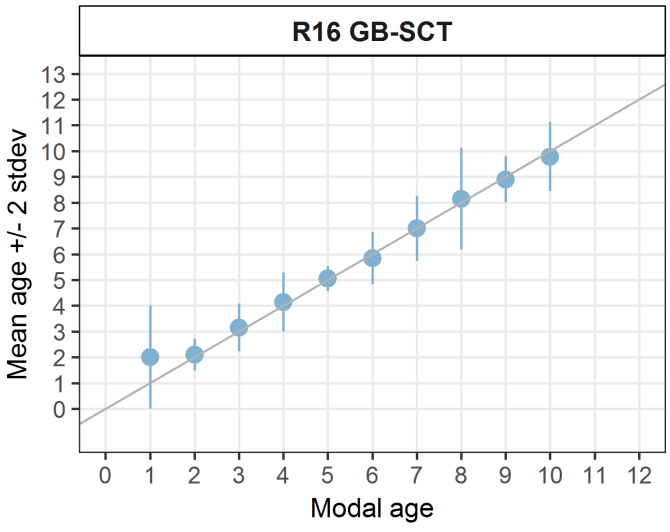
[[6]]


R12 IE
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 7 8 9 10 11 12 13

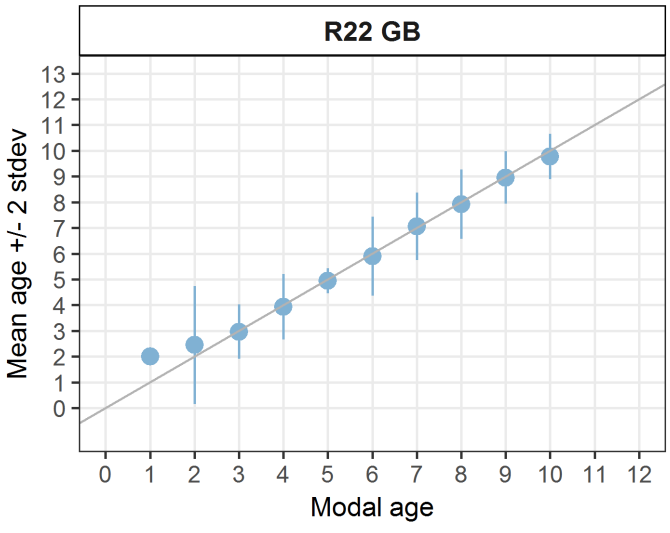
[[7]]


R14 FR
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 7 8 9 10 11 12 13

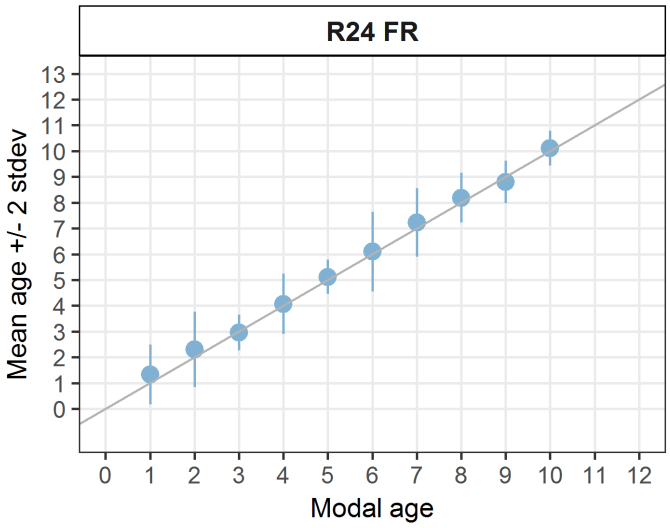
[[8]]


R16 GB-SCT
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 7 8 9 10 11 12 13

[[9]]


R22 GB
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 7 8 9 10 11 12 13

[[10]]


R24 FR
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 7 8 9 10 11 12 13

8.2 Results advanced readers-whole otoliths

All samples included

Data Overview

Table 9.2.1: Data overview including modal age and statistics per sample.

Fish ID	Event ID	Image ID	length	sex	Catch date	ICES area	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	Modal age	PA %	CV %	APE %
PLE_001	159	17635	380		12/01/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_002	159	17636	330		12/01/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	100	0	0
PLE_003	159	17637	430		12/01/2018 00:00:00	27.7.j	7	7	6	7	6	7	7	67	8	7
PLE_004	159	17638	350		12/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_005	159	17639	400		12/01/2018 00:00:00	27.7.j	8	9	8	9	8	8	8	67	6	5
PLE_006	159	17640	410		12/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_007	159	17641	410		15/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_008	159	17642	320		15/01/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_009	159	17643	340		15/01/2018 00:00:00	27.7.j	8	8	7	8	8	9	8	67	8	4
PLE_010	159	17644	400		15/01/2018 00:00:00	27.7.j	6	6	6	6	7	6	6	83	7	5
PLE_011	159	17645	410		15/01/2018 00:00:00	27.7.j	9	9	8	9	8	9	9	67	6	5
PLE_012	159	17646	360		31/01/2018 00:00:00	27.7.j	5	5	5	6	5	5	5	83	8	5
PLE_013	159	17647	420		31/01/2018 00:00:00	27.7.j	9	9	8	9	9	9	9	83	5	3
PLE_014	159	17648	340		31/01/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_015	159	17649	320		31/01/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_016	159	17650	370		31/01/2018 00:00:00	27.7.j	8	7	7	8	8	8	8	67	7	6
PLE_017	159	17651	430		31/01/2018 00:00:00	27.7.j	9	9	6	9	9	8	9	67	15	11
PLE_018	159	17652	410		31/01/2018 00:00:00	27.7.j	8	8	8	8	8	8	8	100	0	0
PLE_019	159	17653	410		09/02/2018 00:00:00	27.7.j	5	3	5	5	5	5	5	83	17	12
PLE_020	159	17654	400		09/02/2018 00:00:00	27.7.j	6	5	6	6	7	6	6	67	11	6
PLE_021	159	17655	350		09/02/2018 00:00:00	27.7.j	4	4	4	5	4	4	4	83	10	7
PLE_022	159	17656	360		09/02/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4
PLE_023	159	17657	460		20/02/2018 00:00:00	27.7.j	10	10	9	10	10	10	10	83	4	3

PLE_024	159	17658	360	20/02/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_025	159	17659	310	20/02/2018 00:00:00	27.7.j	6	5	6	6	6	6	6	83	7	5
PLE_026	159	17660	380	20/02/2018 00:00:00	27.7.j	9	8	7	9	9	10	9	50	12	9
PLE_027	159	17661	370	20/02/2018 00:00:00	27.7.j	8	8	6	8	8	8	8	83	11	7
PLE_028	159	17662	310	20/02/2018 00:00:00	27.7.j	7	7	6	5	7	7	7	67	13	10
PLE_029	159	17663	360	23/02/2018 00:00:00	27.7.j	5	5	4	6	6	6	6	50	15	12
PLE_030	159	17664	380	23/02/2018 00:00:00	27.7.j	8	7	6	8	8	8	8	67	11	9
PLE_031	159	17665	340	23/02/2018 00:00:00	27.7.j	8	8	8	8	8	8	8	100	0	0
PLE_032	159	17666	350	23/02/2018 00:00:00	27.7.j	9	9	8	9	10	9	9	67	7	4
PLE_033	159	17667	370	23/02/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_034	159	17668	370	23/02/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4
PLE_035	159	17669	390	23/02/2018 00:00:00	27.7.j	6	6	5	7	7	6	6	50	12	9
PLE_036	159	17670	320	23/02/2018 00:00:00	27.7.j	6	5	6	6	6	6	6	83	7	5
PLE_037	159	17671	400	23/02/2018 00:00:00	27.7.j	8	8	7	8	8	8	8	83	5	4
PLE_038	159	17672	450	23/02/2018 00:00:00	27.7.j	10	8	8	10	10	9	10	50	11	9
PLE_039	159	17673	410	23/02/2018 00:00:00	27.7.j	9	10	8	9	11	11	9	33	13	10
PLE_040	159	17674	390	13/03/2018 00:00:00	27.7.j	10	10	8	10	10	10	10	83	8	6
PLE_041	159	17675	290	13/03/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_042	159	17676	410	13/03/2018 00:00:00	27.7.j	10	10	7	10	10	10	10	83	13	9
PLE_043	159	17677	400	14/03/2018 00:00:00	27.7.j	9	9	7	10	9	10	9	50	12	7
PLE_044	159	17678	390	14/03/2018 00:00:00	27.7.j	12	12	9	11	12	12	12	67	11	8
PLE_045	159	17679	380	14/03/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4
PLE_046	159	17680	410	22/03/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	100	0	0
PLE_047	159	17681	320	22/03/2018 00:00:00	27.7.j	7	6	6	7	7	7	7	67	8	7
PLE_048	159	17682	460	22/03/2018 00:00:00	27.7.j	10	8	7	10	10	9	10	50	14	11
PLE_049	159	17683	380	22/03/2018 00:00:00	27.7.j	9	9	6	8	9	9	9	67	15	11
PLE_050	159	17684	340	22/03/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_051	159	17685	320	22/03/2018 00:00:00	27.7.j	4	3	3	4	4	4	4	67	14	12
PLE_052	159	17686	330	23/03/2018 00:00:00	27.7.j	6	6	5	5	6	7	6	50	13	10
PLE_053	159	17687	400	23/03/2018	27.7.j	8	7	6	8	8	7	8	50	11	9

					00:00:00											
PLE_054	159	17688	390		23/03/2018 00:00:00	27.7.j	8	6	5	8	8	8	8	67	19	16
PLE_055	159	17689	480		23/03/2018 00:00:00	27.7.j	8	8	7	8	9	10	8	50	12	9
PLE_056	159	17690	450		28/03/2018 00:00:00	27.7.j	9	9	8	9	9	10	9	67	7	4
PLE_057	159	17691	420		28/03/2018 00:00:00	27.7.j	9	9	7	9	9	9	9	83	9	6
PLE_058	159	17692	300		28/03/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_059	159	17693	370		28/03/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4
PLE_060	159	17694	280	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_061	159	17695	240	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_062	159	17696	230	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_063	159	17697	210	F	23/02/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_064	159	17698	260	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_065	159	17699	250	F	23/02/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_066	159	17700	310	F	28/02/2018 00:00:00	27.7.j	7	7	6	8	7	7	7	67	9	5
PLE_067	159	17701	410	F	13/03/2018 00:00:00	27.7.j	7	7	5	7	7	7	7	83	12	8
PLE_068	159	17702	320	F	15/03/2018 00:00:00	27.7.j	4	4	4	5	4	4	4	83	10	7
PLE_069	159	17703	170	F	15/03/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_070	159	17704	410	F	16/03/2018 00:00:00	27.7.j	8	8	7	8	8	8	8	83	5	4
PLE_071	159	17705	310	F	17/03/2018 00:00:00	27.7.j	5	4	4	5	5	4	4	50	12	11
PLE_072	159	17706	180	F	17/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_073	159	17707	110	F	17/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_074	159	17708	180	M	17/03/2018 00:00:00	27.7.j	2	3	2	2	2	2	2	83	19	13
PLE_075	159	17709	300	F	17/03/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_076	159	17710	230	F	17/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_077	159	17711	190	M	23/02/2018 00:00:00	27.7.j	2	2	2	3	3	2	2	67	22	19
PLE_078	159	17712	230	M	23/02/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_079	159	17713	270	M	23/02/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_080	159	17714	280	M	23/02/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4
PLE_081	159	17715	230	M	15/03/2018 00:00:00	27.7.j	4	4	3	4	4	4	4	83	11	7
PLE_082	159	17716	200	M	15/03/2018 00:00:00	27.7.j	4	4	3	4	4	4	4	83	11	7

PLE_083	159	17717	190	M	15/03/2018 00:00:00	27.7.j	2	3	2	3	2	3	2	50	22	20
PLE_084	159	17718	160	M	15/03/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_085	159	17719	290	M	15/03/2018 00:00:00	27.7.j	8	7	5	9	9	8	8	33	20	14
PLE_086	159	17720	120	M	17/03/2018 00:00:00	27.7.j	1	1	1	1	1	1	1	100	0	0
PLE_087	159	17721	280		05/07/2018 00:00:00	27.7.j	3	3	2	2	3	3	3	67	19	17
PLE_088	159	17722	320		05/07/2018 00:00:00	27.7.j	5	5	4	5	5	5	5	83	8	6
PLE_089	159	17723	280		05/07/2018 00:00:00	27.7.j	3	4	3	3	3	3	3	83	13	9
PLE_090	159	17724	390		05/07/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_091	159	17725	440		10/07/2018 00:00:00	27.7.j	10	10	8	10	10	10	10	83	8	6
PLE_092	159	17726	440		10/07/2018 00:00:00	27.7.j	9	9	8	9	9	8	9	67	6	5
PLE_093	159	17727	390		10/07/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	100	0	0
PLE_094	159	17728	380		10/07/2018 00:00:00	27.7.j	9	6	6	9	9	8	9	50	19	16
PLE_095	159	17729	400		10/07/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_096	159	17730	470		10/07/2018 00:00:00	27.7.j	9	9	8	9	9	9	9	83	5	3
PLE_097	159	17731	410		10/07/2018 00:00:00	27.7.j	5	4	3	5	5	4	5	50	19	15
PLE_098	159	17732	390		10/07/2018 00:00:00	27.7.j	10	10	9	11	11	10	10	50	7	5
PLE_099	159	17733	410		30/07/2018 00:00:00	27.7.j	10	9	8	9	10	10	10	50	9	7
PLE_100	159	17734	300	F	30/07/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_101	159	17735	260	F	30/07/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_102	159	17736	270	M	30/07/2018 00:00:00	27.7.j	4	4	4	4	5	4	4	83	10	7
PLE_103	159	17737	250	F	30/07/2018 00:00:00	27.7.j	3	3	3	3	2	3	3	83	14	10
PLE_104	159	17738	290	M	30/07/2018 00:00:00	27.7.j	6	6	4	6	6	5	6	67	15	12
PLE_105	159	17739	360	F	03/08/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_106	159	17740	330	F	03/08/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_107	159	17741	460	F	03/08/2018 00:00:00	27.7.j	8	8	6	8	9	8	8	67	13	8
PLE_108	159	17742	490	F	03/08/2018 00:00:00	27.7.j	5	5	4	5	5	4	5	67	11	10
PLE_109	159	17743	360	F	03/08/2018 00:00:00	27.7.j	6	6	4	6	6	6	6	83	14	10
PLE_110	159	17744	440	F	03/08/2018 00:00:00	27.7.j	6	6	4	6	7	7	6	50	18	11
PLE_111	159	17745	380	F	07/08/2018 00:00:00	27.7.j	5	6	5	5	5	6	5	67	10	8
PLE_112	159	17746	430	F	07/08/2018	27.7.j	8	8	7	8	8	8	8	83	5	4

					00:00:00											
PLE_113	159	17747	300	M	07/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_114	159	17748	360	F	07/08/2018 00:00:00	27.7.j	3	3	3	4	3	4	3	67	15	13
PLE_115	159	17749	290	F	07/08/2018 00:00:00	27.7.j	5	5	5	5	5	5	5	100	0	0
PLE_116	159	17750	310	F	09/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_117	159	17751	420	F	09/08/2018 00:00:00	27.7.j	7	7	5	8	8	8	8	50	16	12
PLE_118	159	17752	330	F	09/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_119	159	17753	360	F	09/08/2018 00:00:00	27.7.j	7	7	6	7	10	8	7	50	18	13
PLE_120	159	17754	310	F	09/08/2018 00:00:00	27.7.j	3	3	3	4	4	3	3	67	15	13
PLE_121	159	17755	400		17/08/2018 00:00:00	27.7.j	9	9	8	9	9	9	9	83	5	3
PLE_122	159	17756	330	F	17/08/2018 00:00:00	27.7.j	4	4	4	5	5	4	4	67	12	10
PLE_123	159	17757	310	F	17/08/2018 00:00:00	27.7.j	2	2	2	3	3	2	2	67	22	19
PLE_124	159	17758	360	F	17/08/2018 00:00:00	27.7.j	6	6	5	7	8	6	6	50	16	12
PLE_125	159	17759	430	F	17/08/2018 00:00:00	27.7.j	8	9	8	8	10	8	8	67	10	8
PLE_126	159	17760	390		17/08/2018 00:00:00	27.7.j	10	10	9	10	10	9	10	67	5	5
PLE_127	159	17761	390		21/08/2018 00:00:00	27.7.j	9	9	8	9	9	9	9	83	5	3
PLE_128	159	17762	400		21/08/2018 00:00:00	27.7.j	8	8	7	8	8	8	8	83	5	4
PLE_129	159	17763	340		21/08/2018 00:00:00	27.7.j	5	5	4	5	5	4	5	67	11	10
PLE_130	159	17764	370		21/08/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_131	159	17765	460		21/08/2018 00:00:00	27.7.j	9	9	7	9	10	9	9	67	11	7
PLE_132	159	17766	430		21/08/2018 00:00:00	27.7.j	10	9	8	10	11	10	10	50	11	8
PLE_133	159	17767	390	F	06/09/2018 00:00:00	27.7.j	3	3	3	3	3	3	3	100	0	0
PLE_134	159	17768	360	F	06/09/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_135	159	17769	440	F	06/09/2018 00:00:00	27.7.j	7	7	7	9	9	7	7	67	13	12
PLE_136	159	17770	350	F	06/09/2018 00:00:00	27.7.j	4	4	4	6	6	4	4	67	22	19
PLE_137	159	17771	320	F	07/09/2018 00:00:00	27.7.j	3	3	3	5	4	4	3	50	22	18
PLE_138	159	17772	450	F	07/09/2018 00:00:00	27.7.j	8	8	8	8	8	8	8	100	0	0
PLE_139	159	17773	370	F	04/09/2018 00:00:00	27.7.j	4	4	4	4	4	4	4	100	0	0
PLE_140	159	17774	470		17/09/2018 00:00:00	27.7.j	6	6	5	6	6	6	6	83	7	5
PLE_141	159	17775	440		04/10/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4

PLE_142	159	17776	390		04/10/2018 00:00:00	27.7.j	6	6	5	7	9	6	6	50	21	15
PLE_143	159	17777	460		05/10/2018 00:00:00	27.7.j	9	9	7	9	9	8	9	67	10	8
PLE_144	159	17778	390		05/10/2018 00:00:00	27.7.j	6	6	5	6	7	6	6	67	11	6
PLE_145	159	17779	370		26/10/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	100	0	0
PLE_146	159	17780	420		26/10/2018 00:00:00	27.7.j	7	7	6	7	7	7	7	83	6	4
PLE_147	159	17781	360		26/10/2018 00:00:00	27.7.j	8	7	6	9	9	8	8	33	15	11
PLE_148	159	17782	470		26/10/2018 00:00:00	27.7.j	6	6	6	6	6	6	6	100	0	0
PLE_149	159	17783	440		02/11/2018 00:00:00	27.7.j	9	9	9	9	10	9	9	83	4	3
PLE_150	159	17784	430	F	02/11/2018 00:00:00	27.7.j	8	8	8	8	8	8	8	100	0	0
PLE_151	159	17785	410	F	02/11/2018 00:00:00	27.7.j	9	8	8	10	10	9	8	33	10	7
PLE_152	159	17786	460	F	02/11/2018 00:00:00	27.7.j	8	6	-	9	10	8	8	40	18	13
PLE_153	159	17787	420	F	27/11/2018 00:00:00	27.7.j	8	8	8	10	11	9	8	50	14	11
PLE_154	159	17788	420	F	28/11/2018 00:00:00	27.7.j	7	6	5	7	7	7	7	67	13	10
PLE_155	159	17789	290	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_156	159	17790	280	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_157	159	17791	270	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_158	159	17792	310	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_159	159	17793	270	F	22/11/2018 00:00:00	27.7.j	2	2	2	3	3	2	2	67	22	19
PLE_160	159	17794	290	F	22/11/2018 00:00:00	27.7.j	2	2	2	3	3	3	2	50	22	20
PLE_161	159	17795	260	F	22/11/2018 00:00:00	27.7.j	2	2	2	2	2	2	2	100	0	0
PLE_162	159	17796	430	F	26/11/2018 00:00:00	27.7.j	9	10	8	9	10	9	9	50	8	6
PLE_163	159	17797	380	F	26/11/2018 00:00:00	27.7.j	4	4	4	4	5	4	4	83	10	7
PLE_164	159	17798	360	F	26/11/2018 00:00:00	27.7.j	8	8	5	8	11	8	8	67	24	12
PLE_165	159	17799	370	F	26/11/2018 00:00:00	27.7.j	6	4	4	6	6	6	6	67	19	17
PLE_166	159	17800	380	F	26/11/2018 00:00:00	27.7.j	8	8	6	8	7	8	8	67	11	9
PLE_167	159	17801	360	F	29/11/2018 00:00:00	27.7.j	7	8	6	7	9	8	7	33	14	11
PLE_168	159	17802	250	M	22/11/2018 00:00:00	27.7.j	1	1	1	2	1	1	1	83	35	24
PLE_169	159	17803	290	M	22/11/2018 00:00:00	27.7.j	9	9	4	9	9	7	9	67	26	20
PLE_170	159	17804	210	M	22/11/2018 00:00:00	27.7.j	1	1	1	1	2	1	1	83	35	24
PLE_171	159	17805	370	M	27/11/2018	27.7.j	7	8	6	9	10	8	8	33	18	12

					00:00:00											
PLE_172	159	17616	380	F	21/11/2013 00:00:00	27.7.h	4	4	4	4	4	4	4	100	0	0
PLE_173	159	17615	390	F	21/11/2013 00:00:00	27.7.h	4	3	3	4	4	5	4	50	20	14
PLE_174	159	17617	340	F	11/11/2016 00:00:00	27.7.h	4	4	4	5	5	4	4	67	12	10
PLE_175	159	17618	350	M	14/11/2016 00:00:00	27.7.h	4	4	4	4	4	4	4	100	0	0
PLE_176	159	17619	290	M	14/11/2016 00:00:00	27.7.h	4	4	4	4	4	4	4	100	0	0
PLE_177	159	17620	380	F	14/11/2016 00:00:00	27.7.h	3	3	3	3	4	3	3	83	13	9
PLE_178	159	17621	450	F	19/11/2016 00:00:00	27.7.h	6	6	5	6	6	5	6	67	9	8
PLE_179	159	17622	230	F	25/11/2016 00:00:00	27.7.h	4	3	3	4	4	3	3	50	16	14
PLE_180	159	17623	270	M	25/11/2016 00:00:00	27.7.h	4	3	3	4	4	3	3	50	16	14
PLE_181	159	17624	260	M	25/11/2016 00:00:00	27.7.h	3	3	3	3	3	3	3	100	0	0
PLE_182	159	17625	240	F	25/11/2016 00:00:00	27.7.h	3	3	3	3	3	3	3	100	0	0
PLE_183	159	17626	230	F	25/11/2016 00:00:00	27.7.h	4	4	4	5	5	4	4	67	12	10
PLE_184	159	17627	280	F	25/11/2016 00:00:00	27.7.h	4	4	3	4	4	3	4	67	14	12
PLE_185	159	17628	290	F	25/11/2016 00:00:00	27.7.h	4	4	4	4	4	4	4	100	0	0
PLE_186	159	17629	270	F	25/11/2016 00:00:00	27.7.h	3	4	3	4	4	3	3	50	16	14
PLE_187	159	17630	320	F	25/11/2016 00:00:00	27.7.h	5	5	3	5	6	5	5	67	20	13
PLE_188	159	17631	290	F	25/11/2016 00:00:00	27.7.h	3	3	2	3	3	3	3	83	14	10
PLE_189	159	17632	350	F	25/11/2016 00:00:00	27.7.h	5	5	4	5	5	5	5	83	8	6
PLE_190	159	17633	370	F	29/11/2016 00:00:00	27.7.h	6	6	5	6	6	6	6	83	7	5
PLE_191	159	17634	380	M	29/11/2016 00:00:00	27.7.h	6	6	6	6	6	6	6	100	0	0

Table 9.2.2: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings per reader and per modal age are summarized at the end of the table.

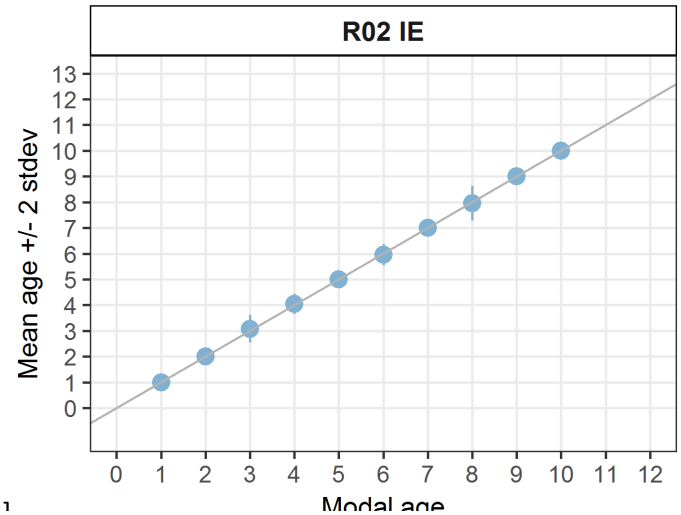
Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE	total
1	3	3	3	3	3	3	**18**
2	19	19	19	19	19	19	**114**
3	27	27	27	27	27	27	**162**
4	26	26	26	26	26	26	**156**
5	19	19	19	19	19	19	**114**
6	23	23	23	23	23	23	**138**
7	16	16	16	16	16	16	**96**
8	27	27	26	27	27	27	**161**
9	20	20	20	20	20	20	**120**
10	10	10	10	10	10	10	**60**
11	0	0	0	0	0	0	**0**
12	1	1	1	1	1	1	**6**
Total	**191**	**191**	**190**	**191**	**191**	**191**	**1145**

Table 9.2.3: Age composition by reader gives a summary of number of readings per reader.

Modal age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE
1	3	3	3	2	2	**3**
2	19	17	21	16	17	**17**
3	25	30	32	25	24	**28**
4	27	28	31	24	25	**29**
5	21	20	27	27	24	**18**
6	22	24	33	21	19	**20**
7	18	19	15	16	18	**18**
8	24	21	23	22	18	**28**
9	21	20	5	25	21	**17**
10	10	8	0	11	17	**11**
11	0	0	0	2	5	**1**
12	1	1	0	0	1	**1**
Total	**191**	**191**	**190**	**191**	**191**	**191**

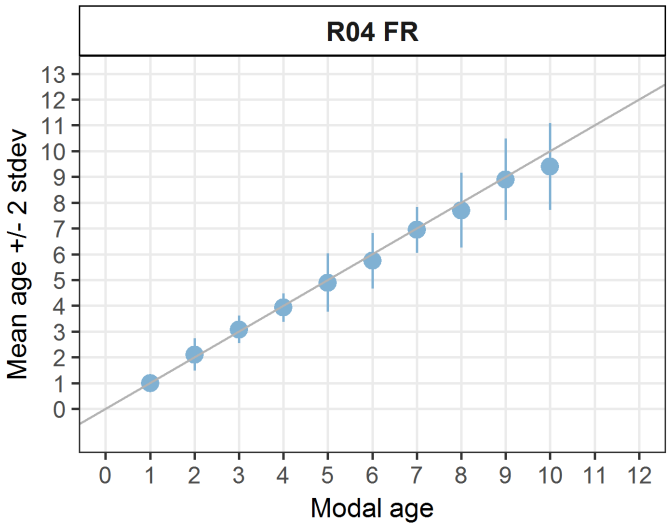
Table 9.2.4: Mean length at age per reader is calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R02 IE	R04 FR	R06 FR	R08 BE	R10 BE	R12 IE
1	193 mm	193 mm	193 mm	165 mm	185 mm	**193 mm**
2	236 mm	242 mm	241 mm	236 mm	229 mm	**236 mm**
3	298 mm	296 mm	298 mm	286 mm	291 mm	**287 mm**
4	309 mm	314 mm	334 mm	307 mm	309 mm	**324 mm**
5	367 mm	362 mm	380 mm	353 mm	358 mm	**364 mm**
6	381 mm	389 mm	376 mm	380 mm	373 mm	**381 mm**
7	376 mm	374 mm	417 mm	379 mm	377 mm	**373 mm**
8	398 mm	405 mm	417 mm	397 mm	395 mm	**398 mm**
9	410 mm	414 mm	414 mm	406 mm	404 mm	**414 mm**
10	423 mm	415 mm	-	424 mm	419 mm	**422 mm**
11	-	-	-	390 mm	402 mm	**410 mm**
12	390 mm	390 mm	-	-	390 mm	**390 mm**
Weighted Mean	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**	**348 mm**

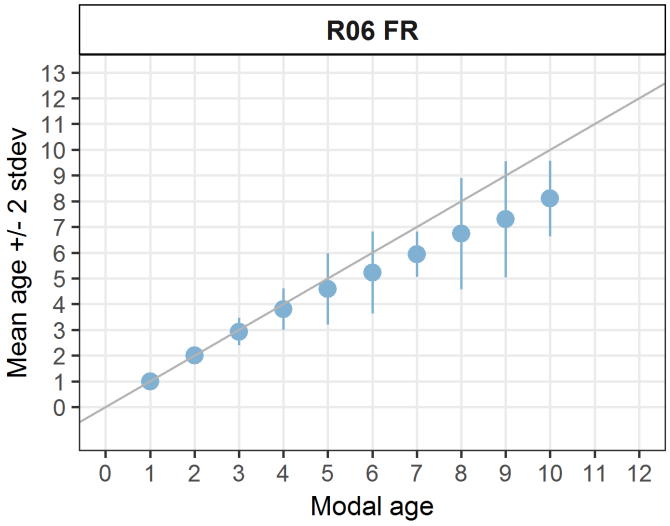

R02 IE
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

[[1]]

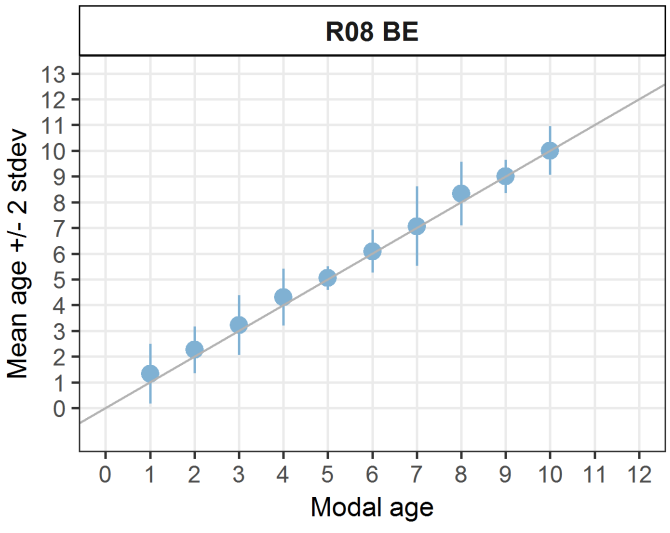
[[2]]


R04 FR
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

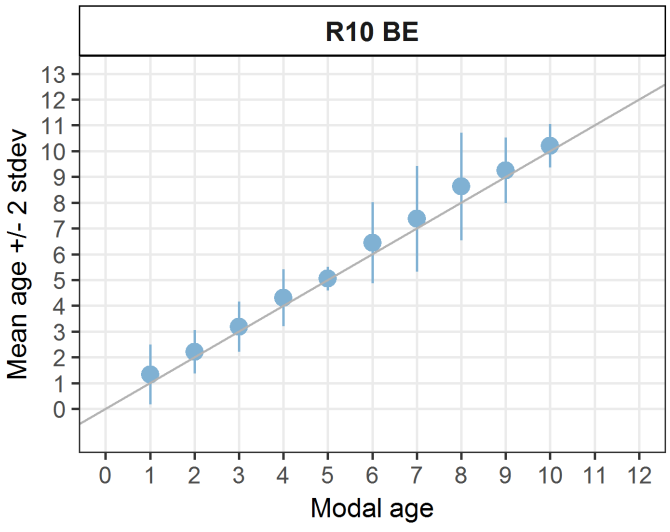
[[3]]


R06 FR
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

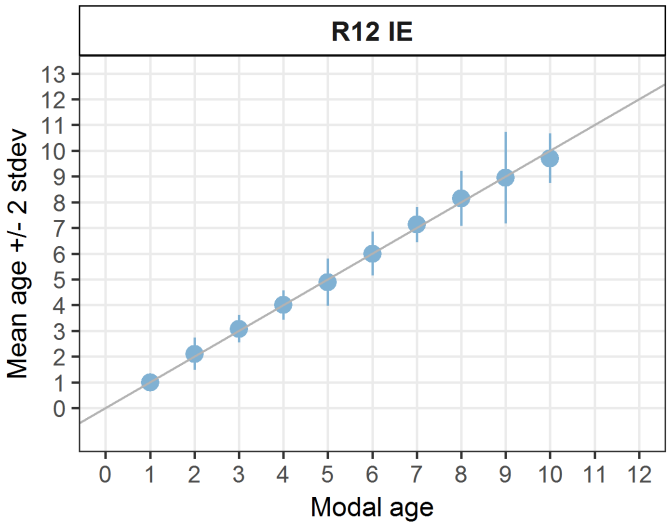
[[4]]


R08 BE
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 7 8 9 10 11 12 13

[[5]]


R10 BE
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 7 8 9 10 11 12 13

[[6]]


R12 IE
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 7 8 9 10 11 12 13

8.3 Results all readers-sectioned otoliths

Data Overview

Table 9.3.1: Summary of statistics; PA (%), CV (%) and APE (%).

CV	PA	APE
26 %	56 %	18 %

Table 9.3.2: Data overview including modal age and statistics per sample.

Fish ID	Event ID	Image ID	length	sex	Catch date	ICES area	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB	Modal age	PA %	CV %	APE %
PLE_192	159	17551	450	F	01/04/2018 00:00:00	27.7.h	9	8	9	9	9	9	80	5	4
PLE_193	159	17552	510	F	01/04/2018 00:00:00	27.7.h	10	8	11	10	12	10	40	15	10
PLE_194	159	17553	480	F	01/04/2018 00:00:00	27.7.h	9	7	9	10	11	9	40	16	11
PLE_195	159	17554	470	F	01/04/2018 00:00:00	27.7.h	10	8	10	10	12	10	60	14	8
PLE_196	159	17555	520	F	01/04/2018 00:00:00	27.7.h	8	7	8	8	9	8	60	9	5
PLE_197	159	17556	440	F	01/04/2018 00:00:00	27.7.h	8	6	8	8	8	8	80	12	8
PLE_198	159	17557	430	F	01/04/2018 00:00:00	27.7.h	8	7	8	8	8	8	80	6	4
PLE_199	159	17558	420	F	01/04/2018 00:00:00	27.7.h	6	5	5	5	8	5	60	22	17
PLE_200	159	17559	460	F	01/04/2018 00:00:00	27.7.h	10	6	10	9	12	10	40	23	16
PLE_201	159	17560	400	F	01/04/2018 00:00:00	27.7.h	9	7	9	8	9	9	60	11	9
PLE_202	159	17561	390	F	01/04/2018 00:00:00	27.7.h	9	7	9	9	9	9	80	10	7
PLE_203	159	17562	380	F	01/04/2018 00:00:00	27.7.h	9	7	8	9	9	9	60	11	9
PLE_204	159	17563	410	F	01/04/2018 00:00:00	27.7.h	8	6	8	8	10	8	60	18	10
PLE_205	159	17564	420	M	01/04/2018 00:00:00	27.7.h	8	5	7	6	8	8	40	19	15
PLE_206	159	17565	400	M	01/04/2018 00:00:00	27.7.h	7	7	7	6	8	7	60	10	6
PLE_207	159	17566	390	M	01/04/2018 00:00:00	27.7.h	9	6	8	8	9	8	40	15	10
PLE_208	159	17567	370	F	01/04/2018 00:00:00	27.7.h	6	5	6	6	6	6	80	8	6
PLE_209	159	17568	360	F	01/04/2018 00:00:00	27.7.h	7	6	7	7	9	7	60	15	10
PLE_210	159	17569	430	M	01/04/2018 00:00:00	27.7.h	10	6	10	8	10	10	60	20	16
PLE_211	159	17570	330	F	01/04/2018 00:00:00	27.7.h	5	5	5	5	7	5	80	17	12
PLE_212	159	17571	350	F	01/04/2018 00:00:00	27.7.h	6	5	7	6	7	6	40	13	10
PLE_213	159	17572	340	F	01/04/2018 00:00:00	27.7.h	5	5	5	5	5	5	100	0	0

PLE_214	159	17573	380	M	01/04/2018 00:00:00	27.7.h	8	6	8	8	11	8	60	22	14
PLE_215	159	17574	360	M	01/04/2018 00:00:00	27.7.h	7	4	7	6	9	7	40	28	19
PLE_216	159	17575	370	M	01/04/2018 00:00:00	27.7.h	6	5	7	5	13	5	40	46	32
PLE_217	159	17576	350	M	01/04/2018 00:00:00	27.7.h	5	4	6	4	7	4	40	25	20
PLE_218	159	17577	320	F	01/04/2018 00:00:00	27.7.h	4	4	4	4	5	4	80	11	8
PLE_219	159	17578	310	F	01/04/2018 00:00:00	27.7.h	4	3	4	4	5	4	60	18	10
PLE_220	159	17579	330	M	01/04/2018 00:00:00	27.7.h	4	4	5	4	8	4	60	35	24
PLE_221	159	17580	460	F	01/07/2018 00:00:00	27.7.h	8	6	8	8	11	8	60	22	14
PLE_222	159	17581	410	F	01/07/2018 00:00:00	27.7.h	9	7	9	9	9	9	80	10	7
PLE_223	159	17582	450	F	01/07/2018 00:00:00	27.7.h	10	7	10	10	8	10	60	16	13
PLE_224	159	17583	490	F	01/07/2018 00:00:00	27.7.h	12	8	13	10	11	8	20	18	13
PLE_225	159	17584	440	F	01/07/2018 00:00:00	27.7.h	8	6	8	7	8	8	60	12	10
PLE_226	159	17585	510	F	01/07/2018 00:00:00	27.7.h	11	8	11	11	9	11	60	14	12
PLE_227	159	17586	470	F	01/07/2018 00:00:00	27.7.h	6	5	7	6	14	6	40	48	34
PLE_228	159	17587	480	F	01/07/2018 00:00:00	27.7.h	9	5	9	-	11	9	50	30	21
PLE_229	159	17588	500	F	01/07/2018 00:00:00	27.7.h	12	7	9	8	19	7	20	44	33
PLE_230	159	17589	530	F	01/07/2018 00:00:00	27.7.h	16	9	12	12	15	12	40	22	17
PLE_231	159	17590	420	F	01/07/2018 00:00:00	27.7.h	6	4	5	6	14	6	40	57	40
PLE_232	159	17591	430	F	01/07/2018 00:00:00	27.7.h	10	7	9	9	14	9	40	26	18
PLE_233	159	17592	400	F	01/07/2018 00:00:00	27.7.h	6	4	7	6	11	6	40	38	26
PLE_234	159	17593	430	M	01/07/2018 00:00:00	27.7.h	12	6	12	-	14	12	50	31	23
PLE_235	159	17594	370	F	01/07/2018 00:00:00	27.7.h	4	4	4	4	9	4	80	45	32
PLE_236	159	17595	380	F	01/07/2018 00:00:00	27.7.h	7	6	6	7	10	6	40	23	16
PLE_237	159	17596	390	F	01/07/2018 00:00:00	27.7.h	8	5	7	6	13	5	20	40	28
PLE_238	159	17597	390	M	01/07/2018 00:00:00	27.7.h	8	5	8	7	11	8	40	28	18
PLE_239	159	17598	360	F	01/07/2018 00:00:00	27.7.h	5	5	6	5	9	5	60	29	20
PLE_240	159	17599	410	M	01/07/2018 00:00:00	27.7.h	11	7	11	10	12	11	40	19	13
PLE_241	159	17600	350	F	01/07/2018 00:00:00	27.7.h	5	6	5	5	7	5	60	16	13
PLE_242	159	17601	340	F	01/07/2018 00:00:00	27.7.h	4	4	4	4	5	4	80	11	8
PLE_243	159	17602	330	F	01/07/2018	27.7.h	4	4	4	4	-	4	100	0	0

					00:00:00										
PLE_244	159	17603	330	M	01/07/2018	27.7.h	7	4	6	5	9	4	20	31	23
					00:00:00										
PLE_245	159	17604	310	F	01/07/2018	27.7.h	3	2	3	3	4	3	60	24	13
					00:00:00										
PLE_246	159	17605	350	M	01/07/2018	27.7.h	8	5	8	-	9	8	50	23	17
					00:00:00										
PLE_247	159	17606	320	F	01/07/2018	27.7.h	6	-	5	5	6	5	50	10	9
					00:00:00										
PLE_248	159	17607	370	M	01/07/2018	27.7.h	5	4	5	5	9	5	60	35	24
					00:00:00										
PLE_249	159	17608	340	M	01/07/2018	27.7.h	7	5	8	6	7	7	40	17	13
					00:00:00										
PLE_250	159	17609	320	M	01/07/2018	27.7.h	4	4	5	4	7	4	60	27	20
					00:00:00										
PLE_251	159	17610	300	F	01/07/2018	27.7.h	6	5	6	5	5	5	60	10	9
					00:00:00										
PLE_252	159	17611	270	F	01/07/2018	27.7.h	5	4	5	4	5	5	60	12	10
					00:00:00										
PLE_253	159	17612	280	F	01/07/2018	27.7.h	2	2	2	2	4	2	80	37	27
					00:00:00										
PLE_254	159	17613	300	M	01/07/2018	27.7.h	6	4	5	4	9	4	40	37	27
					00:00:00										
PLE_255	159	17614	300	M	01/07/2018	27.7.h	2	2	2	2	5	2	80	52	37
					00:00:00										

Table 9.3.3: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings per reader and per modal age are summarized at the end of the table.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB	total
2	2	2	2	2	2	**10**
3	1	1	1	1	1	**5**
4	10	10	10	10	9	**49**
5	11	10	11	11	11	**54**
6	6	6	6	6	6	**30**
7	5	5	5	5	5	**25**
8	12	12	12	11	12	**59**
9	8	8	8	7	8	**39**
10	5	5	5	5	5	**25**
11	2	2	2	2	2	**10**
12	2	2	2	1	2	**9**
Total	**64**	**63**	**64**	**61**	**63**	**315**

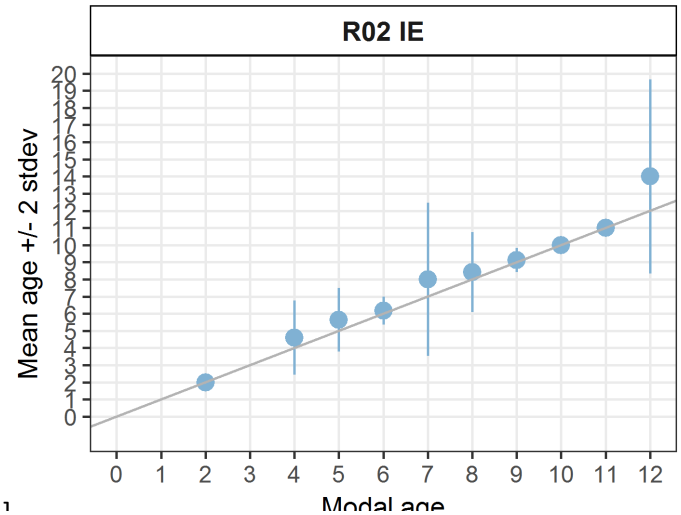
Table 9.3.4: Age composition by reader gives a summary of number of readings per reader.

Modal age	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB
2	2	3	2	2	**0**
3	1	1	1	1	**0**
4	7	14	5	10	**2**
5	7	15	11	10	**7**
6	10	12	6	10	**2**
7	6	12	9	4	**6**
8	11	5	12	10	**8**
9	8	1	8	6	**16**
10	6	0	4	6	**3**
11	2	0	3	1	**7**
12	3	0	2	1	**4**
13	0	0	1	0	**2**
14	0	0	0	0	**4**
15	0	0	0	0	**1**

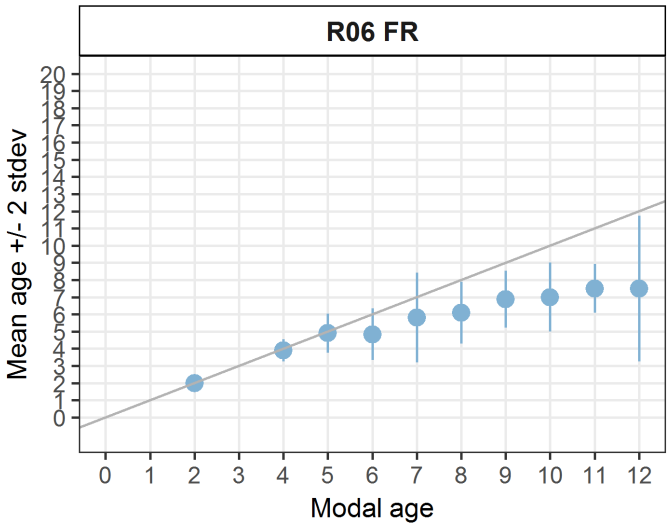
16	1	0	0	0	**0**
19	0	0	0	0	**1**
Total	**64**	**63**	**64**	**61**	**63**

Table 9.3.5: Mean 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.

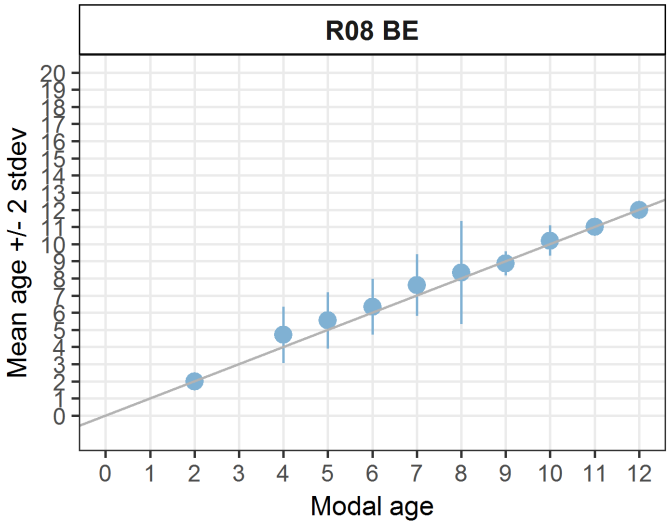
Age	R02 IE	R06 FR	R08 BE	R10 BE	R20 GB
2	290 mm	297 mm	290 mm	290 mm	-
3	310 mm	310 mm	310 mm	310 mm	-
4	331 mm	344 mm	334 mm	324 mm	**295 mm**
5	339 mm	379 mm	343 mm	349 mm	**311 mm**
6	372 mm	411 mm	348 mm	392 mm	**345 mm**
7	362 mm	433 mm	391 mm	392 mm	**340 mm**
8	421 mm	486 mm	411 mm	436 mm	**416 mm**
9	422 mm	530 mm	442 mm	420 mm	**391 mm**
10	458 mm	-	452 mm	468 mm	**407 mm**
11	460 mm	-	477 mm	510 mm	**440 mm**
12	473 mm	-	480 mm	530 mm	**462 mm**
13	-	-	490 mm	-	**380 mm**
14	-	-	-	-	**438 mm**
15	-	-	-	-	**530 mm**
16	530 mm	-	-	-	-
19	-	-	-	-	**500 mm**
Weighted Mean	**392 mm**	**393 mm**	**392 mm**	**391 mm**	**393 mm**


R02 IE
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

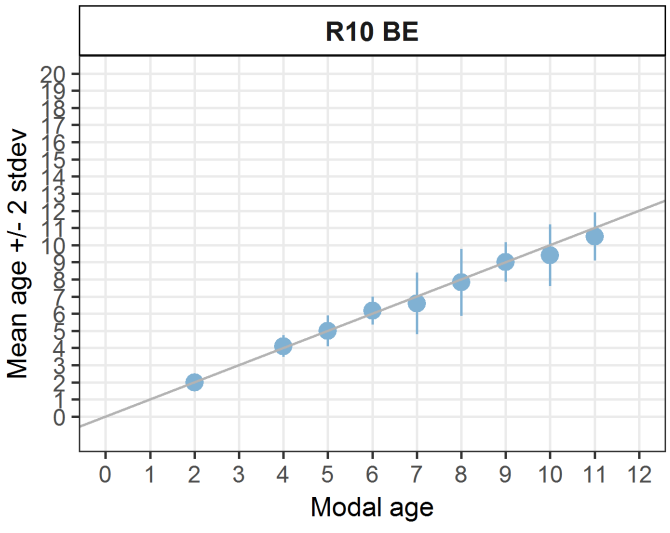
[[1]] [[2]]


R06 FR
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

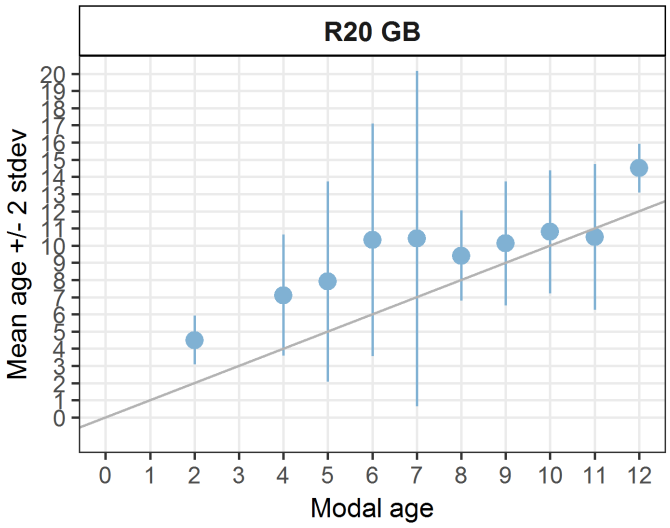
[[3]]


R08 BE
Mean age +/- 2 stdev
0 1 2 3 4 5 6 7 8 9 10 11 12
Modal age

[[4]]


R10 BE
Mean age +/- 2 stdev
Modal age
0 1 2 3 4 5 6 7 8 9 10 11 12

[[5]]


R20 GB
Mean age +/- 2 stdev
Modal age
0 1 2 3 4 5 6 7 8 9 10 11 12

8.4 Results advanced readers-sectioned otoliths

All samples included

Data Overview

Table 9.4.1: Data overview including modal age and statistics per sample.

Fish ID	Event ID	Image ID	length	sex	Catch date	ICES area	R02 IE	R06 FR	R08 BE	R10 BE	Modal age	PA %	CV %	APE %
PLE_192	159	17551	450	F	01/04/2018 00:00:00	27.7.h	9	8	9	9	9	75	6	4
PLE_193	159	17552	510	F	01/04/2018 00:00:00	27.7.h	10	8	11	10	10	50	13	9
PLE_194	159	17553	480	F	01/04/2018 00:00:00	27.7.h	9	7	9	10	9	50	14	10
PLE_195	159	17554	470	F	01/04/2018 00:00:00	27.7.h	10	8	10	10	10	75	11	8
PLE_196	159	17555	520	F	01/04/2018 00:00:00	27.7.h	8	7	8	8	8	75	6	5
PLE_197	159	17556	440	F	01/04/2018 00:00:00	27.7.h	8	6	8	8	8	75	13	10
PLE_198	159	17557	430	F	01/04/2018 00:00:00	27.7.h	8	7	8	8	8	75	6	5
PLE_199	159	17558	420	F	01/04/2018 00:00:00	27.7.h	6	5	5	5	5	75	10	7
PLE_200	159	17559	460	F	01/04/2018 00:00:00	27.7.h	10	6	10	9	10	50	22	16
PLE_201	159	17560	400	F	01/04/2018 00:00:00	27.7.h	9	7	9	8	9	50	12	9
PLE_202	159	17561	390	F	01/04/2018 00:00:00	27.7.h	9	7	9	9	9	75	12	9
PLE_203	159	17562	380	F	01/04/2018 00:00:00	27.7.h	9	7	8	9	9	50	12	9
PLE_204	159	17563	410	F	01/04/2018 00:00:00	27.7.h	8	6	8	8	8	75	13	10
PLE_205	159	17564	420	M	01/04/2018 00:00:00	27.7.h	8	5	7	6	5	25	20	15
PLE_206	159	17565	400	M	01/04/2018 00:00:00	27.7.h	7	7	7	6	7	75	7	6
PLE_207	159	17566	390	M	01/04/2018 00:00:00	27.7.h	9	6	8	8	8	50	16	11
PLE_208	159	17567	370	F	01/04/2018 00:00:00	27.7.h	6	5	6	6	6	75	9	7
PLE_209	159	17568	360	F	01/04/2018 00:00:00	27.7.h	7	6	7	7	7	75	7	6
PLE_210	159	17569	430	M	01/04/2018 00:00:00	27.7.h	10	6	10	8	10	50	23	18
PLE_211	159	17570	330	F	01/04/2018 00:00:00	27.7.h	5	5	5	5	5	100	0	0
PLE_212	159	17571	350	F	01/04/2018 00:00:00	27.7.h	6	5	7	6	6	50	14	8
PLE_213	159	17572	340	F	01/04/2018 00:00:00	27.7.h	5	5	5	5	5	100	0	0
PLE_214	159	17573	380	M	01/04/2018 00:00:00	27.7.h	8	6	8	8	8	75	13	10

PLE_215	159	17574	360	M	01/04/2018 00:00:00	27.7.h	7	4	7	6	7	50	24	17
PLE_216	159	17575	370	M	01/04/2018 00:00:00	27.7.h	6	5	7	5	5	50	17	13
PLE_217	159	17576	350	M	01/04/2018 00:00:00	27.7.h	5	4	6	4	4	50	20	16
PLE_218	159	17577	320	F	01/04/2018 00:00:00	27.7.h	4	4	4	4	4	100	0	0
PLE_219	159	17578	310	F	01/04/2018 00:00:00	27.7.h	4	3	4	4	4	75	13	10
PLE_220	159	17579	330	M	01/04/2018 00:00:00	27.7.h	4	4	5	4	4	75	12	9
PLE_221	159	17580	460	F	01/07/2018 00:00:00	27.7.h	8	6	8	8	8	75	13	10
PLE_222	159	17581	410	F	01/07/2018 00:00:00	27.7.h	9	7	9	9	9	75	12	9
PLE_223	159	17582	450	F	01/07/2018 00:00:00	27.7.h	10	7	10	10	10	75	16	12
PLE_224	159	17583	490	F	01/07/2018 00:00:00	27.7.h	12	8	13	10	8	25	21	16
PLE_225	159	17584	440	F	01/07/2018 00:00:00	27.7.h	8	6	8	7	8	50	13	10
PLE_226	159	17585	510	F	01/07/2018 00:00:00	27.7.h	11	8	11	11	11	75	15	11
PLE_227	159	17586	470	F	01/07/2018 00:00:00	27.7.h	6	5	7	6	6	50	14	8
PLE_228	159	17587	480	F	01/07/2018 00:00:00	27.7.h	9	5	9	-	9	67	30	23
PLE_229	159	17588	500	F	01/07/2018 00:00:00	27.7.h	12	7	9	8	7	25	24	17
PLE_230	159	17589	530	F	01/07/2018 00:00:00	27.7.h	16	9	12	12	12	50	23	15
PLE_231	159	17590	420	F	01/07/2018 00:00:00	27.7.h	6	4	5	6	6	50	18	14
PLE_232	159	17591	430	F	01/07/2018 00:00:00	27.7.h	10	7	9	9	9	50	14	10
PLE_233	159	17592	400	F	01/07/2018 00:00:00	27.7.h	6	4	7	6	6	50	22	15
PLE_234	159	17593	430	M	01/07/2018 00:00:00	27.7.h	12	6	12	-	12	67	35	27
PLE_235	159	17594	370	F	01/07/2018 00:00:00	27.7.h	4	4	4	4	4	100	0	0
PLE_236	159	17595	380	F	01/07/2018 00:00:00	27.7.h	7	6	6	7	6	50	9	8
PLE_237	159	17596	390	F	01/07/2018 00:00:00	27.7.h	8	5	7	6	5	25	20	15
PLE_238	159	17597	390	M	01/07/2018 00:00:00	27.7.h	8	5	8	7	8	50	20	14
PLE_239	159	17598	360	F	01/07/2018 00:00:00	27.7.h	5	5	6	5	5	75	10	7
PLE_240	159	17599	410	M	01/07/2018 00:00:00	27.7.h	11	7	11	10	11	50	19	14
PLE_241	159	17600	350	F	01/07/2018 00:00:00	27.7.h	5	6	5	5	5	75	10	7
PLE_242	159	17601	340	F	01/07/2018 00:00:00	27.7.h	4	4	4	4	4	100	0	0
PLE_243	159	17602	330	F	01/07/2018 00:00:00	27.7.h	4	4	4	4	4	100	0	0
PLE_244	159	17603	330	M	01/07/2018	27.7.h	7	4	6	5	4	25	23	18

					00:00:00									
PLE_245	159	17604	310	F	01/07/2018 00:00:00	27.7.h	3	2	3	3	3	75	18	14
PLE_246	159	17605	350	M	01/07/2018 00:00:00	27.7.h	8	5	8	-	8	67	25	19
PLE_247	159	17606	320	F	01/07/2018 00:00:00	27.7.h	6	-	5	5	5	67	11	8
PLE_248	159	17607	370	M	01/07/2018 00:00:00	27.7.h	5	4	5	5	5	75	11	8
PLE_249	159	17608	340	M	01/07/2018 00:00:00	27.7.h	7	5	8	6	5	25	20	15
PLE_250	159	17609	320	M	01/07/2018 00:00:00	27.7.h	4	4	5	4	4	75	12	9
PLE_251	159	17610	300	F	01/07/2018 00:00:00	27.7.h	6	5	6	5	5	50	10	9
PLE_252	159	17611	270	F	01/07/2018 00:00:00	27.7.h	5	4	5	4	4	50	13	11
PLE_253	159	17612	280	F	01/07/2018 00:00:00	27.7.h	2	2	2	2	2	100	0	0
PLE_254	159	17613	300	M	01/07/2018 00:00:00	27.7.h	6	4	5	4	4	50	20	16
PLE_255	159	17614	300	M	01/07/2018 00:00:00	27.7.h	2	2	2	2	2	100	0	0

Table 9.4.2: Number of age readings table gives an overview of number of readings per reader and modal age. The total numbers of readings per reader and per modal age are summarized at the end of the table.

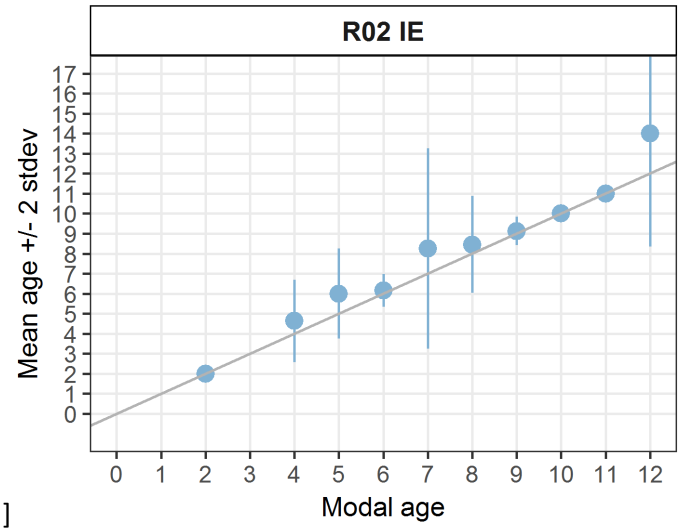
Modal age	R02 IE	R06 FR	R08 BE	R10 BE	total
2	2	2	2	2	**8**
3	1	1	1	1	**4**
4	11	11	11	11	**44**
5	12	11	12	12	**47**
6	6	6	6	6	**24**
7	4	4	4	4	**16**
8	11	11	11	10	**43**
9	8	8	8	7	**31**
10	5	5	5	5	**20**
11	2	2	2	2	**8**
12	2	2	2	1	**7**
Total	**64**	**63**	**64**	**61**	**252**

Table 9.4.3: Age composition by reader gives a summary of number of readings per reader.

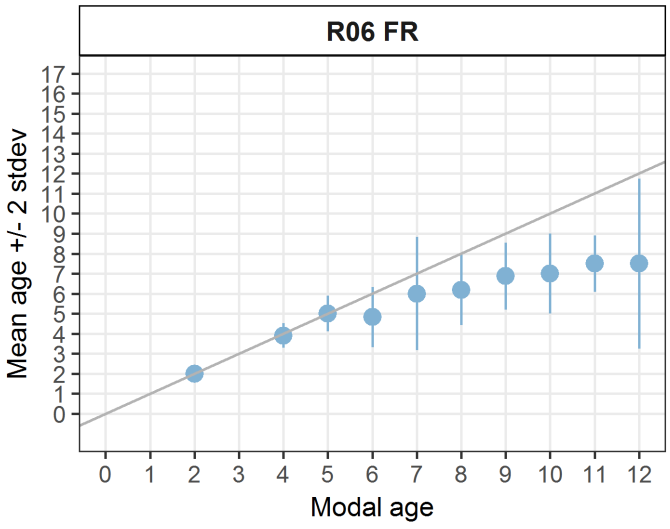
Modal age	R02 IE	R06 FR	R08 BE	R10 BE
2	2	3	2	**2**
3	1	1	1	**1**
4	7	14	5	**10**
5	7	15	11	**10**
6	10	12	6	**10**
7	6	12	9	**4**
8	11	5	12	**10**
9	8	1	8	**6**
10	6	0	4	**6**
11	2	0	3	**1**
12	3	0	2	**1**
13	0	0	1	**0**
16	1	0	0	**0**
Total	**64**	**63**	**64**	**61**

Table 9.4.4: Mean 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.

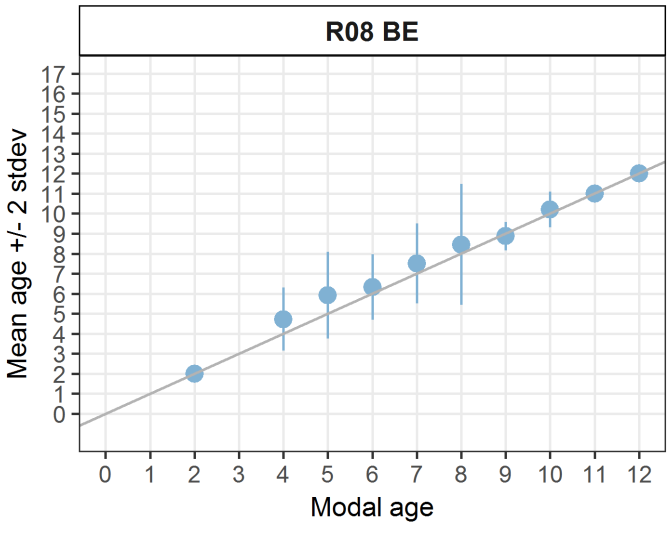
Age	R02 IE	R06 FR	R08 BE	R10 BE
2	290 mm	297 mm	290 mm	**290 mm**
3	310 mm	310 mm	310 mm	**310 mm**
4	331 mm	344 mm	334 mm	**324 mm**
5	339 mm	379 mm	343 mm	**349 mm**
6	372 mm	411 mm	348 mm	**392 mm**
7	362 mm	433 mm	391 mm	**392 mm**
8	421 mm	486 mm	411 mm	**436 mm**
9	422 mm	530 mm	442 mm	**420 mm**
10	458 mm	-	452 mm	**468 mm**
11	460 mm	-	477 mm	**510 mm**
12	473 mm	-	480 mm	**530 mm**
13	-	-	490 mm	-
16	530 mm	-	-	-
Weighted Mean	**392 mm**	**393 mm**	**392 mm**	**391 mm**



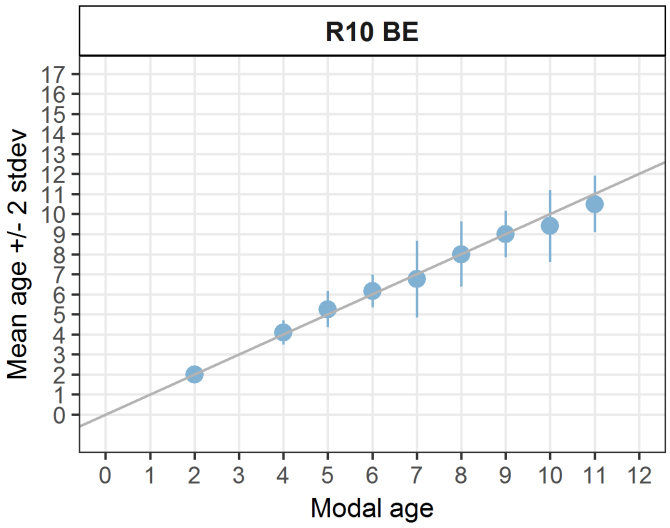
[[1]] [[2]]



[[3]]


R08 BE
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 7 8 9 10 11 12 13 14 15 16 17

[[4]]


R10 BE
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 7 8 9 10 11 12 13 14 15 16 17

9 Annex 2. Recommendations

Due to low reader agreement on ‘sectioned’ otoliths it is recommended that WGBIOP:

- Review the methods used to age plaice for stock assessment purposes in 7h-k and identify how to ensure consistency between institutes
- Define a framework/roadmap for improved reader agreement, i.e. regular mini exchanges utilising the SmartDots platform, revised protocol, unbalanced sample size for 7h and 7jk divisions

Readers involved in age determination of plaice in 7.h-k should familiarize themselves with current reference sets / interpretation protocols and consistently follow them while ageing.

Regular exchanges, both internally and externally, to learn and to improve the agreements between readers should be organised using SmartDots application.

The possibilities for validation studies focussing on regularity of growth patterns and formation of the 1st annulus in otoliths of plaice should be further investigated.