

Report of the autumn 2019 Western Baltic cod (*Gadus morhua*) age reading exchange – SD 22

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SmartDots event ID: 251

- an age reading guide for Western Baltic cod (cod2224) is attached to this document -

Introduction

In spring 2019, a preliminary age reading exercise of Western Baltic cod (*Gadus morhua*) in ICES SD 22 took place (Smartdot event ID 201). One conclusion was to conduct regular otolith exchanges to continuously train age readers.

In autumn 2019 this second age reading comparison was conducted. It included a larger number of otoliths (n=360) covering two different quarters. A total of six age readers from three countries participated. The exchange included sliced otoliths, however, this method is currently only used in Germany. Denmark and Sweden use broken otoliths for aging. This had been already an issue in the previous spring exchange because readers reading broken otoliths are not used to read sliced otoliths.

Recently, McQueen et al. (2019) validated the zone formation of otoliths from juvenile Western Baltic cod (age 0 and age 1), and Krumme et al. (2020) validated the zone formation of both juvenile and young adult Western Baltic cod (age 0 to age 3). Both studies identified a change in the interpretation of the timing of the translucent zone (TZ) formation: the TZ is formed during summer, and not – as previously thought – during winter. Prior to this age reading comparison, McQueen et al. (2019), a manuscript version of Krumme et al. (2020) and a brief instruction for this otolith exchange via Smartdots using sliced otoliths was distributed.

The objectives of the present exchange were to:

- Evaluate the accuracy and precision in age reading of sliced Western Baltic cod otolith (SD 22)
- Train new age readers for this stock
- Identify common error sources in age reading
- Discuss and agree on the next steps to be taken as a form of an online workshop
- After the autumn otolith exchange, an online meeting was conducted on June 3rd 2020 to discuss the results from the exchange with all age readers. Frequent errors and uncertainties in the age readings were highlighted and discussed, the aim being, to support the learning process.

Methods

Overview of samples and readers

Six age readers from three countries participated in the Western Baltic cod otolith exchange in autumn 2019 (Table 1). Two age readers were trained and read Western Baltic cod otoliths for the first time (“basic” expertise). The advanced readers provide the age readings for the stock assessment. All images were from sectioned otoliths; however, most age readers read broken cod otoliths in their routine work.

Table 1: Reader overview.

Country	Reader code	Expertise	standard method
Denmark	R02 DK	Advanced	Broken
Germany	R04 DE	Advanced	Sliced
Denmark	R06 DK	Advanced	Broken
Sweden	R08 SE	Advanced	Broken
Sweden	R10 SE	Basic	Broken
Sweden	R12 SE	Basic	Broken

In total, 360 otoliths covering fish lengths between 8 and 100 cm were included in this exchange. Samples covered quarter 1 and 4 and represented samples from the Baltic International Trawl Survey (BITS).

Table 2: Overview of samples used for the Western Baltic cod autumn 2019 exchange.

Year	ICES area	Quarter	Number of samples	Modal age range	Length range
2018	SD 22	4	155	0-8	80-1000 mm
2019	SD 22	1	205	1-7	120-880 mm

Statistical analysis

In the first part of analysis the tables and plots from the Guus Eltink Excel sheet ‘Age Reading Comparisons’ ([Eltink, A.T.G.W. 2000](#)) are presented. The order and numbering of tables and plots are the same as in the excel sheet. Tables 6.1 - 6.4 from the ‘Age Reading Comparisons’ sheet are not output since these are merely used to do calculations for the other tables.

All statistical analyses were conducted separately for i) all age readers and ii) “advanced” age readers. If a reader was classified “advanced”, the age reader was considered well trained and she/he provides ages for stock assessment or similar purposes. Prior to the age reading comparison, McQueen et al. (2019) and a manuscript version of Krumme et al. (2020), both dealing with validated, sectioned otoliths of Western Baltic cod, were distributed.

The following metrics were determined:

Percentage Agreement

The percentage agreement (PA) is calculated as the ratio between the number of age readings in agreement with the modal age and the total number of age readings for that sample per reader and modal age. The weighted mean is calculated based on the number of age readings.

$$PA = \frac{n_{modalage}}{n_{total}} * 100$$

Co-efficient of Variation (CV)

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

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

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:

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

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

Age error matrix (AEM)

Age error matrices (AEM) were produced following procedures outlined by WKSABCAL (2014) where the matrix shows the proportion of each modal age mis-aged as other ages. The sum of each row is 1, which equals 100%. The age data was analysed twice, the first time all readers were included and the second time only the “advanced” readers were included. 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.

Results

All readers

The weighted average percentage agreement based on modal ages for all readers was 84 %, with the weighted average CV of 15 % and APE of 6 %.

Table 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.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE	all
0	-	-	-	-	-	-	-
1	33 %	38 %	31 %	17 %	17 %	23 %	34 %
2	11 %	8 %	29 %	17 %	9 %	16 %	18 %
3	7 %	5 %	23 %	9 %	6 %	11 %	12 %
4	11 %	5 %	13 %	10 %	8 %	14 %	11 %
5	6 %	5 %	14 %	12 %	5 %	10 %	10 %
6	5 %	0 %	8 %	10 %	0 %	7 %	9 %
7	0 %	0 %	10 %	8 %	0 %	0 %	9 %
8	-	-	-	-	-	-	5 %
Weighted Mean	11 %	9 %	23 %	12 %	8 %	13 %	15 %

The percentage agreement per reader per modal age gives the percentage of readings which are equal to the modal age. The weighted mean included at the bottom of the table, is weighted according to number of age readings. At model age 0, the PA calculated across all readers is only 67 %, with two readers having 20 or 0 % agreement. In none of the modal ages was PA above 90 %.

Table 4: Percentage agreement (PA) table represents the PA per modal age and reader, the PA of all readers combined per modal age and a weighted mean of the PA per reader.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE	all
0	20 %	100 %	0 %	94 %	91 %	97 %	67 %
1	81 %	88 %	41 %	97 %	97 %	94 %	83 %
2	94 %	97 %	56 %	83 %	97 %	86 %	85 %
3	96 %	98 %	60 %	93 %	97 %	89 %	89 %
4	81 %	97 %	73 %	77 %	90 %	81 %	83 %
5	89 %	93 %	64 %	68 %	93 %	70 %	80 %
6	91 %	100 %	18 %	45 %	100 %	82 %	73 %
7	100 %	100 %	0 %	67 %	100 %	100 %	78 %
8	100 %	100 %	100 %	100 %	0 %	100 %	83 %
Weighted Mean	85 %	97 %	51 %	86 %	95 %	87 %	84 %

The relative bias is the difference between the mean age (per modal age per reader) and the modal age. A positive bias indicates an overestimation of age compared to the modal age. As for the previous tables, a combined bias for all readers and weighted means were calculated. While modal ages 0-3 showed an overestimation of age compared to the modal age, modal age 7 and 8 showed an underestimation of age compared to the modal age.

Table 5: 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. Red and blue values indicate positive and negative bias, respectively.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE	all
0	0.80	0.00	1.00	0.06	0.09	0.03	0.33
1	0.19	-0.06	0.59	0.03	0.03	0.06	0.14
2	0.06	0.03	0.26	0.17	-0.03	0.14	0.10
3	0.00	0.01	-0.17	0.07	-0.01	0.00	-0.02
4	0.06	-0.03	-0.20	0.23	-0.03	-0.03	0.00
5	0.11	-0.07	-0.04	0.39	-0.07	0.15	0.08
6	0.09	0.00	-0.82	0.64	0.00	0.00	-0.02
7	0.00	0.00	-1.33	0.33	0.00	0.00	-0.17
8	0.00	0.00	0.00	0.00	-1.00	0.00	-0.17
Weighted Mean	0.12	-0.01	0.08	0.14	-0.01	0.04	0.06

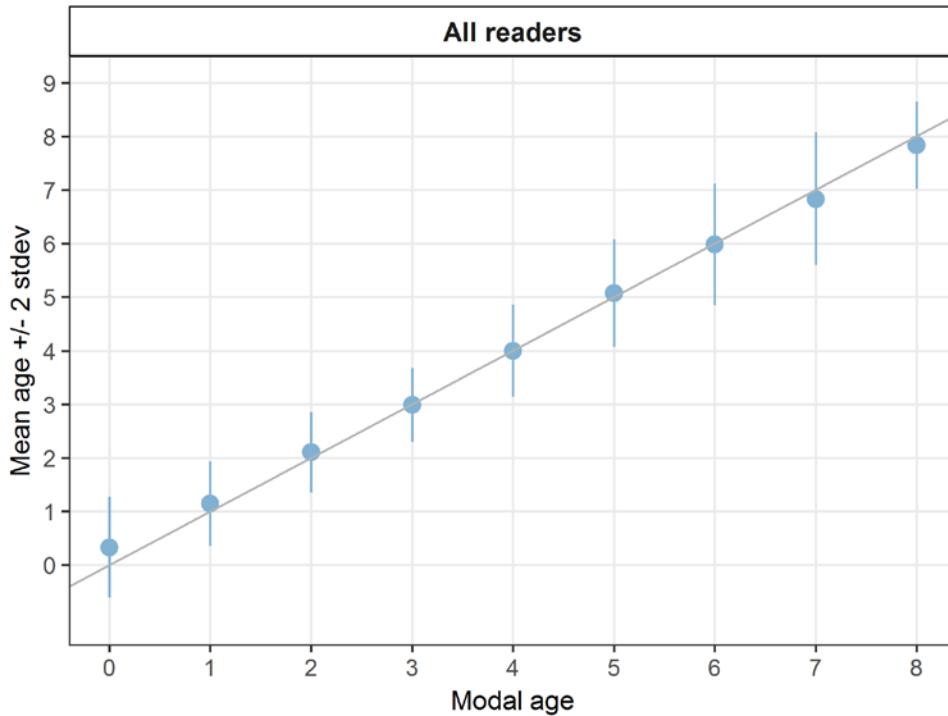


Figure 1: Age bias plot for all readers. Mean age recorded +/- 2 stdev of each reader and all readers combined are plotted against modal age. The estimated mean age corresponds to modal age, if the estimated mean age is on the 1:1 equilibrium line (solid line). Relative bias is the age difference between estimated mean age and modal age. Individual reader age biases can be found in the annex (Fig. 6).

Table 6: Between-reader bias test. This Between-reader bias test gives the 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 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE
R02 DK	-	**	-	-	**	**
R04 DE	**	-	-	**	-	*
R06 DK	-	-	-	-	-	-
R08 SE	-	**	-	-	**	**
R10 SE	**	-	-	**	-	*
R12 SE	**	*	-	**	*	-
Modal age	**	-	-	**	-	*

Results by strata

Advanced readers

The weighted average percentage agreement based on modal ages for all readers was 81 %, with the weighted average CV of 17 % and APE of 8 %.

Table 7: Coefficient of Variation (CV) table presents the CV per modal age and advanced reader, the CV of all advanced readers combined per modal age and a weighted mean of the CV per reader.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	all
0	-	-	-	-	-
1	33 %	42 %	32 %	17 %	39 %
2	6 %	6 %	29 %	17 %	19 %
3	10 %	7 %	23 %	13 %	14 %
4	9 %	5 %	12 %	10 %	10 %
5	5 %	5 %	14 %	10 %	10 %
6	0 %	0 %	8 %	11 %	11 %
7	0 %	7 %	10 %	7 %	12 %
8	-	-	-	-	0 %
Weighted Mean	11 %	10 %	23 %	14 %	17 %

Table 8: Percentage agreement (PA) table represents the PA per modal age and reader, advanced the PA of all advanced readers combined per modal age and a weighted mean of the PA per reader.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	all
0	21 %	100 %	0 %	97 %	54 %
1	82 %	85 %	42 %	97 %	77 %
2	99 %	99 %	56 %	85 %	85 %
3	96 %	96 %	60 %	92 %	86 %
4	86 %	97 %	79 %	79 %	85 %
5	93 %	93 %	64 %	71 %	80 %
6	100 %	100 %	20 %	50 %	68 %
7	100 %	75 %	0 %	75 %	62 %
8	100 %	100 %	100 %	100 %	100 %
Weighted Mean	87 %	96 %	52 %	88 %	81 %

Table 9: 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. Red and blue values indicate positive and negative bias, respectively.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	all
0	0.79	0.00	1.00	0.03	0.46
1	0.18	-0.09	0.58	0.03	0.17
2	0.01	0.01	0.25	0.15	0.11
3	0.03	0.01	-0.17	0.10	-0.01
4	0.07	-0.03	-0.14	0.21	0.02
5	0.07	-0.07	-0.04	0.32	0.07
6	0.00	0.00	-0.80	0.60	-0.05
7	0.00	-0.25	-1.50	0.25	-0.38
8	0.00	0.00	0.00	0.00	0.00
Weighted Mean	0.12	-0.01	0.07	0.14	0.08

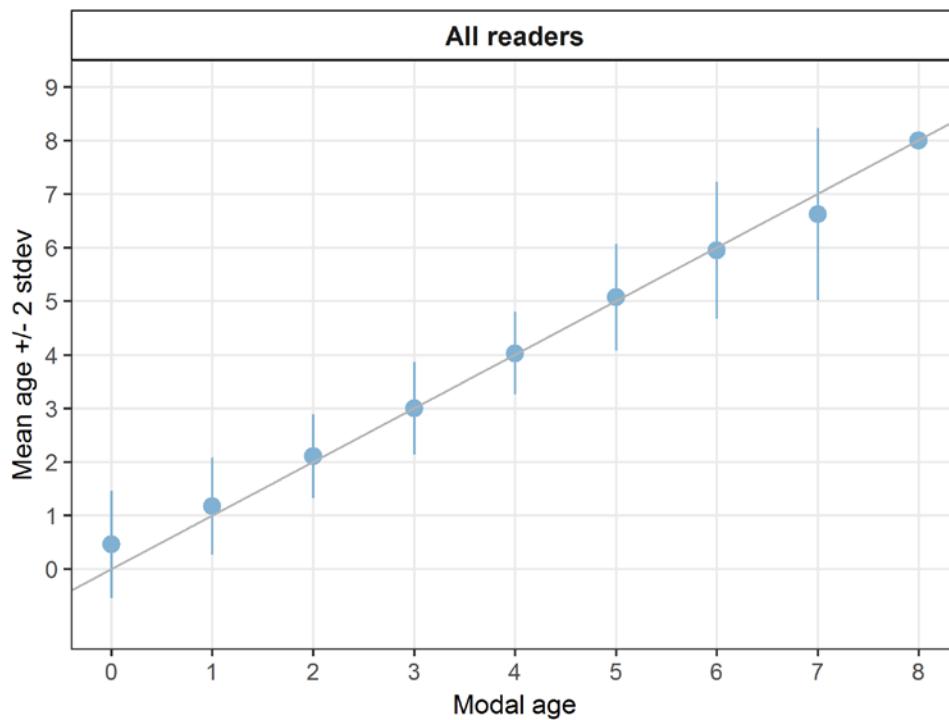


Figure 2: Age bias plot for advanced readers. Individual reader age biases can be found in the annex (Fig. 6).

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

Table 10: Age error matrix (AEM) for cod2224. 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 were used for calculating the AEM.

Modal age	0	1	2	3	4	5	6	7	8
Age 0	0.54	0.03	-	-	-	-	-	-	-
Age 1	0.46	0.77	0.03	0.002	-	-	-	-	-
Age 2	-	0.20	0.85	0.07	-	-	-	-	-
Age 3	-	-	0.130	0.86	0.06	0.01	-	-	-
Age 4	-	-	0.004	0.06	0.85	0.05	-	-	-
Age 5	-	-	-	0.002	0.09	0.80	0.20	0.13	-
Age 6	-	-	-	0.002	-	0.13	0.68	0.19	-
Age 7	-	-	-	0.002	-	0.01	0.10	0.63	-
Age 8	-	-	-	-	-	-	0.03	0.06	1

Discussion

Since the last age reading comparison in spring 2019 the uncertainties and national differences in age interpretation of Western Baltic cod in SD 22 continue. Modal age 0, 6 and 7 showed particularly low PAs but also other modal ages did not show PAs above 89 %. An average PA of 81 % and a CV of 17 % for advanced readers is not satisfactory for a stock for which otolith age reading is validated and considered relatively clear and easy. However, it has to be kept in mind that Sweden and Denmark do not read sliced otoliths on a routine basis, which were used for this and the previous exchange and readers might therefore have been less trained in reading sliced otoliths. Moreover, Swedish age readers usually do not read cod otoliths from SD22 because Sweden is not fishing in SD22 and also is not involved in surveys in SD22.

We can highlight that the basic age readers performed particularly well and participation in future exchanges is encouraged.

This exchange is now closed in SmartDots and can be used for further training purposes because all readers' annotations are now visible for comparisons. Tables 11 and 15 give an overview about the individual readers' ages, PA, CV and APE per sample ID.

Examples of main discrepancies in age interpretation

Discrepancies in age determination can be categorized into three error sources:

1. Misinterpretation of the first translucent summer ring:

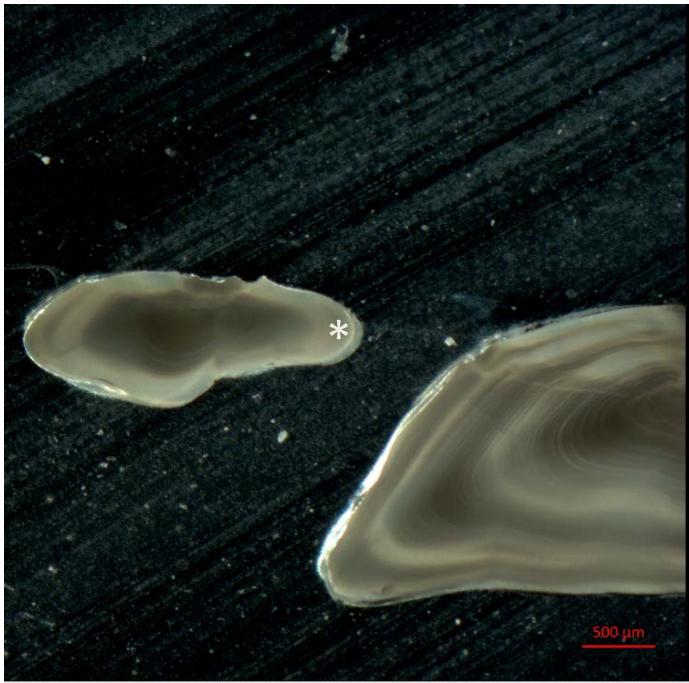


Figure 3: Otolith of a 12 cm cod caught on 8.11.2018 (FishID: 2, age: 0). Image taken using transmitted light. Star indicates first translucent summer ring.

The first ring in the otolith of Figure 3 is a translucent summer ring. Since it was recaptured in November, this 12 cm fish was age 0. The diameter of the first translucent ring is slightly larger than 2 mm. If the translucent ring had been considered a winter ring, this otolith would have been mis-classified as an age-1 cod.

2. Misinterpretation of the edge zone/ not accounting for recapture month

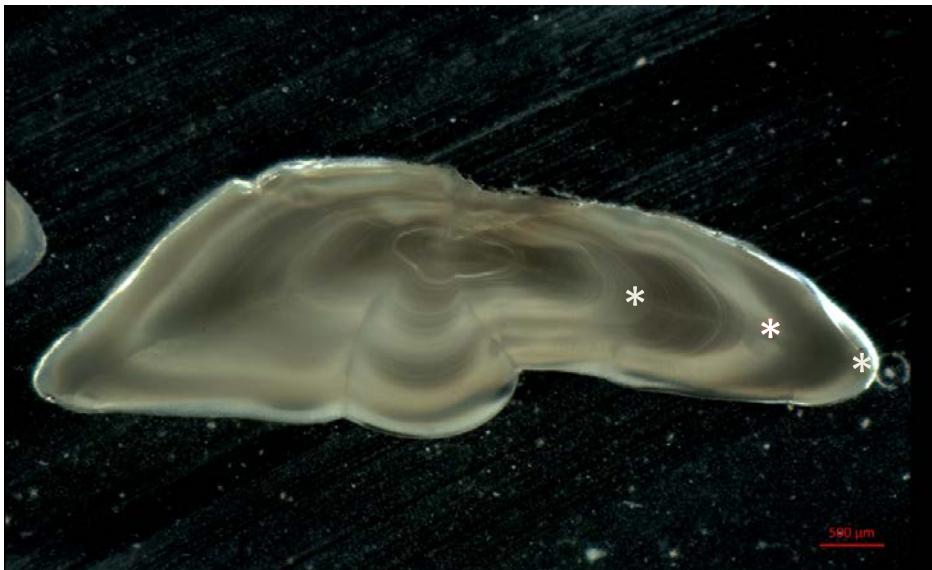


Figure 4: Otolith of a 42 cm cod caught on 9.11.2018 (FishID: 5, age: 2). Image taken using transmitted light. Stars indicate translucent summer rings.

The first translucent ring of the otolith in Figure 4 is a summer ring. This fish had experienced three summers and was recaptured in November; hence, it was age 2.

3. Counting of double rings



Figure 5: Otolith of a 64 cm cod caught on 24.10.2018 (FishID: 144, age: 5). Image taken using transmitted light. Stars indicate translucent summer rings.

The first translucent ring in the otolith of Figure 5 should not be counted as two separate rings. The double ring merges into the single ring in the lower part of the ring. Moreover, given the relatively fast growth of juvenile cod, it is unrealistic that a second ring is formed so close to the first ring, especially given the distance to the translucent ring of the second summer. Since it was recaptured in October, this 64 cm cod was age 5.

Outlook

During the online meeting with age readers and national age reading coordinators several decisions were taken:

1. Regular otolith exchanges of sliced otoliths of Western Baltic cod will be continued.
2. The next exercise will take place in autumn 2020 and involve a selection of potentially incorrectly read otoliths from the BITS of the years between 2017 and 2019 (SD22 and 23) which may have led to discrepancies in the Western Baltic cod stock assessment in 2020. The results will be discussed in an online meeting in January 2021. Using SmartDots, DTU-Aqua will take the lead in this exercise.
3. It was highlighted that it is too late to thoroughly compare – and potentially correct - the national ageing results from the surveys (BITS) and the commercial samplings after the annual data upload in March to InterCatch (or in the future to the RDBES). Therefore, short- and mid-term steps were discussed to overcome this shortcoming of the present ICES procedure.

- a. Commercial sampling: Ageing results from Q1 will be send around among countries during each summer to assess (dis-)similarities. The Thünen Institute will prepare and circulate a template using the age-length distribution of the Q1 2020 data from SD22. This will ensure that the format is consistent among countries.
 - b. Survey data: The Thünen Institute will continue to send around a short report of the age reading results shortly after each German Q1 and Q4 BITS.
4. The countries agreed that images of dubious otoliths should be send to other members of the group at any time.
5. In case it is considered helpful, the Thünen Institute offered to assist other labs by slicing up to 1000 Western Baltic cod otoliths per year.
6. Danish age readers had conducted an age reading comparison between broken and sliced otolith with the result of higher accuracy when reading sliced otolith (see uploaded report on the SmartDots webpage; event ID 269 and 270). After the online meeting, DTU-Aqua (Denmark) informed that they took the decision that Western Baltic cod otoliths will be sliced from 1. January 2020 onwards. This will hopefully increase the quality of the age readings and thus improve the input data for the stock assessment of Western Baltic cod.
7. The Thünen Institute compiled an age reading guide which can be found at the end of this document.

References

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Results all readers

Data Overview

Table 11: Data overview including modal age and statistics per sample.

Fish ID	Event ID	Sample ID	length	sex	Catch date	ICES area	R02 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE	Modal age	PA %	CV %	APE %
1	251	S756_2018_22_001	580	-	08/11/2018 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
2	251	S756_2018_22_003	120	-	08/11/2018 00:00:00	27.3.d	0	0	1	0	0	0	0	83	-	-
3	251	S756_2018_22_005	180	-	08/11/2018 00:00:00	27.3.d	1	0	1	0	1	0	0	50	-	-
4	251	S756_2018_22_007	120	-	08/11/2018 00:00:00	27.3.d	0	0	1	0	0	0	0	83	-	-
5	251	S756_2018_22_009	420	-	09/11/2018 00:00:00	27.3.d	2	2	3	3	2	3	2	50	22	20
6	251	S756_2018_22_010	420	-	09/11/2018 00:00:00	27.3.d	2	2	3	3	2	3	2	50	22	20
7	251	S756_2018_22_011	200	-	09/11/2018 00:00:00	27.3.d	1	1	1	1	1	1	1	100	0	0
8	251	S756_2018_22_012	310	-	09/11/2018 00:00:00	27.3.d	2	2	2	2	1	2	2	83	22	15
9	251	S756_2018_22_013	300	-	09/11/2018 00:00:00	27.3.d	2	2	2	2	2	2	2	100	0	0
10	251	S756_2018_22_023	290	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	2	2	100	0	0
11	251	S756_2018_22_024	310	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	2	2	100	0	0
12	251	S756_2018_22_026	280	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	3	2	83	19	13
13	251	S756_2018_22_030	220	-	10/11/2018 00:00:00	27.3.d	1	1	1	1	1	1	1	100	0	0
14	251	S756_2018_22_031	410	-	10/11/2018 00:00:00	27.3.d	2	2	3	2	2	2	2	83	19	13
15	251	S756_2018_22_036	280	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	2	2	100	0	0
16	251	S756_2018_22_039	620	-	11/11/2018 00:00:00	27.3.d	2	2	4	3	2	3	2	50	31	25
17	251	S756_2018_22_042	430	-	11/11/2018 00:00:00	27.3.d	2	2	3	2	2	3	2	67	22	19
18	251	S756_2018_22_044	670	-	11/11/2018 00:00:00	27.3.d	5	5	4	5	5	5	5	83	8	6
19	251	S756_2018_22_051	100	-	11/11/2018 00:00:00	27.3.d	1	0	1	0	0	0	0	67	-	-
20	251	S756_2018_22_055	110	-	11/11/2018 00:00:00	27.3.d	1	0	1	0	0	0	0	67	-	-
21	251	S756_2018_22_059	180	-	11/11/2018 00:00:00	27.3.d	1	0	1	0	0	0	0	67	-	-
22	251	S756_2018_22_067	80	-	11/11/2018 00:00:00	27.3.d	0	0	1	0	0	0	0	83	-	-
23	251	S756_2018_22_068	90	-	11/11/2018 00:00:00	27.3.d	0	0	1	0	0	0	0	83	-	-
24	251	S760_2019_22_001	880	-	19/02/2019 00:00:00	27.3.d	5	5	5	5	5	5	5	100	0	0
25	251	S760_2019_22_002	720	-	19/02/2019 00:00:00	27.3.d	4	4	5	4	4	4	4	83	10	7

26	251	S760_2019_22_003	690	-	19/02/2019 00:00:00	27.3.d	3	3	4	4	3	3	3	67	15	13
27	251	S760_2019_22_004	680	-	19/02/2019 00:00:00	27.3.d	5	5	6	5	5	-	5	80	9	6
28	251	S760_2019_22_005	630	-	19/02/2019 00:00:00	27.3.d	3	3	5	4	3	4	3	50	22	18
29	251	S760_2019_22_007	580	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	3	3	83	13	9
30	251	S760_2019_22_008	630	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	3	3	83	13	9
31	251	S760_2019_22_009	570	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	4	3	83	13	9
32	251	S760_2019_22_010	510	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	4	3	83	13	9
33	251	S760_2019_22_011	540	-	19/02/2019 00:00:00	27.3.d	3	4	3	4	4	4	4	67	14	12
34	251	S760_2019_22_014	600	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	3	3	83	13	9
35	251	S760_2019_22_015	510	-	19/02/2019 00:00:00	27.3.d	5	4	4	5	4	4	4	67	12	10
36	251	S760_2019_22_016	520	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	4	3	83	13	9
37	251	S760_2019_22_017	500	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	4	3	67	15	13
38	251	S760_2019_22_019	490	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
39	251	S760_2019_22_020	630	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	3	3	83	13	9
40	251	S760_2019_22_021	620	-	19/02/2019 00:00:00	27.3.d	5	4	4	5	4	6	4	50	17	14
41	251	S760_2019_22_024	590	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	3	3	83	13	9
42	251	S760_2019_22_025	580	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	3	3	83	13	9
43	251	S760_2019_22_027	670	-	19/02/2019 00:00:00	27.3.d	4	4	4	5	4	5	4	67	12	10
44	251	S760_2019_22_030	530	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
45	251	S760_2019_22_031	500	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	-	3	100	0	0
46	251	S760_2019_22_034	520	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
47	251	S760_2019_22_035	490	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
48	251	S760_2019_22_041	420	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
49	251	S760_2019_22_042	420	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	2	3	83	14	10
50	251	S760_2019_22_045	410	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	2	3	83	14	10
51	251	S760_2019_22_047	400	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0
52	251	S760_2019_22_050	390	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	-	3	80	16	11
53	251	S760_2019_22_051	420	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	4	3	83	13	9
54	251	S760_2019_22_053	390	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	3	3	100	0	0

55	251	S760_2019_22_062	330	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	2	3	67	19	17
56	251	S760_2019_22_063	330	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	3	3	83	14	10
57	251	S760_2019_22_064	320	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	3	3	83	14	10
58	251	S760_2019_22_065	320	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	3	3	83	14	10
59	251	S760_2019_22_071	300	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	3	3	83	14	10
60	251	S760_2019_22_072	290	-	19/02/2019 00:00:00	27.3.d	2	3	2	3	3	3	3	67	19	17
61	251	S760_2019_22_110	210	-	20/02/2019 00:00:00	27.3.d	1	1	2	1	1	-	1	80	37	27
62	251	S760_2019_22_172	790	-	20/02/2019 00:00:00	27.3.d	5	5	6	6	5	6	5	50	10	9
63	251	S760_2019_22_173	670	-	20/02/2019 00:00:00	27.3.d	5	5	5	6	5	6	5	67	10	8
64	251	S760_2019_22_175	710	-	20/02/2019 00:00:00	27.3.d	5	5	5	5	5	5	5	100	0	0
65	251	S760_2019_22_176	720	-	20/02/2019 00:00:00	27.3.d	5	5	6	6	5	6	5	50	10	9
66	251	S760_2019_22_390	170	-	21/02/2019 00:00:00	27.3.d	1	1	2	1	1	1	1	83	35	24
67	251	S760_2019_22_394	180	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	1	1	83	35	24
68	251	S760_2019_22_407	220	-	22/02/2019 00:00:00	27.3.d	3	3	2	3	3	3	3	83	14	10
69	251	S760_2019_22_408	210	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	1	1	83	35	24
70	251	S760_2019_22_409	190	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	-	1	1	80	37	27
71	251	S760_2019_22_412	140	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	1	1	83	35	24
72	251	S760_2019_22_413	760	-	22/02/2019 00:00:00	27.3.d	5	5	6	5	5	6	5	67	10	8
73	251	S760_2019_22_419	210	-	22/02/2019 00:00:00	27.3.d	2	1	2	1	1	2	1	50	37	33
74	251	S760_2019_22_420	180	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	1	1	83	35	24
75	251	S760_2019_22_423	690	-	23/02/2019 00:00:00	27.3.d	5	5	5	5	5	5	5	100	0	0
76	251	S760_2019_22_425	740	-	23/02/2019 00:00:00	27.3.d	5	5	6	6	5	6	5	50	10	9
77	251	S760_2019_22_428	160	-	23/02/2019 00:00:00	27.3.d	2	1	2	1	1	2	1	50	37	33
78	251	7802556	330	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
79	251	7802557	420	-	23/10/2018 06:13:00	27.3.d	3	2	3	3	2	3	3	67	19	17
80	251	7802558	320	-	23/10/2018 06:13:00	27.3.d	1	1	2	1	1	1	1	83	35	24
81	251	7802559	370	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
82	251	7802560	310	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
83	251	7802561	300	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0

84	251	7802562	290	-	23/10/2018 06:13:00	27.3.d	2	2	1	2	2	2	2	83	22	15
85	251	7802563	260	-	23/10/2018 06:13:00	27.3.d	1	1	1	1	1	1	1	100	0	0
86	251	7802564	220	-	23/10/2018 06:13:00	27.3.d	2	0	1	1	1	1	1	67	63	33
87	251	7802565	380	-	23/10/2018 06:13:00	27.3.d	2	2	2	3	2	3	2	67	22	19
88	251	7802566	410	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	3	2	67	22	19
89	251	7802567	500	-	23/10/2018 06:13:00	27.3.d	4	4	3	4	4	4	4	83	11	7
90	251	7802568	350	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	2	2	83	19	13
91	251	7802569	400	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
92	251	7802570	390	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
93	251	7802571	280	-	23/10/2018 06:13:00	27.3.d	1	1	1	1	1	1	1	100	0	0
94	251	7802572	210	-	23/10/2018 06:13:00	27.3.d	2	0	1	1	1	1	1	67	63	33
95	251	7802573	160	-	23/10/2018 06:13:00	27.3.d	1	0	1	0	0	0	0	67	-	-
96	251	7802574	430	-	23/10/2018 06:13:00	27.3.d	3	2	3	3	2	2	2	50	22	20
97	251	7802575	470	-	23/10/2018 06:13:00	27.3.d	4	3	3	3	4	3	3	67	15	13
98	251	7802576	270	-	23/10/2018 06:13:00	27.3.d	2	1	1	1	1	1	1	83	35	24
99	251	7802577	340	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
100	251	7802578	570	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	3	2	67	22	19
101	251	7802579	540	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	3	2	67	22	19
102	251	7802580	510	-	23/10/2018 06:13:00	27.3.d	4	4	3	4	4	4	4	83	11	7
103	251	7802581	150	-	23/10/2018 06:13:00	27.3.d	1	0	1	0	1	0	0	50	-	-
104	251	7802582	200	-	23/10/2018 06:13:00	27.3.d	1	0	1	0	1	0	0	50	-	-
105	251	7802891	650	-	24/10/2018 06:41:00	27.3.d	4	4	4	4	4	3	4	83	11	7
106	251	7802892	530	-	24/10/2018 06:41:00	27.3.d	2	2	3	3	2	3	2	50	22	20
107	251	7802893	450	-	24/10/2018 06:41:00	27.3.d	3	2	3	2	2	2	2	67	22	19
108	251	7802894	340	-	24/10/2018 06:41:00	27.3.d	1	1	2	2	2	1	1	50	37	33
109	251	7802895	400	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	2	2	83	19	13
110	251	7802896	470	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	2	2	83	19	13
111	251	7802897	440	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	2	2	83	19	13
112	251	7802898	370	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	2	2	100	0	0

113	251	7802899	460	-	24/10/2018 06:41:00	27.3.d	2	2	3	3	2	2	2	67	22	19
114	251	7802900	410	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	2	2	83	19	13
115	251	7802901	390	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	2	2	100	0	0
116	251	7802902	420	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	2	2	83	19	13
117	251	7802903	360	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	2	2	100	0	0
118	251	7802904	330	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	2	2	100	0	0
119	251	7802905	350	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	2	2	100	0	0
120	251	7802906	320	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	2	2	100	0	0
121	251	7802907	290	-	24/10/2018 06:41:00	27.3.d	2	2	1	2	2	2	2	83	22	15
122	251	7803189	940	-	24/10/2018 14:55:00	27.3.d	6	6	6	7	6	6	6	83	7	5
123	251	7803190	790	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	3	3	4	67	14	12
124	251	7803191	830	-	24/10/2018 14:55:00	27.3.d	6	6	5	7	6	7	6	50	12	9
125	251	7803192	1000	-	24/10/2018 14:55:00	27.3.d	8	8	8	8	7	8	8	83	5	4
126	251	7803193	850	-	24/10/2018 14:55:00	27.3.d	6	6	5	6	6	6	6	83	7	5
127	251	7803194	950	-	24/10/2018 14:55:00	27.3.d	6	6	5	6	6	6	6	83	7	5
128	251	7803195	750	-	24/10/2018 14:55:00	27.3.d	4	4	4	5	4	4	4	83	10	7
129	251	7803196	860	-	24/10/2018 14:55:00	27.3.d	6	6	5	7	6	5	6	50	13	10
130	251	7803197	720	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
131	251	7803198	610	-	24/10/2018 14:55:00	27.3.d	5	4	4	5	4	4	4	67	12	10
132	251	7803199	780	-	24/10/2018 14:55:00	27.3.d	7	6	5	7	6	6	6	50	12	9
133	251	7803200	760	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
134	251	7803201	740	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
135	251	7803202	650	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
136	251	7803203	710	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
137	251	7803204	590	-	24/10/2018 14:55:00	27.3.d	4	4	3	4	4	3	4	67	14	12
138	251	7803205	570	-	24/10/2018 14:55:00	27.3.d	6	4	3	7	5	5	5	33	28	20
139	251	7803206	360	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
140	251	7803207	390	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	2	2	83	19	13
141	251	7803208	330	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0

142	251	7803209	300	-	24/10/2018 14:55:00	27.3.d	1	1	2	1	1	1	1	83	35	24
143	251	7803210	530	-	24/10/2018 14:55:00	27.3.d	4	4	3	4	4	4	4	83	11	7
144	251	7803211	640	-	24/10/2018 14:55:00	27.3.d	5	5	4	6	5	5	5	67	13	7
145	251	7803212	700	-	24/10/2018 14:55:00	27.3.d	4	4	4	5	4	4	4	83	10	7
146	251	7803213	680	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
147	251	7803214	510	-	24/10/2018 14:55:00	27.3.d	5	4	3	5	4	4	4	50	18	13
148	251	7803215	670	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
149	251	7803216	690	-	24/10/2018 14:55:00	27.3.d	5	5	4	5	5	4	5	67	11	10
150	251	7803217	450	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	2	2	83	19	13
151	251	7803218	490	-	24/10/2018 14:55:00	27.3.d	3	4	3	3	4	3	3	67	15	13
152	251	7803219	410	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	2	2	83	19	13
153	251	7803220	420	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
154	251	7803221	560	-	24/10/2018 14:55:00	27.3.d	4	4	3	4	4	4	4	83	11	7
155	251	7803222	440	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
157	251	7803223	620	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
158	251	7803224	600	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
159	251	7803225	630	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	4	4	100	0	0
160	251	7803226	430	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	2	2	83	19	13
161	251	7803227	400	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
162	251	7803228	370	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
163	251	7803229	350	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
164	251	7803230	380	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
165	251	7803231	340	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
166	251	7803232	320	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	2	2	100	0	0
167	251	7803233	310	-	24/10/2018 14:55:00	27.3.d	1	1	1	1	1	1	1	100	0	0
168	251	7803234	280	-	24/10/2018 14:55:00	27.3.d	1	1	1	1	1	1	1	100	0	0
169	251	7803235	820	-	30/10/2018 11:58:00	27.3.d	5	5	5	5	5	5	5	100	0	0
170	251	7807045	140	-	30/10/2018 11:58:00	27.3.d	1	0	1	0	0	0	0	67	-	-
171	251	7807046	330	-	30/10/2018 10:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0

172	251	7806841	280	-	30/10/2018 10:13:00	27.3.d	2	2	2	2	2	2	2	100	0	0
173	251	7806842	260	-	30/10/2018 10:13:00	27.3.d	2	2	2	2	1	2	2	83	22	15
174	251	7806843	130	-	30/10/2018 10:13:00	27.3.d	1	0	1	0	0	0	0	67	-	-
175	251	7806844	850	-	30/10/2018 08:23:00	27.3.d	5	5	5	5	5	5	5	100	0	0
176	251	7806686	490	-	30/10/2018 08:23:00	27.3.d	2	2	3	3	2	2	2	67	22	19
177	251	7806687	320	-	30/10/2018 08:23:00	27.3.d	2	2	2	2	2	2	2	100	0	0
178	251	7806688	260	-	30/10/2018 08:23:00	27.3.d	2	2	1	2	2	2	2	83	22	15
179	251	7806689	690	-	30/10/2018 06:24:00	27.3.d	4	4	4	4	4	4	4	100	0	0
180	251	7806465	300	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	2	2	83	22	15
181	251	7806466	310	-	30/10/2018 06:24:00	27.3.d	2	2	2	2	2	2	2	100	0	0
182	251	7806467	270	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	2	2	83	22	15
183	251	7806468	290	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	2	2	83	22	15
184	251	7806469	280	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	2	2	83	22	15
185	251	7806470	170	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	0	0	67	-	-
186	251	7806471	150	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	0	0	67	-	-
187	251	7806472	150	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	0	0	67	-	-
188	251	7806473	160	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	0	0	67	-	-
189	251	7806474	170	-	29/10/2018 07:53:00	27.3.d	0	0	1	0	0	0	0	83	-	-
190	251	7806128	180	-	29/10/2018 06:05:00	27.3.d	1	0	1	0	0	0	0	67	-	-
191	251	7805939	150	-	29/10/2018 06:05:00	27.3.d	1	0	1	0	0	0	0	67	-	-
192	251	7805940	390	-	28/10/2018 12:25:00	27.3.d	2	2	2	3	2	2	2	83	19	13
193	251	7805758	170	-	28/10/2018 13:27:00	27.3.d	2	2	1	1	1	1	1	67	39	33
194	251	7805562	160	-	28/10/2018 10:41:00	27.3.d	1	0	1	1	0	0	0	50	-	-
195	251	7805356	640	-	28/10/2018 09:12:00	27.3.d	2	2	3	3	2	2	2	67	22	19
196	251	7805199	210	-	28/10/2018 09:12:00	27.3.d	0	0	1	1	0	0	0	67	-	-
197	251	7805200	310	-	28/10/2018 06:41:00	27.3.d	1	0	1	1	1	1	1	83	49	33
198	251	7804982	150	-	27/10/2018 12:00:00	27.3.d	1	0	1	0	0	0	0	67	-	-
199	251	7804870	160	-	27/10/2018 12:00:00	27.3.d	1	0	1	0	0	1	0	50	-	-
200	251	7804871	170	-	27/10/2018 12:00:00	27.3.d	1	0	1	0	0	0	0	67	-	-

201	251	7804872	190	-	27/10/2018 12:00:00	27.3.d	0	0	1	0	0	0	0	83	-	-
202	251	7804873	190	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	0	0	67	-	-
203	251	7808502	180	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	0	0	67	-	-
204	251	7808503	160	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	0	0	67	-	-
205	251	7808504	180	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	0	0	67	-	-
206	251	7808505	160	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	0	0	67	-	-
207	251	7808506	160	-	01/11/2018 09:40:00	27.3.d	1	0	1	0	0	0	0	67	-	-
208	251	7808351	170	-	01/11/2018 07:26:00	27.3.d	1	0	1	0	0	0	0	67	-	-
209	251	7808249	150	-	31/10/2018 06:14:00	27.3.d	1	0	1	0	0	0	0	67	-	-
210	251	7807451	160	-	31/10/2018 06:14:00	27.3.d	1	0	1	0	0	0	0	67	-	-
211	251	7807452	650	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
212	251	7895905	710	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
213	251	7895906	690	-	28/02/2019 14:27:21	27.3.d	6	6	5	6	6	6	6	83	7	5
214	251	7895907	510	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	4	5	5	83	8	6
215	251	7895908	780	-	28/02/2019 14:27:21	27.3.d	7	7	6	8	7	7	7	67	9	5
216	251	7895909	680	-	28/02/2019 14:27:21	27.3.d	6	5	5	7	5	4	5	50	19	15
217	251	7895910	530	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
218	251	7895911	560	-	28/02/2019 14:27:21	27.3.d	3	4	4	4	5	3	4	50	20	14
219	251	7895912	490	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
220	251	7895913	550	-	28/02/2019 14:27:21	27.3.d	4	4	4	4	4	4	4	100	0	0
221	251	7895914	590	-	28/02/2019 14:27:21	27.3.d	6	5	5	6	5	6	5	50	10	9
222	251	7895915	480	-	28/02/2019 14:27:21	27.3.d	4	3	4	3	3	3	3	67	15	13
223	251	7895916	540	-	28/02/2019 14:27:21	27.3.d	5	4	5	6	4	5	5	50	16	11
224	251	7895917	600	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
225	251	7895918	760	-	28/02/2019 14:27:21	27.3.d	6	6	6	7	6	6	6	83	7	5
226	251	7895919	660	-	28/02/2019 14:27:21	27.3.d	7	7	6	7	7	7	7	83	6	4
227	251	7895920	700	-	28/02/2019 14:27:21	27.3.d	6	6	5	6	6	6	6	83	7	5
228	251	7895921	670	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
229	251	7895922	640	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0

230	251	7895923	610	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
231	251	7895924	520	-	28/02/2019 14:27:21	27.3.d	3	3	3	4	3	3	3	83	13	9
232	251	7895925	420	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
233	251	7895926	570	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
234	251	7895927	480	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
235	251	7895928	450	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
236	251	7895929	820	-	28/02/2019 14:27:21	27.3.d	6	6	5	6	6	6	6	83	7	5
237	251	7895930	580	-	28/02/2019 14:27:21	27.3.d	5	5	4	5	5	5	5	83	8	6
238	251	7895931	630	-	28/02/2019 14:27:21	27.3.d	7	7	5	7	7	7	7	83	12	8
239	251	7895932	620	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	5	5	100	0	0
240	251	7895933	420	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
241	251	7895934	400	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
242	251	7895935	350	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
243	251	7895936	390	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	3	3	100	0	0
244	251	7895937	320	-	28/02/2019 14:27:21	27.3.d	2	2	2	2	2	2	2	100	0	0
245	251	7895938	310	-	28/02/2019 14:27:21	27.3.d	3	3	2	3	3	3	3	83	14	10
246	251	7895939	290	-	28/02/2019 14:27:21	27.3.d	3	3	2	3	3	3	3	83	14	10
247	251	7895940	280	-	28/02/2019 14:27:21	27.3.d	3	3	2	3	2	2	2	50	22	20
248	251	7895941	550	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	3	83	14	10
249	251	7896061	580	-	01/03/2019 06:27:20	27.3.d	3	3	4	3	3	3	3	83	13	9
250	251	7896062	560	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0
251	251	7896063	570	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0
252	251	7896064	500	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0
253	251	7896065	600	-	01/03/2019 06:27:20	27.3.d	3	3	4	4	3	3	3	67	15	13
254	251	7896066	540	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0
255	251	7896067	470	-	01/03/2019 06:27:20	27.3.d	-	3	3	3	3	3	3	100	0	0
256	251	7896068	450	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0
257	251	7896069	490	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0
258	251	7896070	480	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0

259	251	7896071	530	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
260	251	7896072	440	-	01/03/2019 06:27:20	27.3.d	2	3	3	3	3	3	3	83	14	10	
261	251	7896073	510	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
262	251	7896074	520	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
263	251	7896075	460	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
264	251	7896076	400	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
265	251	7896077	380	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
266	251	7896078	420	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
267	251	7896079	340	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	3	83	14	10	
268	251	7896080	360	-	01/03/2019 06:27:20	27.3.d	3	4	2	3	3	3	3	67	21	11	
269	251	7896081	350	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	3	83	14	10	
270	251	7896082	390	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
271	251	7896083	370	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	3	83	14	10	
272	251	7896084	430	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
273	251	7896085	310	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	3	83	14	10	
274	251	7896086	330	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	2	3	67	19	17
275	251	7896087	410	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	3	3	100	0	0	
276	251	7896088	300	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	3	83	14	10	
277	251	7896089	320	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	3	2	3	67	19	17
278	251	7896090	520	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0	
279	251	7896562	510	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0	
280	251	7896563	470	-	01/03/2019 09:53:07	27.3.d	3	3	-	3	3	3	3	100	0	0	
281	251	7896564	480	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0	
282	251	7896565	340	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10	
283	251	7896566	430	-	01/03/2019 09:53:07	27.3.d	3	3	3	4	3	3	3	83	13	9	
284	251	7896567	420	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0	
285	251	7896568	440	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0	
286	251	7896569	410	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0	
287	251	7896570	390	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10	

288	251	7896571	380	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0
289	251	7896572	330	-	01/03/2019 09:53:07	27.3.d	3	3	2	4	2	3	3	50	27	20
290	251	7896573	370	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
291	251	7896574	360	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
292	251	7896575	450	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	3	3	100	0	0
293	251	7896576	350	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
294	251	7896577	260	-	01/03/2019 09:53:07	27.3.d	3	3	-	3	2	2	3	60	21	18
295	251	7896578	310	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
296	251	7896579	300	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
297	251	7896580	320	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
298	251	7896581	290	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
299	251	7896582	280	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	3	3	83	14	10
300	251	7896583	270	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	2	2	2	50	22	20
301	251	7896584	510	-	02/03/2019 06:57:32	27.3.d	3	3	-	3	3	3	3	100	0	0
302	251	7896815	490	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
303	251	7896816	450	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
304	251	7896817	600	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
305	251	7896818	460	-	02/03/2019 06:57:32	27.3.d	4	3	3	4	3	4	3	50	16	14
306	251	7896819	620	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
307	251	7896820	470	-	02/03/2019 06:57:32	27.3.d	3	3	4	3	3	3	3	83	13	9
308	251	7896821	440	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
309	251	7896822	410	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
310	251	7896823	340	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
311	251	7896824	370	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
312	251	7896825	400	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
313	251	7896826	350	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	3	3	83	14	10
314	251	7896827	560	-	02/03/2019 06:57:32	27.3.d	3	3	-	3	3	3	3	100	0	0
316	251	7896828	430	-	02/03/2019 06:57:32	27.3.d	3	3	-	3	3	3	3	100	0	0
317	251	7896829	460	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0

318	251	7896830	390	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
319	251	7896831	500	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
320	251	7896832	420	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
321	251	7896833	380	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	3	3	100	0	0
322	251	7896834	330	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	3	3	83	14	10
323	251	7896835	310	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	3	3	83	14	10
324	251	7896836	360	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	2	3	67	19	17
327	251	7896837	280	-	02/03/2019 06:57:32	27.3.d	3	3	1	3	3	3	3	83	31	21
328	251	7896838	320	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	2	3	67	19	17
329	251	7896839	660	-	02/03/2019 10:16:07	27.3.d	4	4	-	4	4	4	4	100	0	0
330	251	7896840	470	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
331	251	7896841	500	-	02/03/2019 10:16:07	27.3.d	3	3	4	3	3	3	3	83	13	9
332	251	7896842	480	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
333	251	7897089	430	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
334	251	7897090	440	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
335	251	7897091	460	-	02/03/2019 10:16:07	27.3.d	3	3	3	4	3	3	3	83	13	9
336	251	7897092	410	-	02/03/2019 10:16:07	27.3.d	3	3	3	4	3	3	3	83	13	9
337	251	7897093	400	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
338	251	7897094	390	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
339	251	7897095	510	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
340	251	7897096	450	-	02/03/2019 10:16:07	27.3.d	2	3	3	3	3	3	3	83	14	10
341	251	7897097	380	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
342	251	7897098	420	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
343	251	7897099	370	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	3	3	83	14	10
344	251	7897100	360	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
345	251	7897101	320	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	3	3	83	14	10
346	251	7897102	330	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
347	251	7897103	340	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	3	3	100	0	0
348	251	7897104	310	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	3	3	83	14	10

349	251	7897105	300	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	3	3	83	14	10
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351	251	7897107	120	-	04/03/2019 13:00:05	27.3.d	1	1	1	1	1	1	1	100	0	0
352	251	7897108	130	-	04/03/2019 13:00:05	27.3.d	1	1	2	1	1	1	1	83	35	24
353	251	7897109	150	-	04/03/2019 13:00:05	27.3.d	1	1	2	1	1	1	1	83	35	24
354	251	7897817	170	-	04/03/2019 15:03:42	27.3.d	1	1	2	1	1	1	1	83	35	24
356	251	7898125	760	-	07/03/2019 13:13:19	27.3.d	3	3	4	3	3	3	3	83	13	9
357	251	7898126	600	-	07/03/2019 13:13:19	27.3.d	3	3	4	4	3	4	3	50	16	14
358	251	7898127	760	-	07/03/2019 13:13:19	27.3.d	3	3	4	4	3	3	3	67	15	13
359	251	7898209	170	-	07/03/2019 13:13:19	27.3.d	1	1	2	1	1	1	1	83	35	24
360	251	7898645	180	-	07/03/2019 13:13:19	27.3.d	1	1	2	1	1	1	1	83	35	24
361	251	7899237	150	-	07/03/2019 13:13:19	27.3.d	1	1	2	1	1	1	1	83	35	24
362	251	7899238	710	-	07/03/2019 10:52:25	27.3.d	4	3	4	4	3	4	4	67	14	12
363	251	7899239	850	-	07/03/2019 10:52:25	27.3.d	6	6	5	8	6	6	6	67	16	10
364	251	7899240	280	-	07/03/2019 10:52:25	27.3.d	3	3	2	3	3	3	3	83	14	10
365	251	7899241	160	-	07/03/2019 10:52:25	27.3.d	1	1	2	1	1	1	1	83	35	24

Table 12: 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 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE	total
0	35	35	35	35	35	35	210
1	32	32	32	32	31	31	190
2	70	70	70	70	70	70	420
3	148	149	144	149	149	147	886
4	31	31	30	31	31	31	185
5	28	28	28	28	28	27	167
6	11	11	11	11	11	11	66
7	3	3	3	3	3	3	18
8	1	1	1	1	1	1	6
Total	359	360	354	360	359	356	2148

Table 13: Age composition by reader gives a summary of number of readings per reader.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE
0	7	38	0	33	32	34
1	54	28	56	33	35	30
2	75	70	98	59	72	70
3	148	149	117	150	146	145
4	28	34	43	35	32	35
5	29	26	30	26	27	21
6	13	11	9	12	11	16
7	4	3	0	9	4	4
8	1	1	1	3	0	1
Total	359	360	354	360	359	356

Table 14: Mean length at age per reader was calculated per reader and age (not modal age) and for all readers combined per age. A weighted mean is also given.

Age	R02 DK	R04 DE	R06 DK	R08 SE	R10 SE	R12 SE
0	140 mm	163 mm	-	154 mm	153 mm	155 mm
1	185 mm	210 mm	192 mm	206 mm	210 mm	212 mm
2	362 mm	374 mm	307 mm	359 mm	374 mm	352 mm
3	435 mm	436 mm	459 mm	429 mm	442 mm	443 mm
4	635 mm	616 mm	636 mm	607 mm	614 mm	612 mm
5	663 mm	681 mm	709 mm	663 mm	679 mm	668 mm
6	776 mm	821 mm	759 mm	725 mm	821 mm	764 mm
7	712 mm	690 mm	-	746 mm	768 mm	725 mm
8	1000 mm	1000 mm	1000 mm	877 mm	-	1000 mm
Weighted Mean	427 mm	428 mm	427 mm	428 mm	428 mm	427 mm

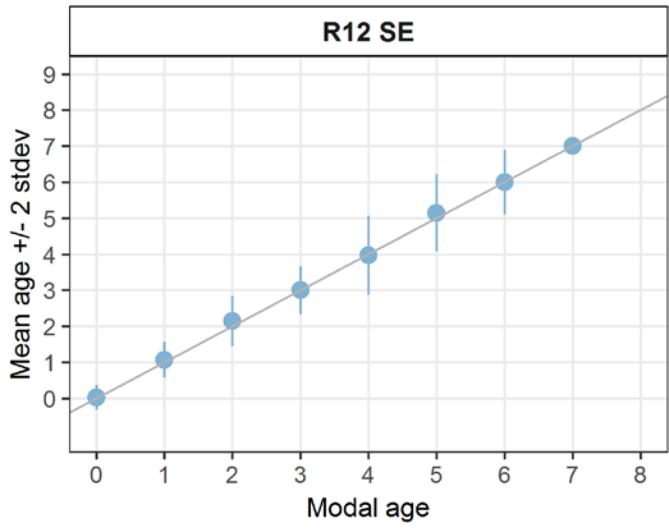
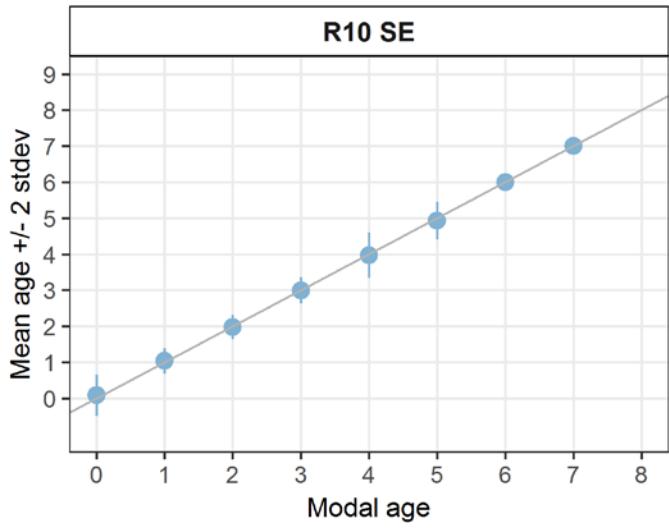
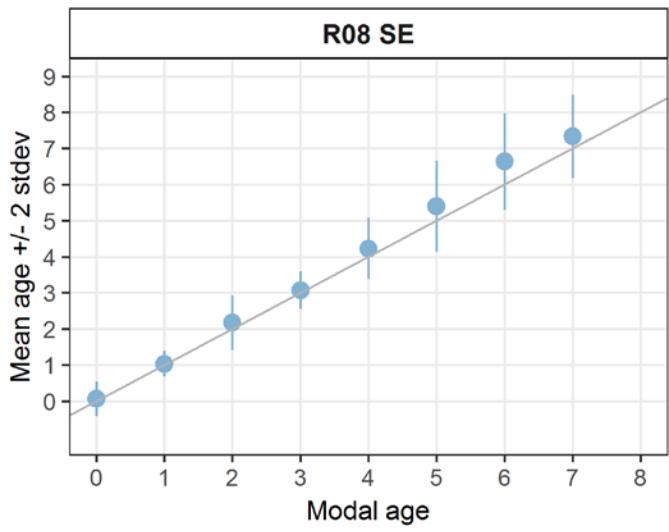
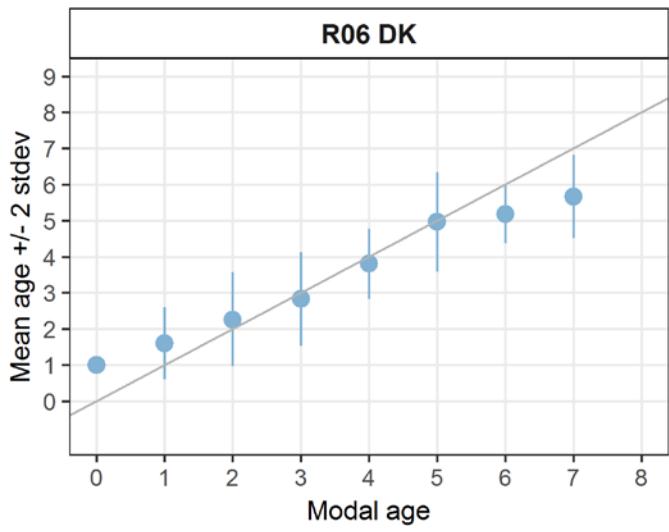
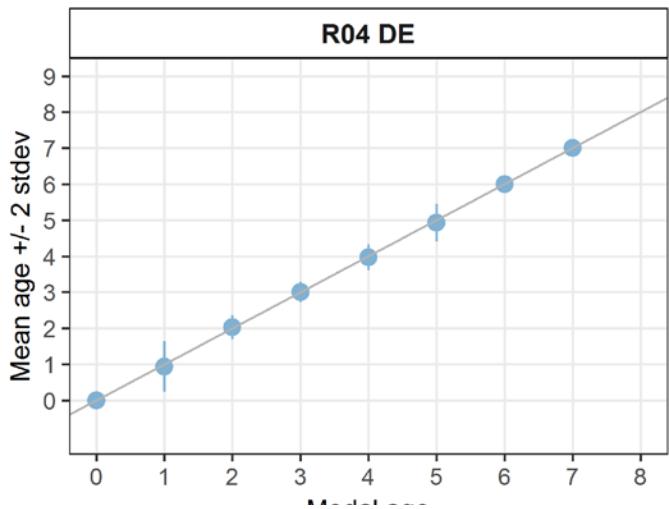
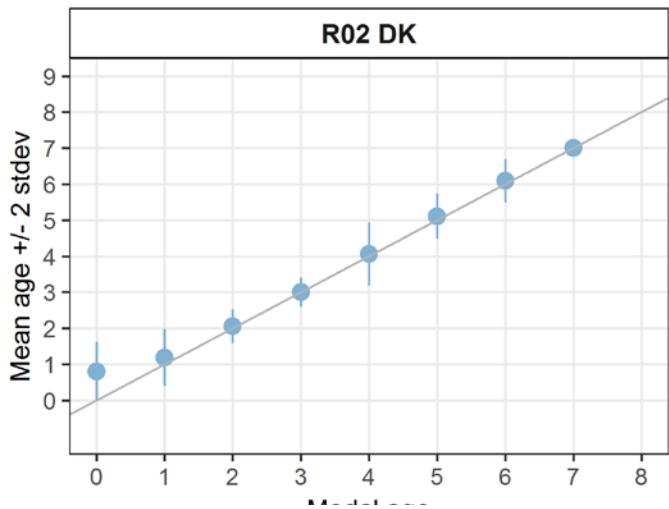


Figure 6: Individual age reading bias plots by age reader.

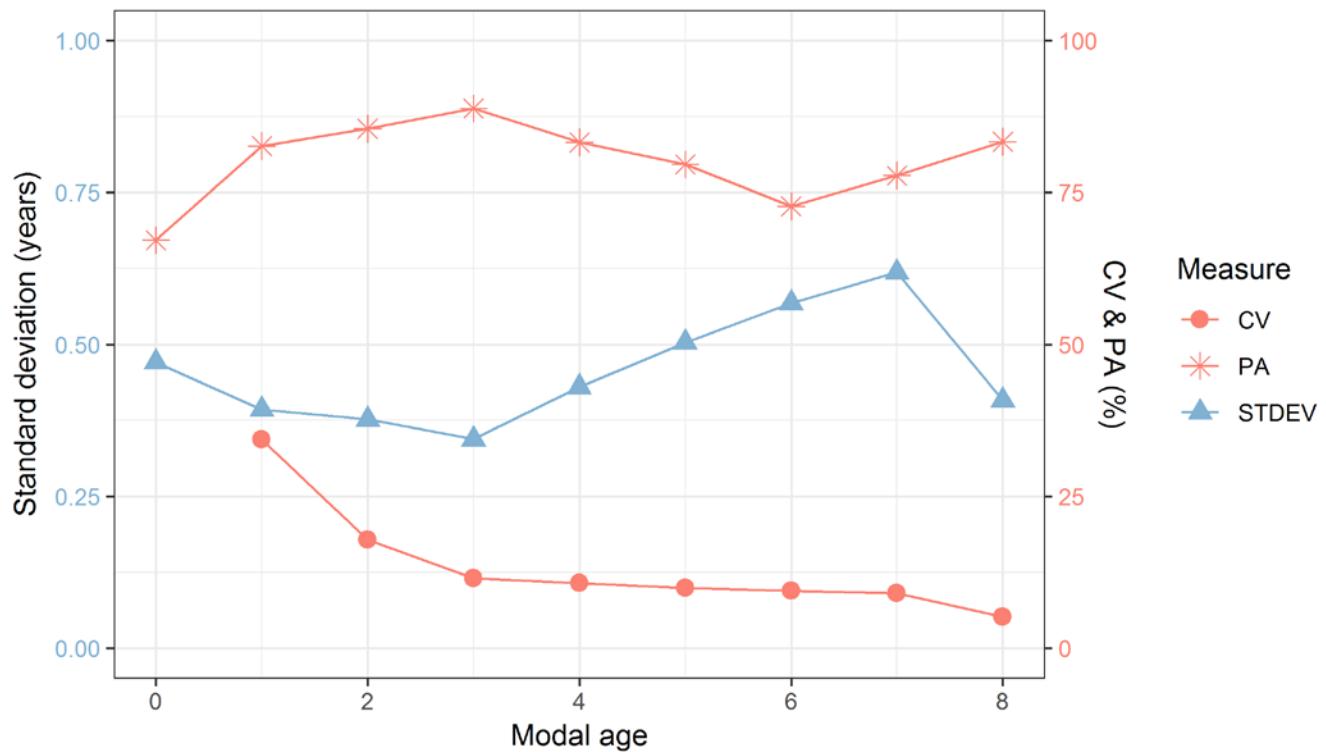


Figure 7: CV, PA and (STDEV (standard deviation) were plotted against modal age

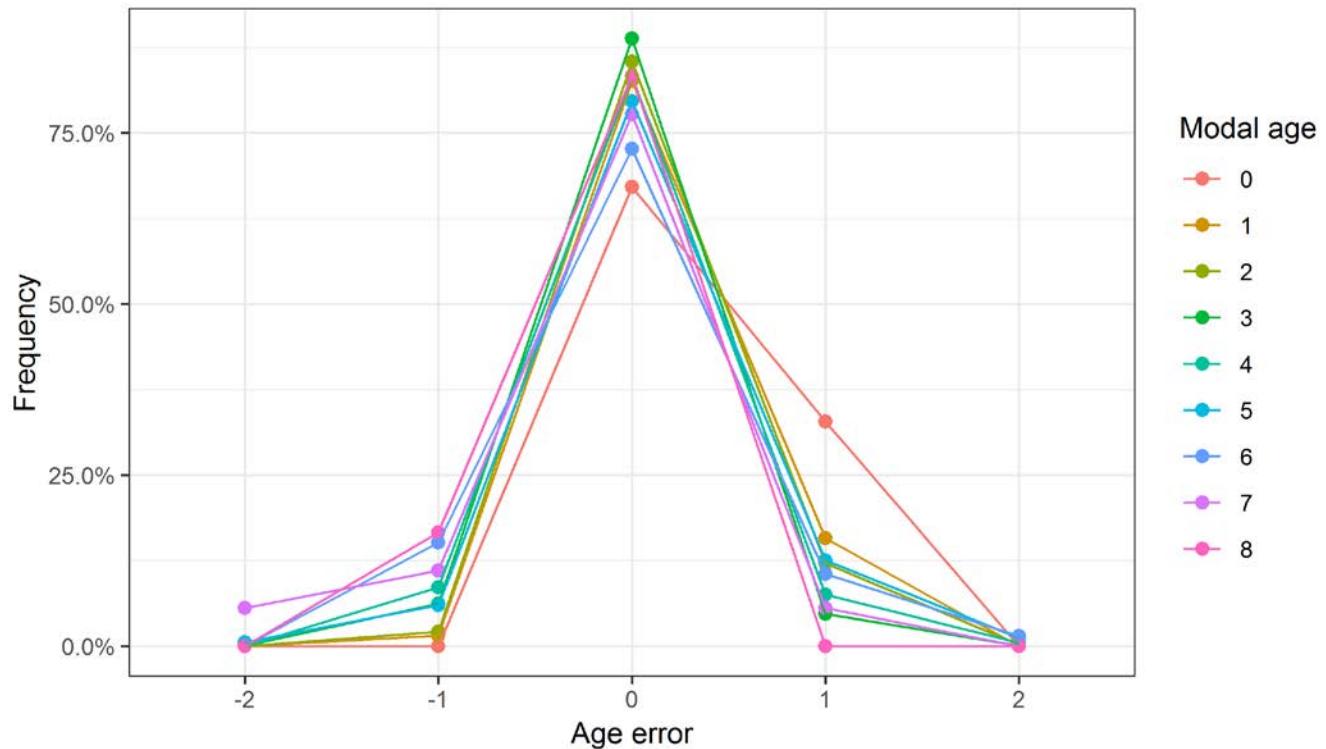


Figure 8: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is shown by the spread of the age readings errors. There appears to be no relative bias, if the age reading errors are normally distributed. The distributions are skewed, if relative bias occurs.

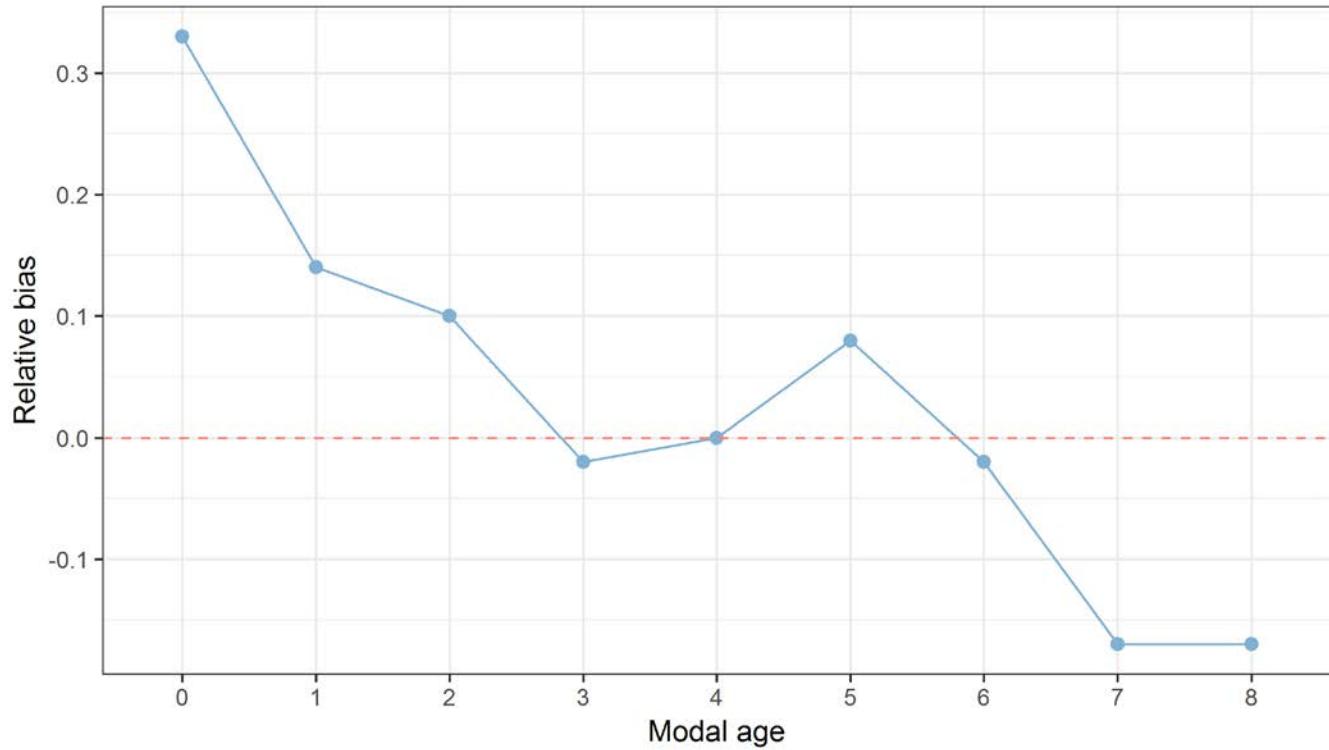


Figure 9: The relative bias by modal age as estimated by all age readers combined.

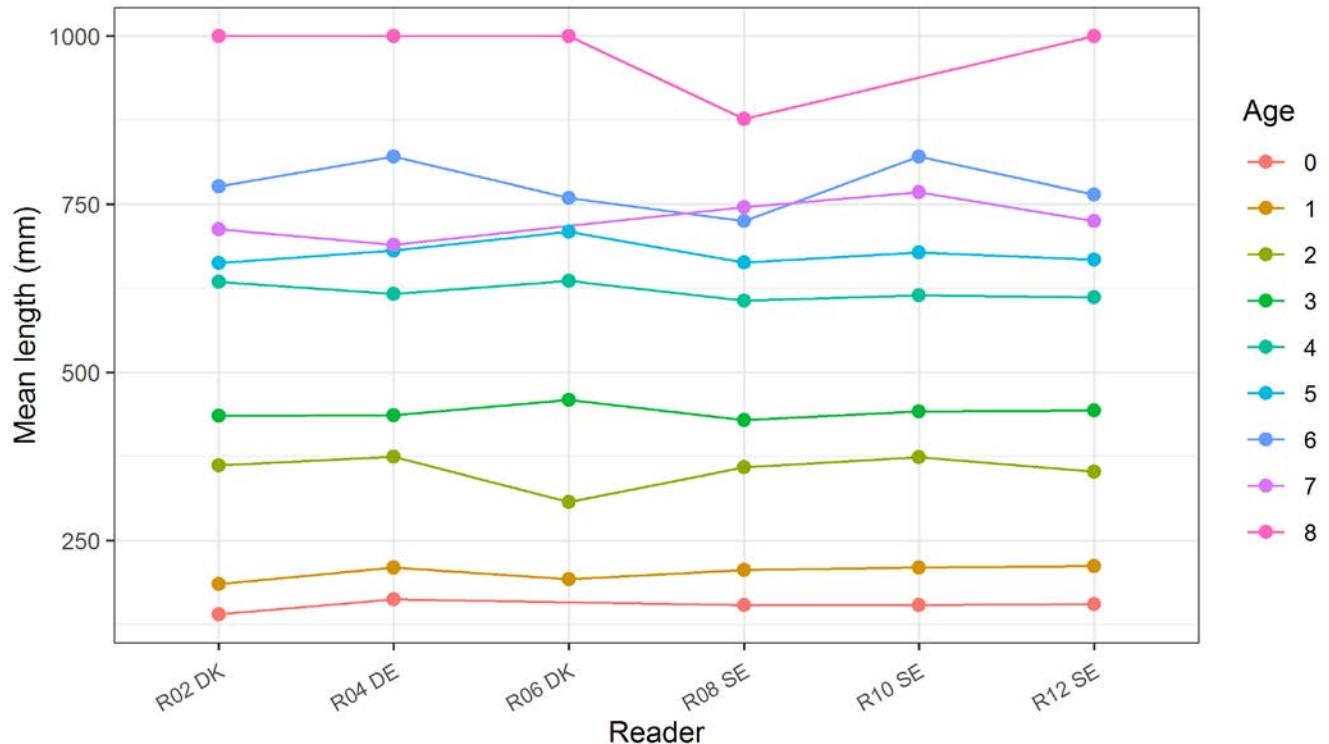


Figure 9: The mean length at age as estimated by each age reader.

Results Advanced readers

All samples included

Data Overview

Table 15: Data overview including modal age and statistics per sample.

Fish ID	Event ID	Sample ID	length	sex	Catch date	ICES area	R02 DK	R04 DE	R06 DK	R08 SE	Modal age	PA %	CV %	APE %
1	251	S756_2018_22_001	580	-	08/11/2018 00:00:00	27.3.d	3	3	3	3	3	100	0	0
2	251	S756_2018_22_003	120	-	08/11/2018 00:00:00	27.3.d	0	0	1	0	0	75	-	-
3	251	S756_2018_22_005	180	-	08/11/2018 00:00:00	27.3.d	1	0	1	0	0	50	-	-
4	251	S756_2018_22_007	120	-	08/11/2018 00:00:00	27.3.d	0	0	1	0	0	75	-	-
5	251	S756_2018_22_009	420	-	09/11/2018 00:00:00	27.3.d	2	2	3	3	2	50	23	20
6	251	S756_2018_22_010	420	-	09/11/2018 00:00:00	27.3.d	2	2	3	3	2	50	23	20
7	251	S756_2018_22_011	200	-	09/11/2018 00:00:00	27.3.d	1	1	1	1	1	100	0	0
8	251	S756_2018_22_012	310	-	09/11/2018 00:00:00	27.3.d	2	2	2	2	2	100	0	0
9	251	S756_2018_22_013	300	-	09/11/2018 00:00:00	27.3.d	2	2	2	2	2	100	0	0
10	251	S756_2018_22_023	290	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	100	0	0
11	251	S756_2018_22_024	310	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	100	0	0
12	251	S756_2018_22_026	280	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	100	0	0
13	251	S756_2018_22_030	220	-	10/11/2018 00:00:00	27.3.d	1	1	1	1	1	100	0	0
14	251	S756_2018_22_031	410	-	10/11/2018 00:00:00	27.3.d	2	2	3	2	2	75	22	17
15	251	S756_2018_22_036	280	-	10/11/2018 00:00:00	27.3.d	2	2	2	2	2	100	0	0
16	251	S756_2018_22_039	620	-	11/11/2018 00:00:00	27.3.d	2	2	4	3	2	50	35	27
17	251	S756_2018_22_042	430	-	11/11/2018 00:00:00	27.3.d	2	2	3	2	2	75	22	17
18	251	S756_2018_22_044	670	-	11/11/2018 00:00:00	27.3.d	5	5	4	5	5	75	11	8
19	251	S756_2018_22_051	100	-	11/11/2018 00:00:00	27.3.d	1	0	1	0	0	50	-	-
20	251	S756_2018_22_055	110	-	11/11/2018 00:00:00	27.3.d	1	0	1	0	0	50	-	-
21	251	S756_2018_22_059	180	-	11/11/2018 00:00:00	27.3.d	1	0	1	0	0	50	-	-
22	251	S756_2018_22_067	80	-	11/11/2018 00:00:00	27.3.d	0	0	1	0	0	75	-	-
23	251	S756_2018_22_068	90	-	11/11/2018 00:00:00	27.3.d	0	0	1	0	0	75	-	-

24	251	S760_2019_22_001	880	-	19/02/2019 00:00:00	27.3.d	5	5	5	5	5	100	0	0
25	251	S760_2019_22_002	720	-	19/02/2019 00:00:00	27.3.d	4	4	5	4	4	75	12	9
26	251	S760_2019_22_003	690	-	19/02/2019 00:00:00	27.3.d	3	3	4	4	3	50	16	14
27	251	S760_2019_22_004	680	-	19/02/2019 00:00:00	27.3.d	5	5	6	5	5	75	10	7
28	251	S760_2019_22_005	630	-	19/02/2019 00:00:00	27.3.d	3	3	5	4	3	50	26	20
29	251	S760_2019_22_007	580	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
30	251	S760_2019_22_008	630	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
31	251	S760_2019_22_009	570	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
32	251	S760_2019_22_010	510	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
33	251	S760_2019_22_011	540	-	19/02/2019 00:00:00	27.3.d	3	4	3	4	3	50	16	14
34	251	S760_2019_22_014	600	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
35	251	S760_2019_22_015	510	-	19/02/2019 00:00:00	27.3.d	5	4	4	5	4	50	13	11
36	251	S760_2019_22_016	520	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
37	251	S760_2019_22_017	500	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
38	251	S760_2019_22_019	490	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
39	251	S760_2019_22_020	630	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
40	251	S760_2019_22_021	620	-	19/02/2019 00:00:00	27.3.d	5	4	4	5	4	50	13	11
41	251	S760_2019_22_024	590	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
42	251	S760_2019_22_025	580	-	19/02/2019 00:00:00	27.3.d	3	3	4	3	3	75	15	12
43	251	S760_2019_22_027	670	-	19/02/2019 00:00:00	27.3.d	4	4	4	5	4	75	12	9
44	251	S760_2019_22_030	530	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
45	251	S760_2019_22_031	500	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
46	251	S760_2019_22_034	520	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
47	251	S760_2019_22_035	490	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
48	251	S760_2019_22_041	420	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
49	251	S760_2019_22_042	420	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
50	251	S760_2019_22_045	410	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
51	251	S760_2019_22_047	400	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
52	251	S760_2019_22_050	390	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14

53	251	S760_2019_22_051	420	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
54	251	S760_2019_22_053	390	-	19/02/2019 00:00:00	27.3.d	3	3	3	3	3	100	0	0
55	251	S760_2019_22_062	330	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14
56	251	S760_2019_22_063	330	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14
57	251	S760_2019_22_064	320	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14
58	251	S760_2019_22_065	320	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14
59	251	S760_2019_22_071	300	-	19/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14
60	251	S760_2019_22_072	290	-	19/02/2019 00:00:00	27.3.d	2	3	2	3	2	50	23	20
61	251	S760_2019_22_110	210	-	20/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
62	251	S760_2019_22_172	790	-	20/02/2019 00:00:00	27.3.d	5	5	6	6	5	50	10	9
63	251	S760_2019_22_173	670	-	20/02/2019 00:00:00	27.3.d	5	5	5	6	5	75	10	7
64	251	S760_2019_22_175	710	-	20/02/2019 00:00:00	27.3.d	5	5	5	5	5	100	0	0
65	251	S760_2019_22_176	720	-	20/02/2019 00:00:00	27.3.d	5	5	6	6	5	50	10	9
66	251	S760_2019_22_390	170	-	21/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
67	251	S760_2019_22_394	180	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
68	251	S760_2019_22_407	220	-	22/02/2019 00:00:00	27.3.d	3	3	2	3	3	75	18	14
69	251	S760_2019_22_408	210	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
70	251	S760_2019_22_409	190	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
71	251	S760_2019_22_412	140	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
72	251	S760_2019_22_413	760	-	22/02/2019 00:00:00	27.3.d	5	5	6	5	5	75	10	7
73	251	S760_2019_22_419	210	-	22/02/2019 00:00:00	27.3.d	2	1	2	1	1	50	38	33
74	251	S760_2019_22_420	180	-	22/02/2019 00:00:00	27.3.d	1	1	2	1	1	75	40	30
75	251	S760_2019_22_423	690	-	23/02/2019 00:00:00	27.3.d	5	5	5	5	5	100	0	0
76	251	S760_2019_22_425	740	-	23/02/2019 00:00:00	27.3.d	5	5	6	6	5	50	10	9
77	251	S760_2019_22_428	160	-	23/02/2019 00:00:00	27.3.d	2	1	2	1	1	50	38	33
78	251	7802556	330	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0
79	251	7802557	420	-	23/10/2018 06:13:00	27.3.d	3	2	3	3	3	75	18	14
80	251	7802558	320	-	23/10/2018 06:13:00	27.3.d	1	1	2	1	1	75	40	30
81	251	7802559	370	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0

82	251	7802560	310	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0
83	251	7802561	300	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0
84	251	7802562	290	-	23/10/2018 06:13:00	27.3.d	2	2	1	2	2	75	29	21
85	251	7802563	260	-	23/10/2018 06:13:00	27.3.d	1	1	1	1	1	100	0	0
86	251	7802564	220	-	23/10/2018 06:13:00	27.3.d	2	0	1	1	1	50	82	50
87	251	7802565	380	-	23/10/2018 06:13:00	27.3.d	2	2	2	3	2	75	22	17
88	251	7802566	410	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	75	22	17
89	251	7802567	500	-	23/10/2018 06:13:00	27.3.d	4	4	3	4	4	75	13	10
90	251	7802568	350	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	75	22	17
91	251	7802569	400	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0
92	251	7802570	390	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0
93	251	7802571	280	-	23/10/2018 06:13:00	27.3.d	1	1	1	1	1	100	0	0
94	251	7802572	210	-	23/10/2018 06:13:00	27.3.d	2	0	1	1	1	50	82	50
95	251	7802573	160	-	23/10/2018 06:13:00	27.3.d	1	0	1	0	0	50	-	-
96	251	7802574	430	-	23/10/2018 06:13:00	27.3.d	3	2	3	3	3	75	18	14
97	251	7802575	470	-	23/10/2018 06:13:00	27.3.d	4	3	3	3	3	75	15	12
98	251	7802576	270	-	23/10/2018 06:13:00	27.3.d	2	1	1	1	1	75	40	30
99	251	7802577	340	-	23/10/2018 06:13:00	27.3.d	2	2	2	2	2	100	0	0
100	251	7802578	570	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	75	22	17
101	251	7802579	540	-	23/10/2018 06:13:00	27.3.d	2	2	3	2	2	75	22	17
102	251	7802580	510	-	23/10/2018 06:13:00	27.3.d	4	4	3	4	4	75	13	10
103	251	7802581	150	-	23/10/2018 06:13:00	27.3.d	1	0	1	0	0	50	-	-
104	251	7802582	200	-	23/10/2018 06:13:00	27.3.d	1	0	1	0	0	50	-	-
105	251	7802891	650	-	24/10/2018 06:41:00	27.3.d	4	4	4	4	4	100	0	0
106	251	7802892	530	-	24/10/2018 06:41:00	27.3.d	2	2	3	3	2	50	23	20
107	251	7802893	450	-	24/10/2018 06:41:00	27.3.d	3	2	3	2	2	50	23	20
108	251	7802894	340	-	24/10/2018 06:41:00	27.3.d	1	1	2	2	1	50	38	33
109	251	7802895	400	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	75	22	17
110	251	7802896	470	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	75	22	17

111	251	7802897	440	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	75	22	17
112	251	7802898	370	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	100	0	0
113	251	7802899	460	-	24/10/2018 06:41:00	27.3.d	2	2	3	3	2	50	23	20
114	251	7802900	410	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	75	22	17
115	251	7802901	390	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	100	0	0
116	251	7802902	420	-	24/10/2018 06:41:00	27.3.d	2	2	3	2	2	75	22	17
117	251	7802903	360	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	100	0	0
118	251	7802904	330	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	100	0	0
119	251	7802905	350	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	100	0	0
120	251	7802906	320	-	24/10/2018 06:41:00	27.3.d	2	2	2	2	2	100	0	0
121	251	7802907	290	-	24/10/2018 06:41:00	27.3.d	2	2	1	2	2	75	29	21
122	251	7803189	940	-	24/10/2018 14:55:00	27.3.d	6	6	6	7	6	75	8	6
123	251	7803190	790	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
124	251	7803191	830	-	24/10/2018 14:55:00	27.3.d	6	6	5	7	6	50	14	8
125	251	7803192	1000	-	24/10/2018 14:55:00	27.3.d	8	8	8	8	8	100	0	0
126	251	7803193	850	-	24/10/2018 14:55:00	27.3.d	6	6	5	6	6	75	9	7
127	251	7803194	950	-	24/10/2018 14:55:00	27.3.d	6	6	5	6	6	75	9	7
128	251	7803195	750	-	24/10/2018 14:55:00	27.3.d	4	4	4	5	4	75	12	9
129	251	7803196	860	-	24/10/2018 14:55:00	27.3.d	6	6	5	7	6	50	14	8
130	251	7803197	720	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
131	251	7803198	610	-	24/10/2018 14:55:00	27.3.d	5	4	4	5	4	50	13	11
132	251	7803199	780	-	24/10/2018 14:55:00	27.3.d	7	6	5	7	7	50	15	12
133	251	7803200	760	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
134	251	7803201	740	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
135	251	7803202	650	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
136	251	7803203	710	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
137	251	7803204	590	-	24/10/2018 14:55:00	27.3.d	4	4	3	4	4	75	13	10
138	251	7803205	570	-	24/10/2018 14:55:00	27.3.d	6	4	3	7	3	25	37	30
139	251	7803206	360	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0

140	251	7803207	390	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	75	22	17
141	251	7803208	330	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
142	251	7803209	300	-	24/10/2018 14:55:00	27.3.d	1	1	2	1	1	75	40	30
143	251	7803210	530	-	24/10/2018 14:55:00	27.3.d	4	4	3	4	4	75	13	10
144	251	7803211	640	-	24/10/2018 14:55:00	27.3.d	5	5	4	6	5	50	16	10
145	251	7803212	700	-	24/10/2018 14:55:00	27.3.d	4	4	4	5	4	75	12	9
146	251	7803213	680	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
147	251	7803214	510	-	24/10/2018 14:55:00	27.3.d	5	4	3	5	5	50	23	18
148	251	7803215	670	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
149	251	7803216	690	-	24/10/2018 14:55:00	27.3.d	5	5	4	5	5	75	11	8
150	251	7803217	450	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	75	22	17
151	251	7803218	490	-	24/10/2018 14:55:00	27.3.d	3	4	3	3	3	75	15	12
152	251	7803219	410	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	75	22	17
153	251	7803220	420	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
154	251	7803221	560	-	24/10/2018 14:55:00	27.3.d	4	4	3	4	4	75	13	10
155	251	7803222	440	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
157	251	7803223	620	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
158	251	7803224	600	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
159	251	7803225	630	-	24/10/2018 14:55:00	27.3.d	4	4	4	4	4	100	0	0
160	251	7803226	430	-	24/10/2018 14:55:00	27.3.d	2	2	3	2	2	75	22	17
161	251	7803227	400	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
162	251	7803228	370	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
163	251	7803229	350	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
164	251	7803230	380	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
165	251	7803231	340	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
166	251	7803232	320	-	24/10/2018 14:55:00	27.3.d	2	2	2	2	2	100	0	0
167	251	7803233	310	-	24/10/2018 14:55:00	27.3.d	1	1	1	1	1	100	0	0
168	251	7803234	280	-	24/10/2018 14:55:00	27.3.d	1	1	1	1	1	100	0	0
169	251	7803235	820	-	30/10/2018 11:58:00	27.3.d	5	5	5	5	5	100	0	0

170	251	7807045	140	-	30/10/2018 11:58:00	27.3.d	1	0	1	0	0	50	-	-
171	251	7807046	330	-	30/10/2018 10:13:00	27.3.d	2	2	2	2	2	100	0	0
172	251	7806841	280	-	30/10/2018 10:13:00	27.3.d	2	2	2	2	2	100	0	0
173	251	7806842	260	-	30/10/2018 10:13:00	27.3.d	2	2	2	2	2	100	0	0
174	251	7806843	130	-	30/10/2018 10:13:00	27.3.d	1	0	1	0	0	50	-	-
175	251	7806844	850	-	30/10/2018 08:23:00	27.3.d	5	5	5	5	5	100	0	0
176	251	7806686	490	-	30/10/2018 08:23:00	27.3.d	2	2	3	3	2	50	23	20
177	251	7806687	320	-	30/10/2018 08:23:00	27.3.d	2	2	2	2	2	100	0	0
178	251	7806688	260	-	30/10/2018 08:23:00	27.3.d	2	2	1	2	2	75	29	21
179	251	7806689	690	-	30/10/2018 06:24:00	27.3.d	4	4	4	4	4	100	0	0
180	251	7806465	300	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	75	29	21
181	251	7806466	310	-	30/10/2018 06:24:00	27.3.d	2	2	2	2	2	100	0	0
182	251	7806467	270	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	75	29	21
183	251	7806468	290	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	75	29	21
184	251	7806469	280	-	30/10/2018 06:24:00	27.3.d	2	2	1	2	2	75	29	21
185	251	7806470	170	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	50	-	-
186	251	7806471	150	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	50	-	-
187	251	7806472	150	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	50	-	-
188	251	7806473	160	-	30/10/2018 06:24:00	27.3.d	1	0	1	0	0	50	-	-
189	251	7806474	170	-	29/10/2018 07:53:00	27.3.d	0	0	1	0	0	75	-	-
190	251	7806128	180	-	29/10/2018 06:05:00	27.3.d	1	0	1	0	0	50	-	-
191	251	7805939	150	-	29/10/2018 06:05:00	27.3.d	1	0	1	0	0	50	-	-
192	251	7805940	390	-	28/10/2018 12:25:00	27.3.d	2	2	2	3	2	75	22	17
193	251	7805758	170	-	28/10/2018 13:27:00	27.3.d	2	2	1	1	1	50	38	33
194	251	7805562	160	-	28/10/2018 10:41:00	27.3.d	1	0	1	1	1	75	67	50
195	251	7805356	640	-	28/10/2018 09:12:00	27.3.d	2	2	3	3	2	50	23	20
196	251	7805199	210	-	28/10/2018 09:12:00	27.3.d	0	0	1	1	0	50	-	-
197	251	7805200	310	-	28/10/2018 06:41:00	27.3.d	1	0	1	1	1	75	67	50
198	251	7804982	150	-	27/10/2018 12:00:00	27.3.d	1	0	1	0	0	50	-	-

199	251	7804870	160	-	27/10/2018 12:00:00	27.3.d	1	0	1	0	0	50	-	-
200	251	7804871	170	-	27/10/2018 12:00:00	27.3.d	1	0	1	0	0	50	-	-
201	251	7804872	190	-	27/10/2018 12:00:00	27.3.d	0	0	1	0	0	75	-	-
202	251	7804873	190	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	50	-	-
203	251	7808502	180	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	50	-	-
204	251	7808503	160	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	50	-	-
205	251	7808504	180	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	50	-	-
206	251	7808505	160	-	01/11/2018 11:53:00	27.3.d	1	0	1	0	0	50	-	-
207	251	7808506	160	-	01/11/2018 09:40:00	27.3.d	1	0	1	0	0	50	-	-
208	251	7808351	170	-	01/11/2018 07:26:00	27.3.d	1	0	1	0	0	50	-	-
209	251	7808249	150	-	31/10/2018 06:14:00	27.3.d	1	0	1	0	0	50	-	-
210	251	7807451	160	-	31/10/2018 06:14:00	27.3.d	1	0	1	0	0	50	-	-
211	251	7807452	650	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
212	251	7895905	710	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
213	251	7895906	690	-	28/02/2019 14:27:21	27.3.d	6	6	5	6	6	75	9	7
214	251	7895907	510	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
215	251	7895908	780	-	28/02/2019 14:27:21	27.3.d	7	7	6	8	7	50	12	7
216	251	7895909	680	-	28/02/2019 14:27:21	27.3.d	6	5	5	7	5	50	17	13
217	251	7895910	530	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
218	251	7895911	560	-	28/02/2019 14:27:21	27.3.d	3	4	4	4	4	75	13	10
219	251	7895912	490	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
220	251	7895913	550	-	28/02/2019 14:27:21	27.3.d	4	4	4	4	4	100	0	0
221	251	7895914	590	-	28/02/2019 14:27:21	27.3.d	6	5	5	6	5	50	10	9
222	251	7895915	480	-	28/02/2019 14:27:21	27.3.d	4	3	4	3	3	50	16	14
223	251	7895916	540	-	28/02/2019 14:27:21	27.3.d	5	4	5	6	5	50	16	10
224	251	7895917	600	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
225	251	7895918	760	-	28/02/2019 14:27:21	27.3.d	6	6	6	7	6	75	8	6
226	251	7895919	660	-	28/02/2019 14:27:21	27.3.d	7	7	6	7	7	75	7	6
227	251	7895920	700	-	28/02/2019 14:27:21	27.3.d	6	6	5	6	6	75	9	7

228	251	7895921	670	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
229	251	7895922	640	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
230	251	7895923	610	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
231	251	7895924	520	-	28/02/2019 14:27:21	27.3.d	3	3	3	4	3	75	15	12
232	251	7895925	420	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
233	251	7895926	570	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
234	251	7895927	480	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
235	251	7895928	450	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
236	251	7895929	820	-	28/02/2019 14:27:21	27.3.d	6	6	5	6	6	75	9	7
237	251	7895930	580	-	28/02/2019 14:27:21	27.3.d	5	5	4	5	5	75	11	8
238	251	7895931	630	-	28/02/2019 14:27:21	27.3.d	7	7	5	7	7	75	15	12
239	251	7895932	620	-	28/02/2019 14:27:21	27.3.d	5	5	5	5	5	100	0	0
240	251	7895933	420	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
241	251	7895934	400	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
242	251	7895935	350	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
243	251	7895936	390	-	28/02/2019 14:27:21	27.3.d	3	3	3	3	3	100	0	0
244	251	7895937	320	-	28/02/2019 14:27:21	27.3.d	2	2	2	2	2	100	0	0
245	251	7895938	310	-	28/02/2019 14:27:21	27.3.d	3	3	2	3	3	75	18	14
246	251	7895939	290	-	28/02/2019 14:27:21	27.3.d	3	3	2	3	3	75	18	14
247	251	7895940	280	-	28/02/2019 14:27:21	27.3.d	3	3	2	3	3	75	18	14
248	251	7895941	550	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
249	251	7896061	580	-	01/03/2019 06:27:20	27.3.d	3	3	4	3	3	75	15	12
250	251	7896062	560	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
251	251	7896063	570	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
252	251	7896064	500	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
253	251	7896065	600	-	01/03/2019 06:27:20	27.3.d	3	3	4	4	3	50	16	14
254	251	7896066	540	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
255	251	7896067	470	-	01/03/2019 06:27:20	27.3.d	-	3	3	3	3	100	0	0
256	251	7896068	450	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0

257	251	7896069	490	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
258	251	7896070	480	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
259	251	7896071	530	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
260	251	7896072	440	-	01/03/2019 06:27:20	27.3.d	2	3	3	3	3	75	18	14
261	251	7896073	510	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
262	251	7896074	520	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
263	251	7896075	460	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
264	251	7896076	400	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
265	251	7896077	380	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
266	251	7896078	420	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
267	251	7896079	340	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
268	251	7896080	360	-	01/03/2019 06:27:20	27.3.d	3	4	2	3	3	50	27	17
269	251	7896081	350	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
270	251	7896082	390	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
271	251	7896083	370	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
272	251	7896084	430	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
273	251	7896085	310	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
274	251	7896086	330	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
275	251	7896087	410	-	01/03/2019 06:27:20	27.3.d	3	3	3	3	3	100	0	0
276	251	7896088	300	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
277	251	7896089	320	-	01/03/2019 06:27:20	27.3.d	3	3	2	3	3	75	18	14
278	251	7896090	520	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
279	251	7896562	510	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
280	251	7896563	470	-	01/03/2019 09:53:07	27.3.d	3	3	-	3	3	100	0	0
281	251	7896564	480	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
282	251	7896565	340	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
283	251	7896566	430	-	01/03/2019 09:53:07	27.3.d	3	3	3	4	3	75	15	12
284	251	7896567	420	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
285	251	7896568	440	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0

286	251	7896569	410	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
287	251	7896570	390	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
288	251	7896571	380	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
289	251	7896572	330	-	01/03/2019 09:53:07	27.3.d	3	3	2	4	3	50	27	17
290	251	7896573	370	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
291	251	7896574	360	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
292	251	7896575	450	-	01/03/2019 09:53:07	27.3.d	3	3	3	3	3	100	0	0
293	251	7896576	350	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
294	251	7896577	260	-	01/03/2019 09:53:07	27.3.d	3	3	-	3	3	100	0	0
295	251	7896578	310	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
296	251	7896579	300	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
297	251	7896580	320	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
298	251	7896581	290	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
299	251	7896582	280	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
300	251	7896583	270	-	01/03/2019 09:53:07	27.3.d	3	3	2	3	3	75	18	14
301	251	7896584	510	-	02/03/2019 06:57:32	27.3.d	3	3	-	3	3	100	0	0
302	251	7896815	490	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
303	251	7896816	450	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
304	251	7896817	600	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
305	251	7896818	460	-	02/03/2019 06:57:32	27.3.d	4	3	3	4	3	50	16	14
306	251	7896819	620	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
307	251	7896820	470	-	02/03/2019 06:57:32	27.3.d	3	3	4	3	3	75	15	12
308	251	7896821	440	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
309	251	7896822	410	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
310	251	7896823	340	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
311	251	7896824	370	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
312	251	7896825	400	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
313	251	7896826	350	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	75	18	14
314	251	7896827	560	-	02/03/2019 06:57:32	27.3.d	3	3	-	3	3	100	0	0

316	251	7896828	430	-	02/03/2019 06:57:32	27.3.d	3	3	-	3	3	100	0	0
317	251	7896829	460	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
318	251	7896830	390	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
319	251	7896831	500	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
320	251	7896832	420	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
321	251	7896833	380	-	02/03/2019 06:57:32	27.3.d	3	3	3	3	3	100	0	0
322	251	7896834	330	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	75	18	14
323	251	7896835	310	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	75	18	14
324	251	7896836	360	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	75	18	14
327	251	7896837	280	-	02/03/2019 06:57:32	27.3.d	3	3	1	3	3	75	40	30
328	251	7896838	320	-	02/03/2019 06:57:32	27.3.d	3	3	2	3	3	75	18	14
329	251	7896839	660	-	02/03/2019 10:16:07	27.3.d	4	4	-	4	4	100	0	0
330	251	7896840	470	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
331	251	7896841	500	-	02/03/2019 10:16:07	27.3.d	3	3	4	3	3	75	15	12
332	251	7896842	480	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
333	251	7897089	430	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
334	251	7897090	440	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
335	251	7897091	460	-	02/03/2019 10:16:07	27.3.d	3	3	3	4	3	75	15	12
336	251	7897092	410	-	02/03/2019 10:16:07	27.3.d	3	3	3	4	3	75	15	12
337	251	7897093	400	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
338	251	7897094	390	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
339	251	7897095	510	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
340	251	7897096	450	-	02/03/2019 10:16:07	27.3.d	2	3	3	3	3	75	18	14
341	251	7897097	380	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
342	251	7897098	420	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
343	251	7897099	370	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	75	18	14
344	251	7897100	360	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
345	251	7897101	320	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	75	18	14
346	251	7897102	330	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0

347	251	7897103	340	-	02/03/2019 10:16:07	27.3.d	3	3	3	3	3	100	0	0
348	251	7897104	310	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	75	18	14
349	251	7897105	300	-	02/03/2019 10:16:07	27.3.d	3	3	2	3	3	75	18	14
350	251	7897106	210	-	04/03/2019 08:27:43	27.3.d	1	1	1	1	1	100	0	0
351	251	7897107	120	-	04/03/2019 13:00:05	27.3.d	1	1	1	1	1	100	0	0
352	251	7897108	130	-	04/03/2019 13:00:05	27.3.d	1	1	2	1	1	75	40	30
353	251	7897109	150	-	04/03/2019 13:00:05	27.3.d	1	1	2	1	1	75	40	30
354	251	7897817	170	-	04/03/2019 15:03:42	27.3.d	1	1	2	1	1	75	40	30
356	251	7898125	760	-	07/03/2019 13:13:19	27.3.d	3	3	4	3	3	75	15	12
357	251	7898126	600	-	07/03/2019 13:13:19	27.3.d	3	3	4	4	3	50	16	14
358	251	7898127	760	-	07/03/2019 13:13:19	27.3.d	3	3	4	4	3	50	16	14
359	251	7898209	170	-	07/03/2019 13:13:19	27.3.d	1	1	2	1	1	75	40	30
360	251	7898645	180	-	07/03/2019 13:13:19	27.3.d	1	1	2	1	1	75	40	30
361	251	7899237	150	-	07/03/2019 13:13:19	27.3.d	1	1	2	1	1	75	40	30
362	251	7899238	710	-	07/03/2019 10:52:25	27.3.d	4	3	4	4	4	75	13	10
363	251	7899239	850	-	07/03/2019 10:52:25	27.3.d	6	6	5	8	6	50	20	14
364	251	7899240	280	-	07/03/2019 10:52:25	27.3.d	3	3	2	3	3	75	18	14
365	251	7899241	160	-	07/03/2019 10:52:25	27.3.d	1	1	2	1	1	75	40	30

Table 16: 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 DK	R04 DE	R06 DK	R08 SE	total
0	34	34	34	34	136
1	33	33	33	33	132
2	68	68	68	68	272
3	152	153	148	153	606
4	29	29	28	29	115
5	28	28	28	28	112
6	10	10	10	10	40
7	4	4	4	4	16
8	1	1	1	1	4
Total	359	360	354	360	1433

Table 17: Age composition by reader gives a summary of number of readings per reader.

Modal age	R02 DK	R04 DE	R06 DK	R08 SE
0	7	38	0	33
1	54	28	56	33
2	75	70	98	59
3	148	149	117	150
4	28	34	43	35
5	29	26	30	26
6	13	11	9	12
7	4	3	0	9
8	1	1	1	3
Total	359	360	354	360

Table 18: 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 DK	R04 DE	R06 DK	R08 SE
0	140 mm	163 mm	-	154 mm
1	185 mm	210 mm	192 mm	206 mm
2	362 mm	374 mm	307 mm	359 mm
3	435 mm	436 mm	459 mm	429 mm
4	635 mm	616 mm	636 mm	607 mm
5	663 mm	681 mm	709 mm	663 mm
6	776 mm	821 mm	759 mm	725 mm
7	712 mm	690 mm	-	746 mm
8	1000 mm	1000 mm	1000 mm	877 mm
Weighted Mean	427 mm	428 mm	427 mm	428 mm

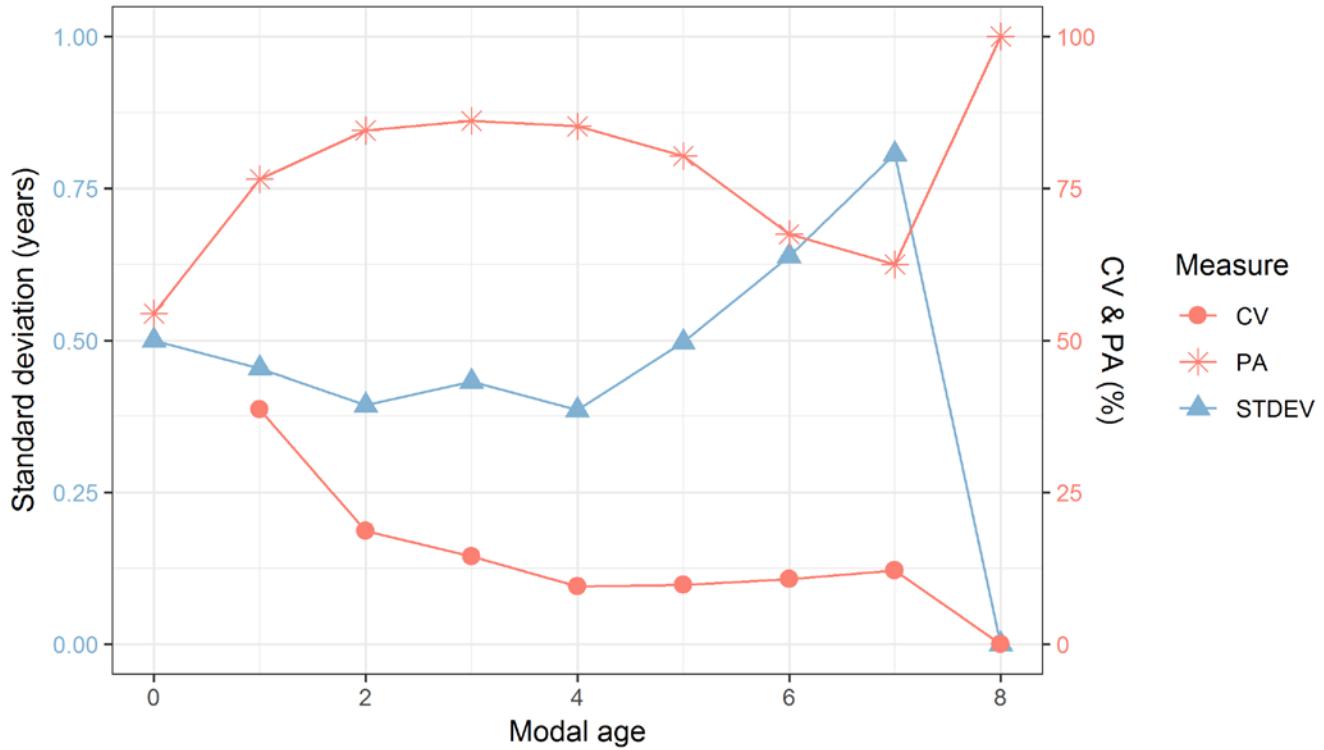


Figure 10: CV, PA and (STDEV (standard deviation) are plotted against modal age

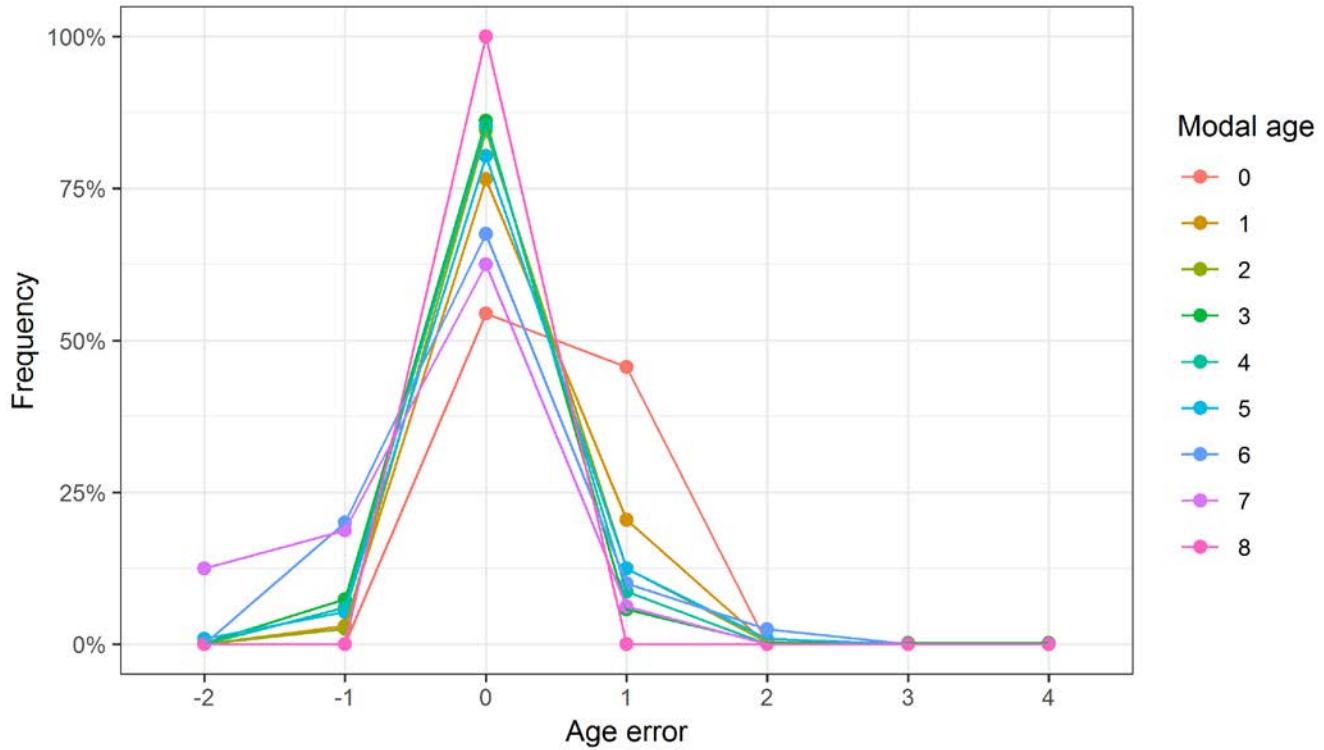


Figure 11: The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by MODAL age group is

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.

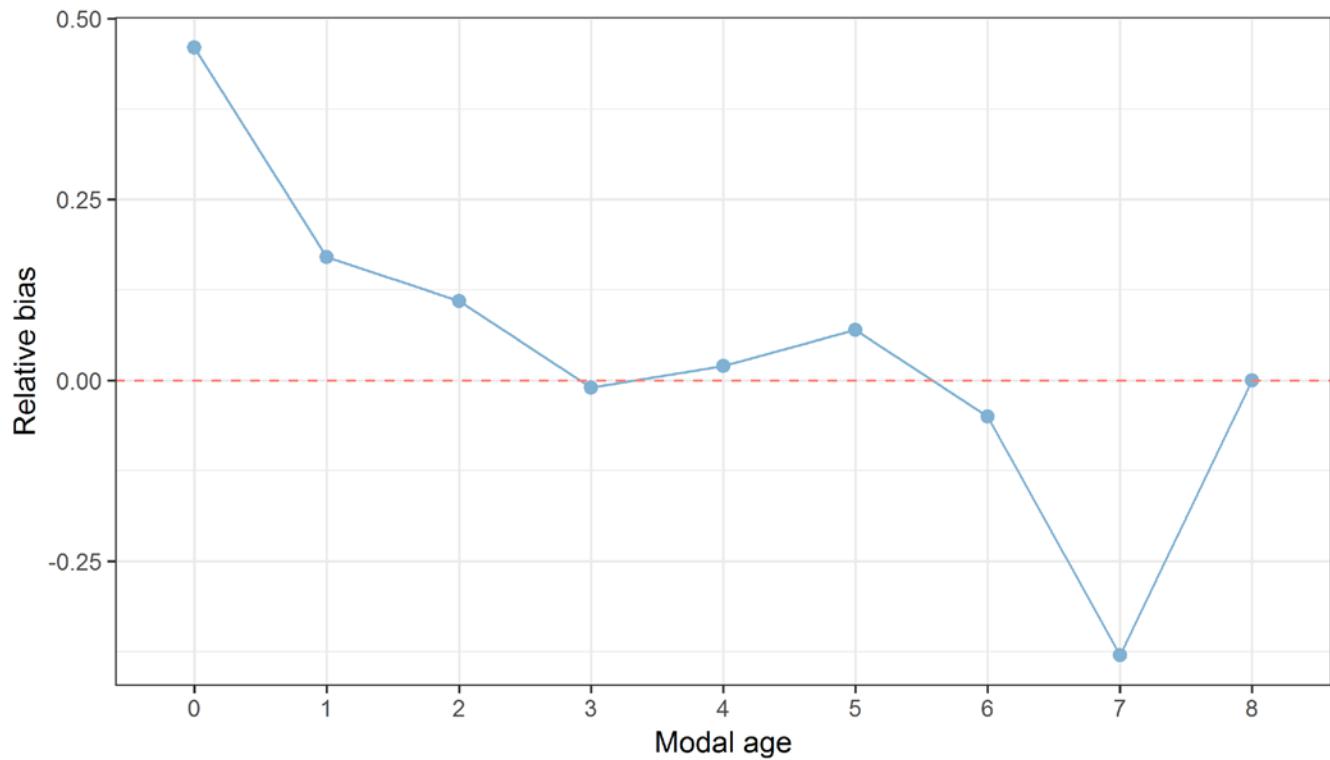


Figure 12: The relative bias by modal age as estimated by all age readers combined.

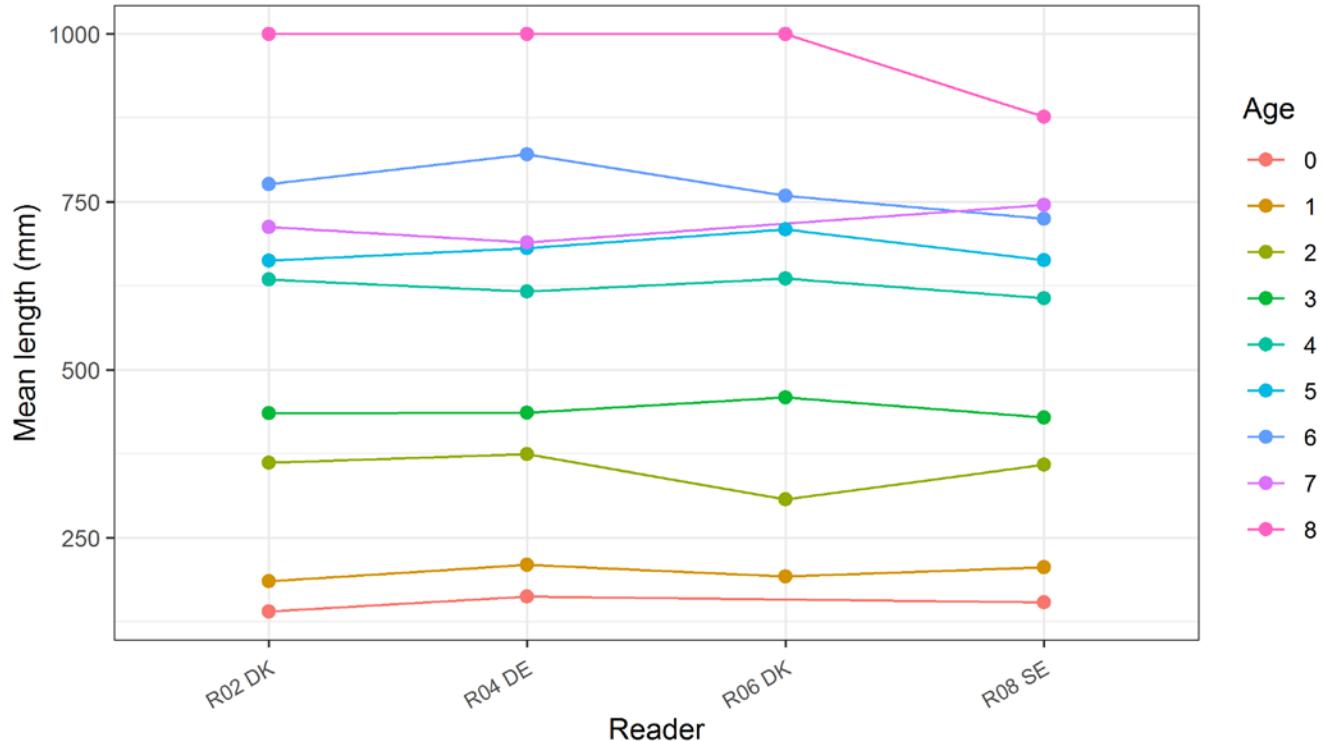


Figure 13: The mean length at age as estimated by each age reader.

Age-reading guide for Western Baltic cod – version 1, 18. August 2020

Uwe Krumme, Kate McQueen, Stefanie Haase, Britta Rotzoll

This document contains age reading guidelines to ease and standardize the international age determination of Western Baltic cod (cod2224). It combines evidence from several sources, involving

- a table using the edge zone category (opaque or translucent) by month to guide age determination,
- the mean diameter of the first ring,
- photos of age-validated otoliths (age 0, age 1, age 2, age 3),
- exemplary images following the strong 2016 cohort, and
- exemplary images of a few older cod (age 5 to age 11).

Table 1 is the supplementary Table S3 of Krumme et al. 2020, Age validation of age 0-3 wild cod *Gadus morhua* in the western Baltic Sea through mark-recapture and tetracycline marking of otoliths, Marine Ecology Progress Series 645:141-158, [DOI:10.3354/meps13380](https://doi.org/10.3354/meps13380):

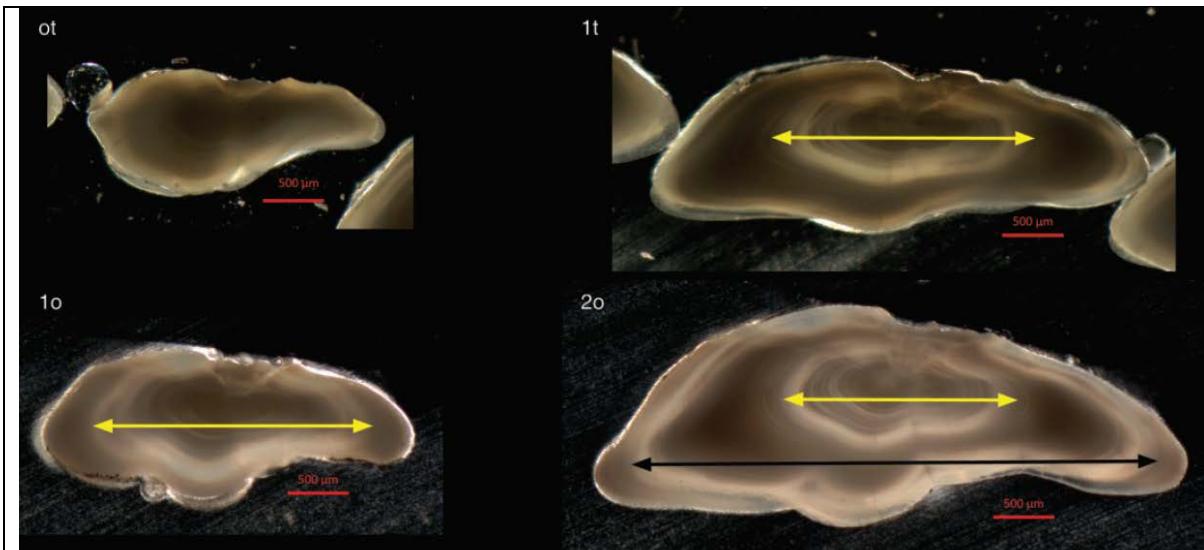
Edge-zone category refers to the number of completed translucent zones (TZ), and the edge type of the otolith, with o=opaque and t=translucent (sectioned otolith seen under transmitted light). For example, an otolith with 1 completed translucent zone and a translucent edge would be coded “1t” (McQueen et al. 2019, Age validation of juvenile cod in the western Baltic Sea. ICES Journal of Marine Science 76(2):430-441, [DOI:10.1093/icesjms/fsy175](https://doi.org/10.1093/icesjms/fsy175)). The age-reading guide for young cod (age 0-2) is taken from McQueen et al. (2019). The table is extended to include age-3 cod, following the results of Krumme et al. 2020, which directly validated the timing and frequency of the formation of the first, second and third translucent zone. UC indicates unclassifiable combinations of month and edge-zone category. Cells filled with a dash (-) indicate combinations of month and edge-zone category which are very unlikely to occur following the current understanding of patterns in TZ formation, and which were very rarely observed in the samples.

Month	Edge-zone category							
	0o	0t	1o	1t	2o	2t	3o	3t
January	-	-	1	-	2	-	2	-
February	-	-	1	-	2	-	2	-
March	-	-	1	-	2	-	2	-
April	-	-	1	-	2	-	2	-
May	-	-	1	-	2	-	2	-
June	-	-	1	1	2	2	2	3
July	-	-	1	1	2	2	2	3
August	0	0	UC	1	UC	2	UC	3
September	0	0	0	1	1	2	3	3
October	0	0	0	1	1	2	3	3
November	0	0	0	1	1	2	3	3
December	0	0	0	1	1	2	3	3

Mean diameter of the first ring

McQueen et al. 2019 found that the mean diameter of the first translucent zone (TZ) was 2.0 ± 0.5 mm. The overall average first TZ diameter estimate of 2 mm can be used as a guideline for age reading for all ages of WBC, and could help to reduce some of the uncertainty in identification of the first TZ.

However, please note that the 2 mm is a rule of thumb and lower and larger diameters can occur. The diameter on the image of a sectioned otoliths can be influenced (1) by the precision of a section in relation to the otolith core (correct slicing), and (2) it depends on growth speed of the juvenile cod in the first year.



Cross sections of Western Baltic cod otoliths. Otolith sections are viewed under transmitted light so TZs appear lighter than the darker opaque zones. Yellow arrows: diameter of the first TZ; black arrow: diameter of the second TZ. Top row: translucent edge type; bottom row: opaque edge types. Otoliths are from cod captured in pound nets in Fehmarn in 2015 and 2016 [0t: 28.09.2015, total length (TL) 13 cm, age 0; 1o: 12.01.2016, TL 17 cm, age 1; 1t: 14.10.15, TL: 21 cm, age 1; 2o: 12.01.2016, TL 28 cm, age 2]. Scale bar: 500 µm.

Photos of age-validated otoliths (age 0, age 1, age 2, age 3), and exemplary images following the strong 2016 cohort.

First, a sequential overview with selected otoliths following the strong 2016 cohort of Western Baltic cod (cod2224) from the Baltic International Trawl Survey (BITS) is given.

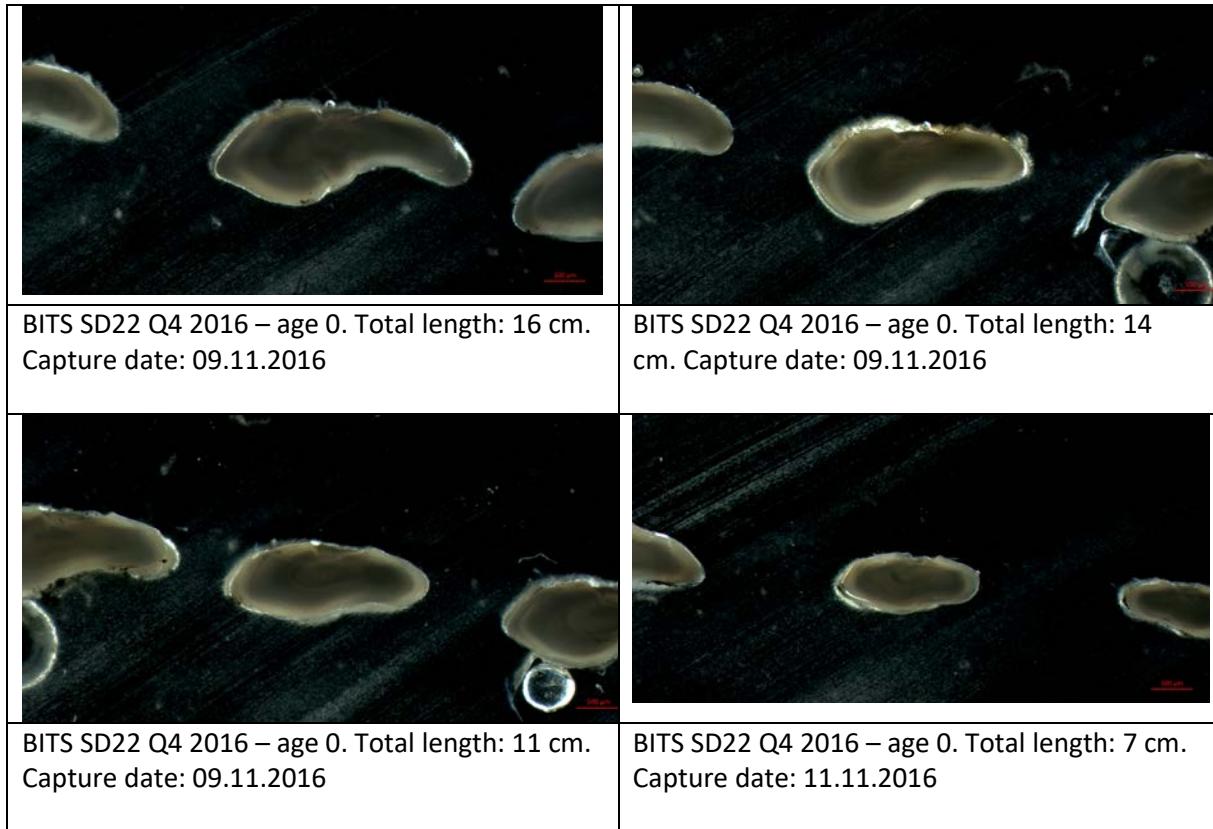
Then, starting with age 0, examples of (a) four sectioned otoliths from the BITS following the strong 2016 cohort of Western Baltic cod (cod2224) and of (b) images of age-validated Western Baltic cod from age-0 to age-3 are given.

Sequential overview with selected otoliths following the strong 2016 cohort of Western Baltic cod

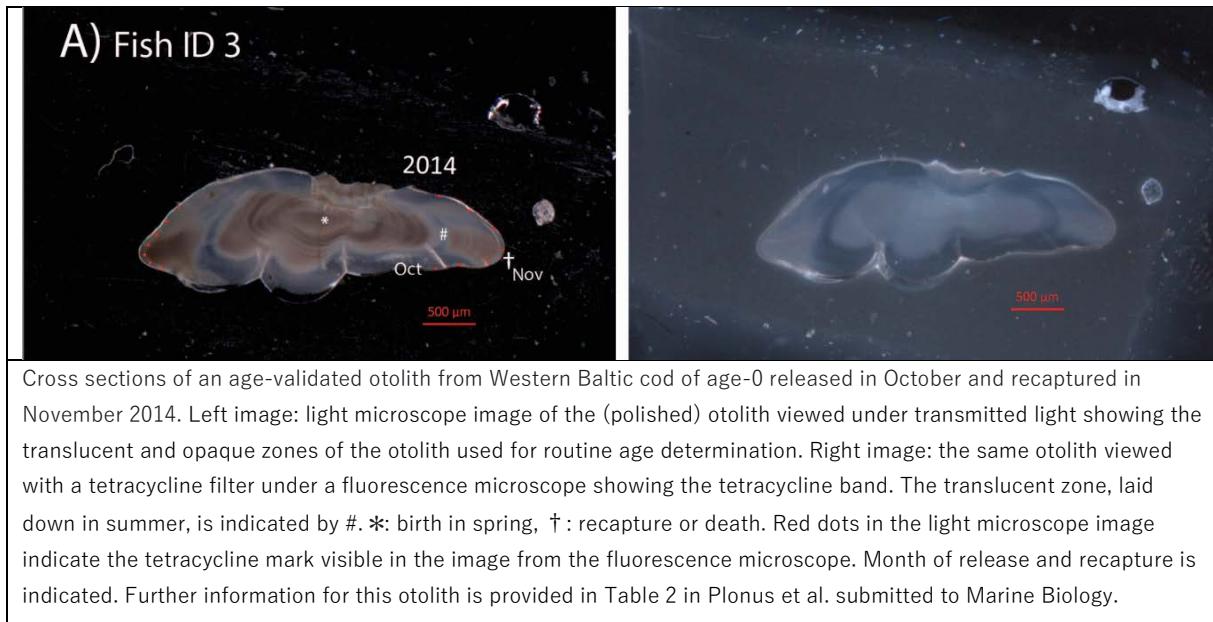
Year	Quarter 1	Quarter 4
2016	In BITS Q1 age 0 cod (still being at egg or larval stage) are not caught.	
		Age 0. Total length: 16 cm. Capture date: 09.11.2016
2017		
	Age 1. Total length: 22 cm. Capture date: 05.03.2017	Age 1. Total length: 28 cm. Capture date: 11.11.2017
2018		
	Age 2. Total length: 31 cm. Capture date: 27.02.2018	Age 2. Total length: 35 cm. Capture date: 08.11.2018

2019		
	Age 3. Total length: 46 cm. Capture date: 19.02.2019	Age 3. Total length: 57 cm. Capture date: 09.11.2019
2020		No samples yet.
	Age 4. Total length: 61 cm. Capture date: 20.02.2020	

Age 0 – examples of four sectioned otoliths from the BITS of the 2016 cohort and age-validated otoliths



Age-validated otoliths of age 0

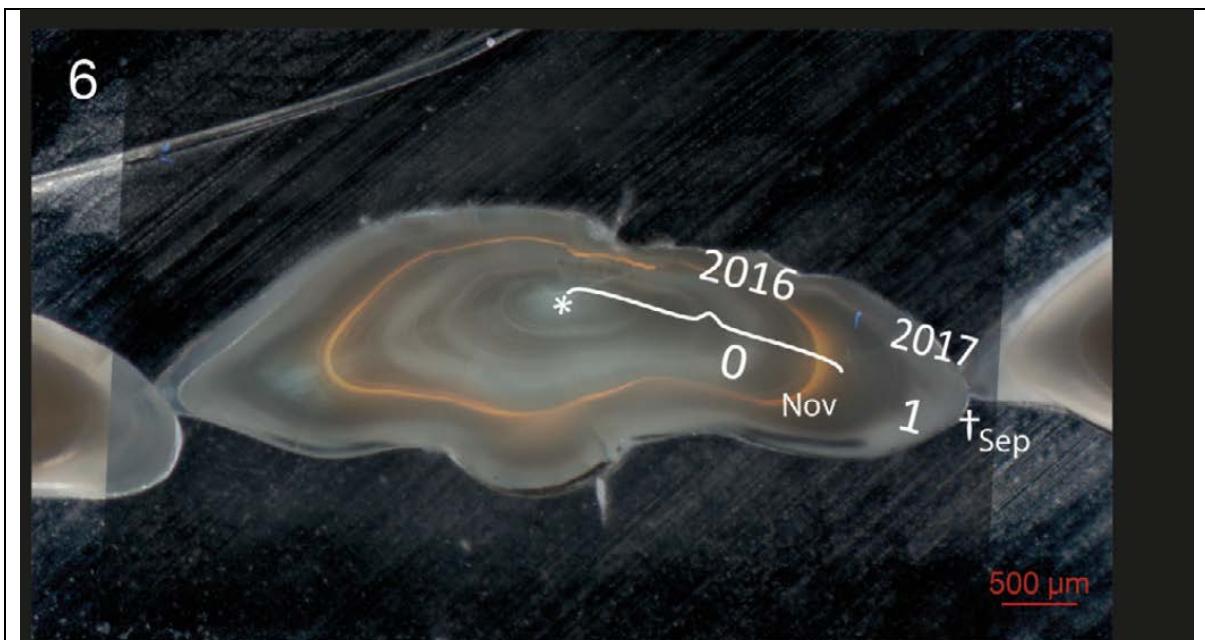


Age 1 - examples of four sectioned otoliths from the BITS of the 2016 cohort and age-validated otoliths

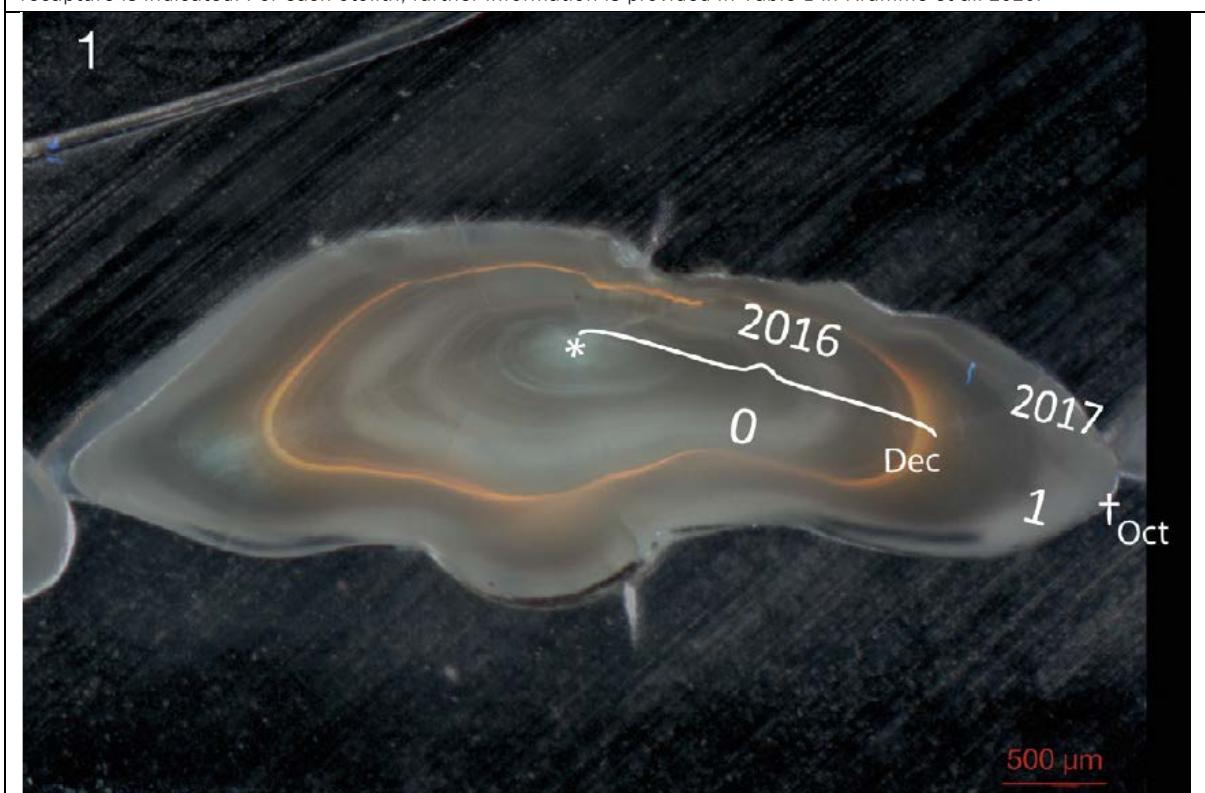
	
BITS SD22 Q1 2017 – age 1. Total length: 22 cm. Capture date: 05.03.2017	BITS SD22 Q1 2017 – age 1. Total length: 16 cm. Capture date: 05.03.2017
	
BITS SD22 Q1 2017 – age 1. Total length: 12 cm. Capture date: 05.03.2017	BITS SD22 Q1 2017 – age 1. Total length: 10 cm. Capture date: 05.03.2017

	
BITS SD22 Q4 2017 – age 1. Total length: 28 cm. Capture date: 11.11.2017	BITS SD22 Q4 2017 – age 1. Total length: 26 cm. Capture date: 11.11.2017
	
BITS SD22 Q4 2017 – age 1. Total length: 23 cm. Capture date: 11.11.2017	BITS SD22 Q4 2017 – age 1. Total length: 18 cm. Capture date: 11.11.2017

Age-validated otoliths of age 1

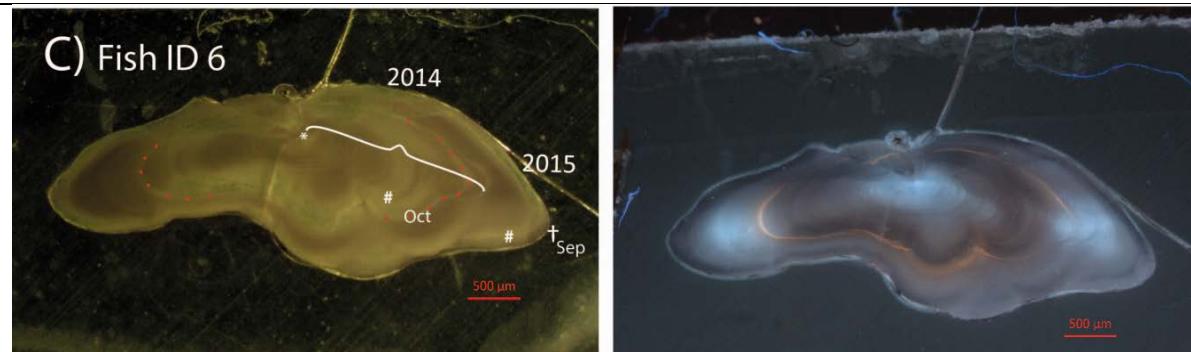


Cross section of an age-validated otolith from Western Baltic cod of age-1 recaptured in September. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been made partially transparent so that the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 1 in Krumme et al. 2020.

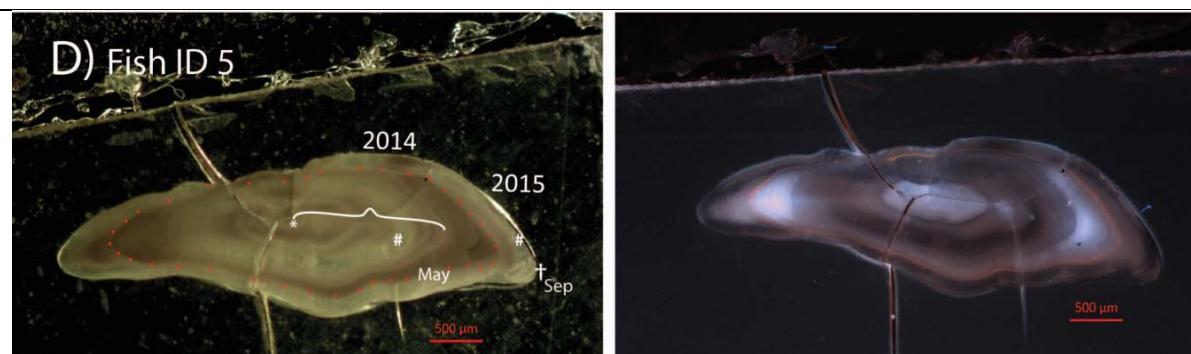


Cross section of an age-validated otolith from Western Baltic cod of age-1 recaptured in October. Cod released as age-0 and recaptured as age-1. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been partially transparent so that

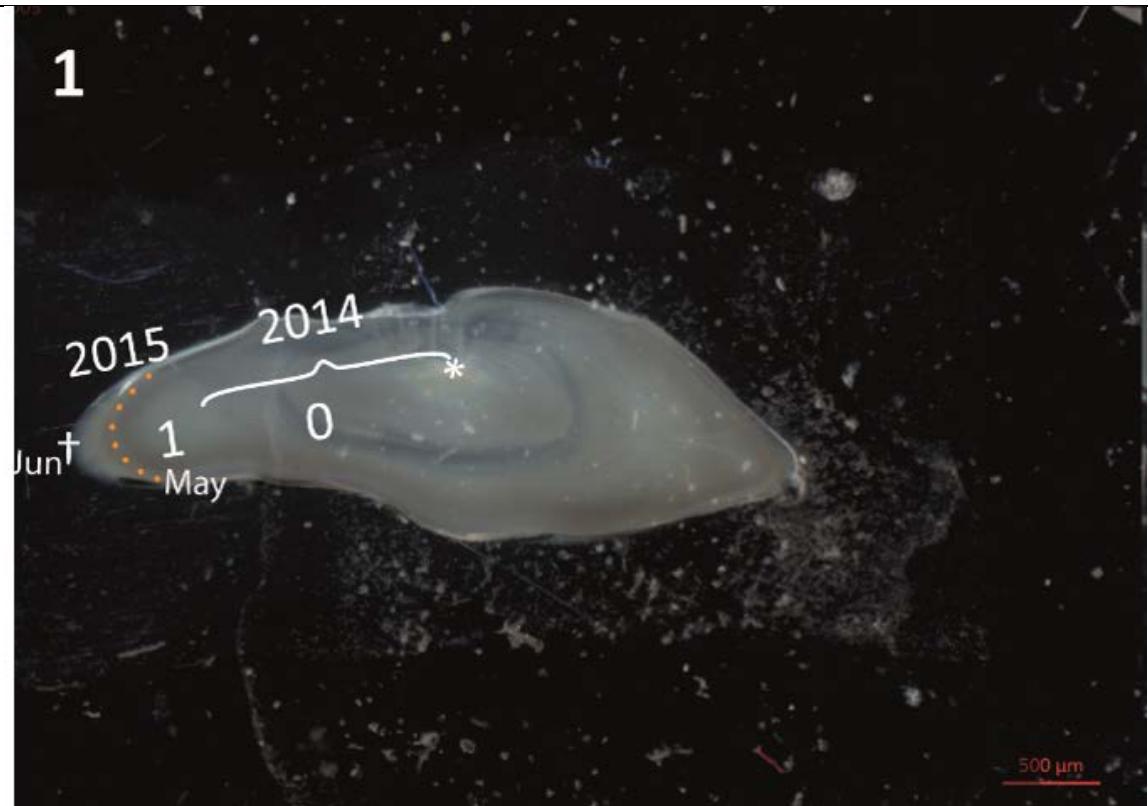
the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 2 in Krumme et al. 2020.



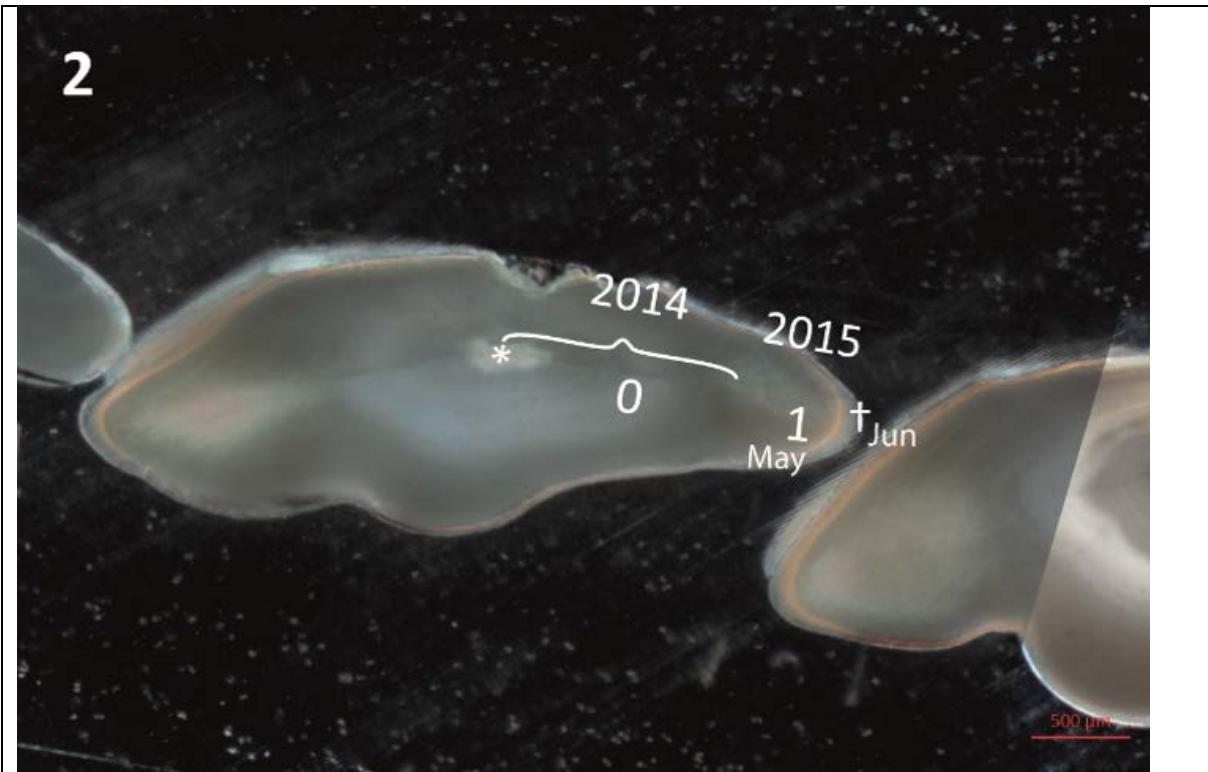
Cross sections of an age-validated otolith from Western Baltic cod, released at age-0 in October 2014 and recaptured at age-1 in September. Left image: light microscope image of the otolith viewed under transmitted light showing the translucent and opaque zones of the otolith used for routine age determination. Right image: the same otolith viewed with a tetracycline filter under a fluorescence microscope showing the tetracycline band. Curly brackets in the images on the left column indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The translucent zone, laid down in summer, is indicated by #. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a curly bracket. *: birth in spring, †: recapture or death. Red dots in the light microscope image indicate the tetracycline mark visible in the image from the fluorescence microscope. Month of release and recapture is indicated. For each otolith, further information is provided in Table 2 in Plonus et al., submitted to Marine Biology.



Cross sections of an age-validated otolith from Western Baltic cod of age-1 recaptured in September. Left image: light microscope image of the otolith viewed under transmitted light showing the translucent and opaque zones of the otolith used for routine age determination. Right image: the same otolith viewed with a tetracycline filter under a fluorescence microscope showing the tetracycline band. Curly brackets in the images on the left column indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The translucent zone, laid down in summer, is indicated by #. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a curly bracket. *: birth in spring, †: recapture or death. Red dots in the light microscope image indicate the tetracycline mark visible in the image from the fluorescence microscope. Month of release and recapture is indicated. For each otolith, further information is provided in Table 2 in Plonus et al., submitted to Marine Biology.



Cross section of an age-validated otolith from Western Baltic cod of age-1 recaptured in June. Example otolith tagged during translucent zone (TZ) formation. Image taken using the tetracycline filter have been overlaid onto light microscope images so that the TZs and tetracycline mark are visible in the same image. The light microscope image was taken using reflected rather than transmitted light, the TZ appears darker than the opaque zone. Orange dots indicate the approximate position of the tetracycline mark. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table S2 in the supplementary material of Krumme et al. 2020.



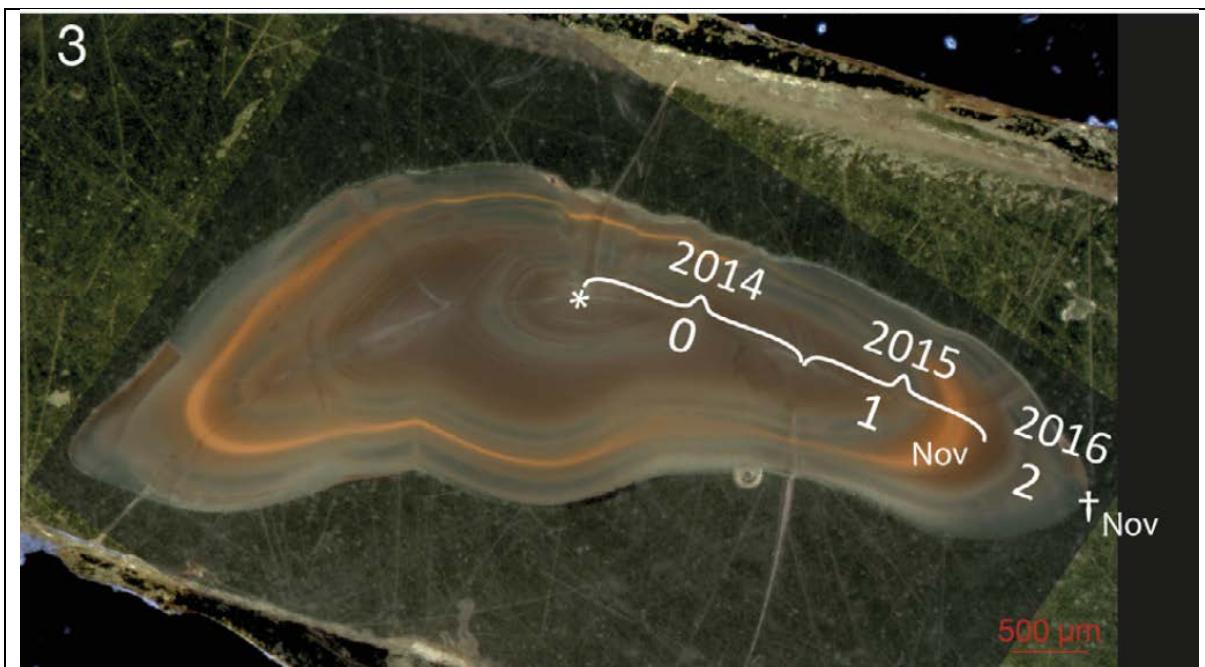
Cross section of an age-validated otolith from Western Baltic cod of age-1 recaptured in June. Example otolith tagged during translucent zone (TZ) formation. Image taken using the tetracycline filter have been overlaid onto light microscope images so that the TZs and tetracycline mark are visible in the same image. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †: recapture or death. Month of release and recapture is indicated. Further information on the fish is provided in Table S2 in the supplementary material of Krumme et al. 2020.

Age 2 - examples of four sectioned otoliths from the BITS of the 2016 cohort and age-validated otoliths

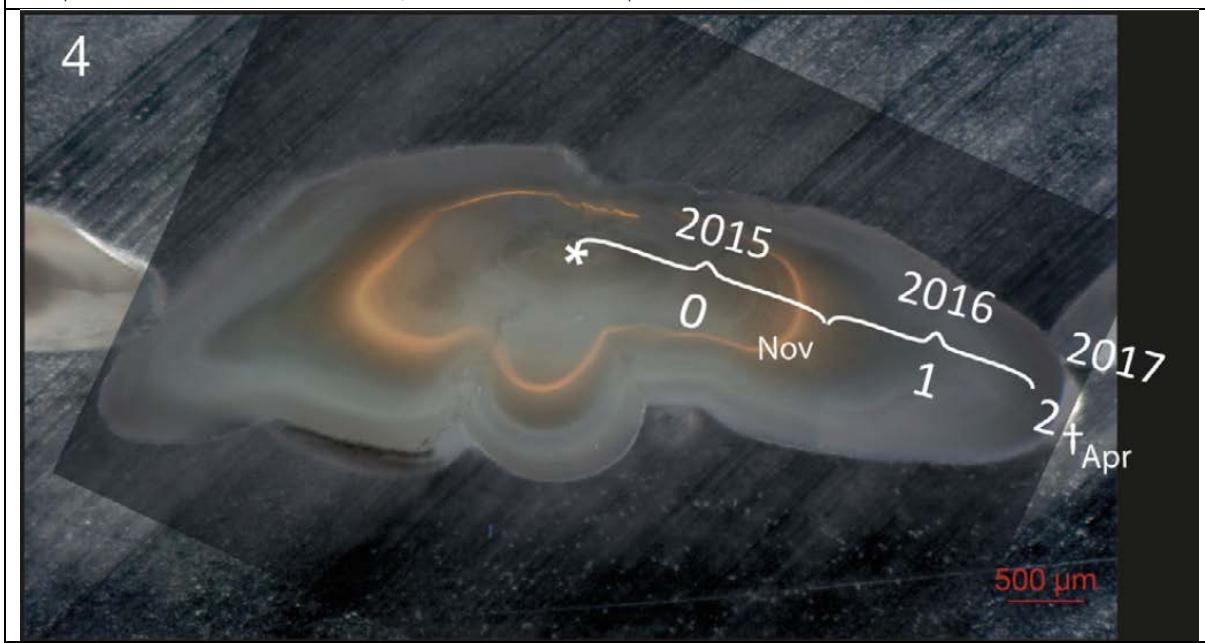
	
BITS SD22 Q1 2018 – age 2. Total length: 31 cm. Capture date: 27.02.2018	BITS SD22 Q1 2018 – age 2. Total length: 26 cm. Capture date: 27.02.2018
	
BITS SD22 Q1 2018 – age 2. Total length: 46 cm. Capture date: 28.02.2018	BITS SD22 Q1 2018 – age 2. Total length: 55 cm. Capture date: 28.02.2018

	
BITS SD22 Q4 2018 – age 2. Total length: 35 cm. Capture date: 08.11.2018	BITS SD22 Q4 2018 – age 2. Total length: 42 cm. Capture date: 09.11.2018
	
BITS SD22 Q4 2018 – age 2. Total length: 28 cm. Capture date: 10.11.2018	BITS SD22 Q4 2018 – age 2. Total length: 62 cm. Capture date: 11.11.2018

Age-validated otoliths of age 2

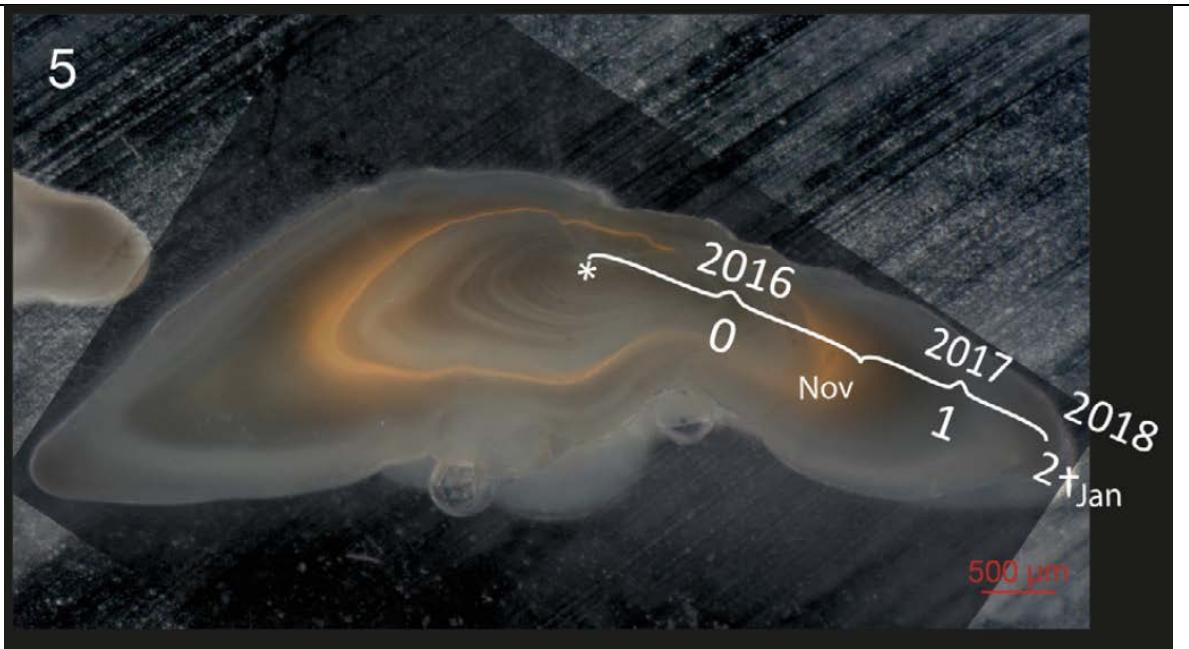


Cross section of an age-validated otolith from Western Baltic cod of age-2 recaptured in November. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been made partially transparent so that the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 1 in Krumme et al. 2020.

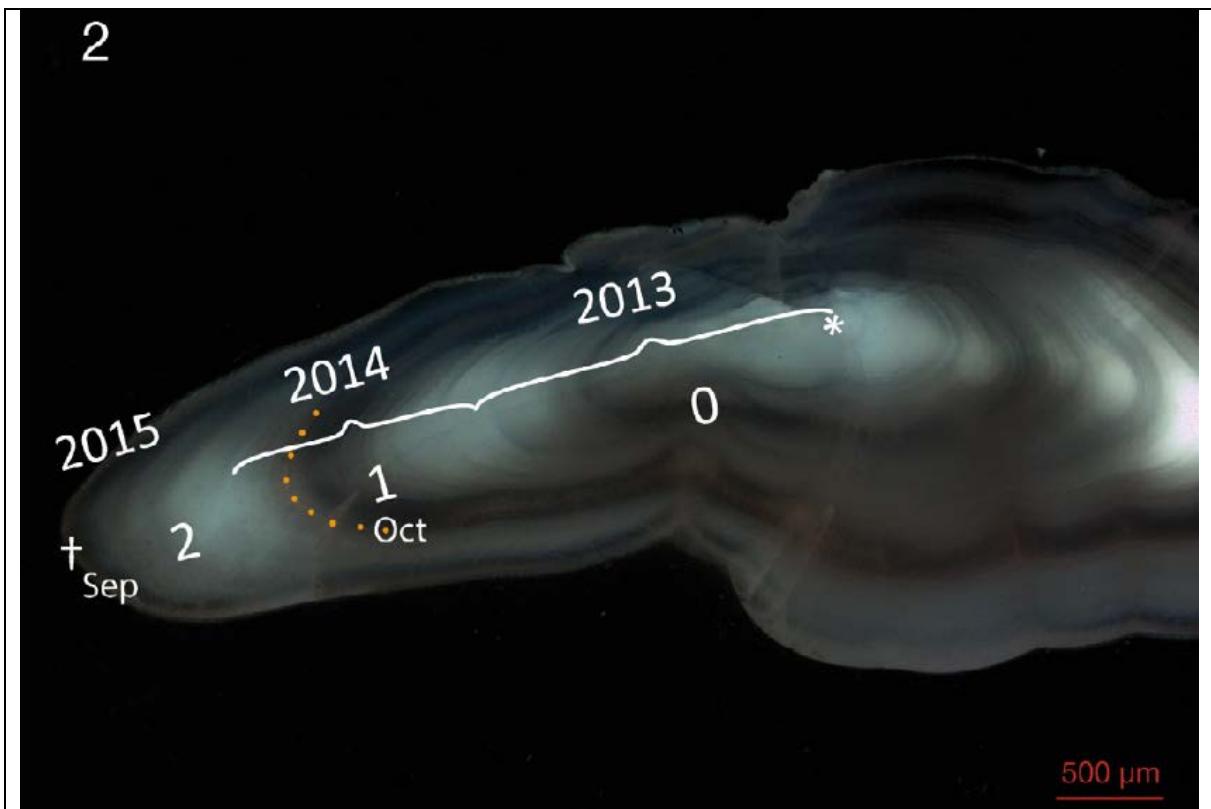


Cross section of an age-validated otolith from Western Baltic cod, released in November 2015 as age-0 and recaptured of age-2 in April 2017. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been made partially transparent so that the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †:

recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 1 in Krumme et al. 2020.



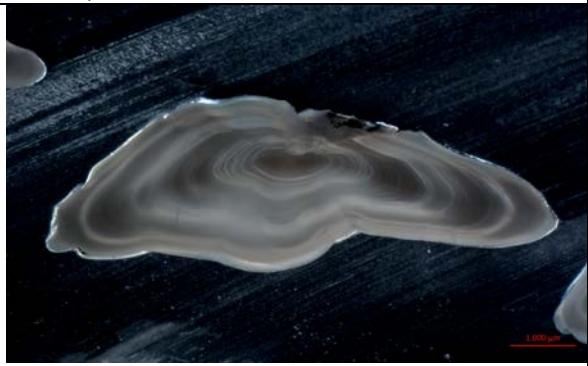
Cross section of an age-validated otolith from Western Baltic cod of age-2 recaptured in January. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been made partially transparent so that the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, +: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 1 in Krumme et al. 2020.



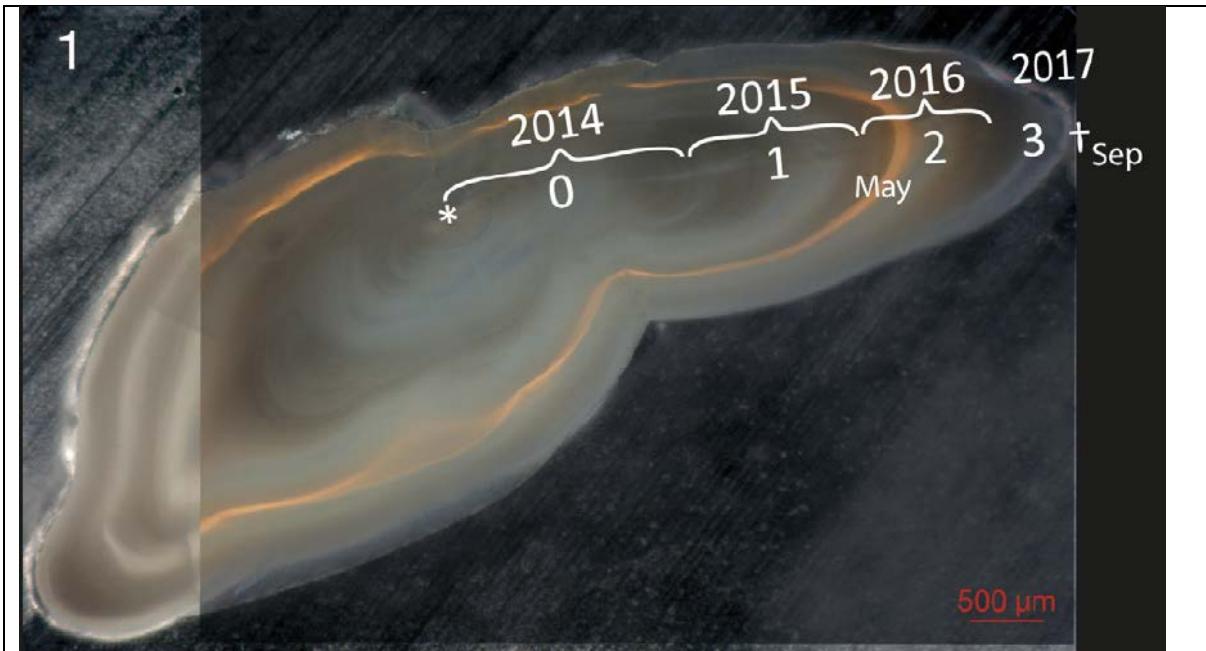
Cross section of an age-validated otolith from Western Baltic cod of age-2 recaptured in September. Cod released as age-1 and recaptured as age-2. Section was polished to a thickness of ca. $100\ \mu\text{m}$ before photographing; therefore, due to the thinness of this section, the macrostructure of the otolith and the tetracycline mark can both be seen in the tetracycline filter image of this otolith, without requiring any image editing (orange dots indicate the tetracycline mark). The image was taken using the tetracycline filter and a minimal amount of transmitted light, so the opaque zones appear light and the translucent zones darker. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, †: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 2 in Krumme et al. 2020.

Age 3 - examples of four sectioned otoliths from the BITS of the 2016 cohort and age-validated otoliths

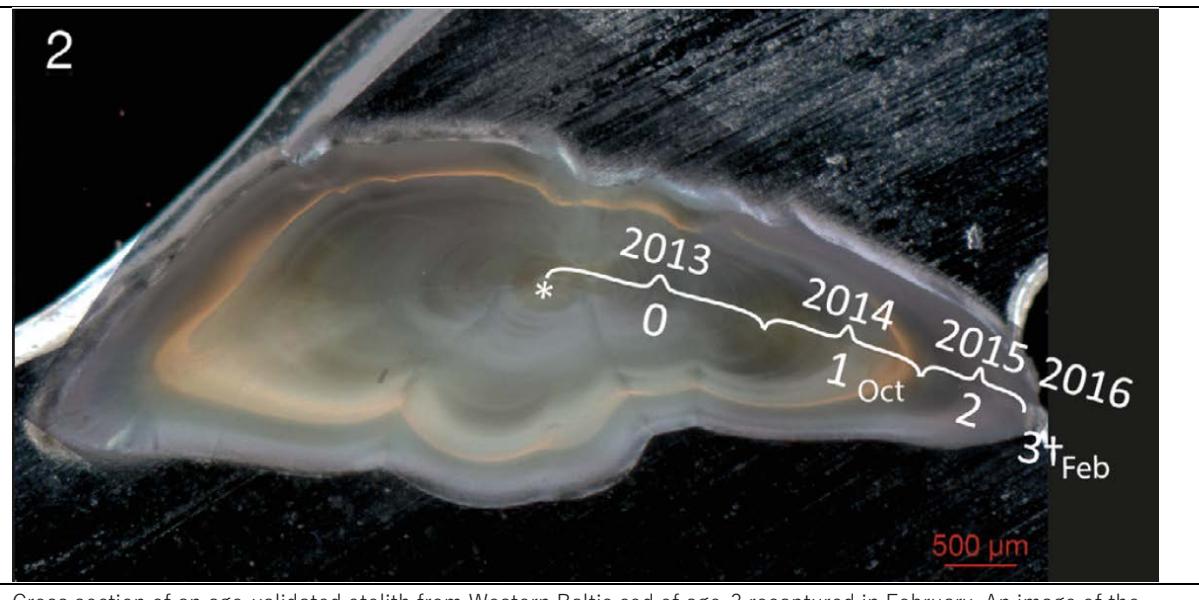
	
BITS SD22 Q1 2019 – age 3. Total length: 69 cm. Capture date: 19.02.2019	BITS SD22 Q1 2019 – age 3. Total length: 58 cm. Capture date: 19.02.2019
	
BITS SD22 Q1 2019 – age 3. Total length: 46 cm. Capture date: 19.02.2019	BITS SD22 Q1 2019 – age 3. Total length: 37 cm. Capture date: 19.02.2019

	
BITS SD22 Q4 2019 – age 3. Total length: 64 cm. Capture date: 08.11.2019	BITS SD22 Q4 2019 – age 3. Total length: 70 cm. Capture date: 08.11.2019
	
BITS SD22 Q4 2019 – age 3. Total length: 57 cm. Capture date: 09.11.2019	BITS SD22 Q4 2019 – age 3. Total length: 41 cm. Capture date: 09.11.2019

Age-validated otoliths of age 3



Cross section of an age-validated otolith from Western Baltic cod of age-3 recaptured in September. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been made partially transparent so that the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, +: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 1 in Krumme et al. 2020.



Cross section of an age-validated otolith from Western Baltic cod of age-3 recaptured in February. An image of the otolith viewed using the tetracycline filter is overlaid onto an image of the otolith viewed using transmitted light. The overlaid tetracycline filter image has been made partially transparent so that the translucent and opaque zones of the otolith can also be seen. Brackets indicate an approximation of a year of otolith growth, consisting of a completed translucent zone with opaque material on either side. The years and the age are numbered along the axis from the core. Incomplete years at the edge are without a bracket. *: birth in spring, +: recapture or death. Month of release and recapture is indicated. For each otolith, further information is provided in Table 1 in Krumme et al. 2020.

Age 4 - examples of four sectioned otoliths from the BITS of the 2016 cohort

	
BITS SD22 Q1 2020 – age 4. Total length: 61 cm. Capture date: 20.02.2020	BITS SD22 Q1 2020 – age 4. Total length: 55 cm. Capture date: 20.02.2020
	
BITS SD22 Q1 2020 – age 4. Total length: 45 cm. Capture date: 20.02.2020	BITS SD22 Q1 2020 – age 4. Total length: 38cm. Capture date: 20.02.2020

Exemplary images of a few older cod (age 5 to age 11)

Examples of age 5, age 6 and age 10 cod.



Age 5, SD 22, Total length: 67 cm. Capture date: 11.11.2018



Age 6, SD 22, Total length: 69 cm. Capture date: 21.02.2020



Age 10, SD 22, Total length: 95 cm. Capture date: 21.02.2020