Report of the 2017 3.a Sprat Age Reading Exchange

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Introduction

In 2016 a pre-workshop sprat exchange took place for the North Sea (4) and Celtic Seas Ecoregion (Divisions 7 (excl. 7.d, e) and 6) stocks. The initial intention was to include samples from the 3.a (Skagerrak and Kattegat) stock but this was not possible due to problems with WebGR. WKARSPRAT (the Workshop for the Age Estimation of Sprat) took place in November 2016. At the workshop the 3.a exercise was partially completed by those readers who were present but time restraints did not allow for all samples to be examined (see ICES, 2016 for results). Much time was spent discussing samples in plenary, the general opinion of the members was that there are regional differences in the readability of the otoliths from the three sprat stocks, with those from 3.a being the most difficult to interpret. Correct age determination of sprat is confounded by the presence of faint translucent rings which are not true annuli and a lack of contrast between the true summer and winter rings (wr), the later feature being most apparent in otoliths from 3.a sprat. Results were discussed during the workshop and a timetable for completion of the 3.a exchange was drafted. An updated age reading protocol and an agreed age image reference collection was compiled by the members of the workshop. Readers were instructed to follow this protocol when completing the rerun of the 3.a exchange. The results here are based on all 100 samples and 10 readers from 6 institutes (Denmark Norway, Sweden, Northern Ireland, Ireland and Germany) who participated, only 4 of whom (from Denmark and Sweden) routinely read 3.a sprat.

Reader details:
(Expertise level is defined as *advanced*; has provided age data for assessment purposes or *basic*; does not)

Reader	ReaderCode	Firstname	Lastname	Expertise level for 3.a sprat
1	1_GBR1	Ian	McCausland	Basic
2	2_DNK1	Maria	Jarnum	Advanced
3	3_SWE1	Marianne	Johansson	Advanced
4	4_SWE3	Annelie	Hilvarsson	Advanced
5	5_NOR2	Eilert	Hermansen	Basic
6	6_NOR1	Jostein	Røttingen	Basic
7	7_IRL1	Claire	Moore	Basic
8	8_DEU1	Gertrud	Delfs	Basic
10	10_NOR3	Inger	Henriksen	Basic
12	12_DNK2	Stina	Bilstrup Stenersen Hansen	Advanced

Sample overview:

Area	Year	Quarter	Length range	n
3.aN	2015	4	100-160mm	25
	2016	1	70-125	14
3.aS	2013	1	90-145mm	15
	2014	2	80-105 mm	8
	2014	3	75 mm	1
	2015	3	95-140 mm	11
	2015	4	100-150 mm	14
	2016	1	85-140 mm	12
Total				**100**

Methods

Otolith images were digitised at DTU Aqua using a standard set up. Images were taken of the otoliths on a black background, soaked in alcohol, under reflected light, at x 3.2 magnification, using a Leica stereomicroscope MZ6, Leica camera DFC320 and Leica Imaging software (LAS V.4.2). Otolith images were uploaded to WebGR. The physical samples were circulated so that readers could refer to these when annotating the images in WebGR. Readers were provided with date of capture and area and asked to follow the agreed age reading protocol in the WKARSPART report Section 4.6 and refer to the agreed age reference collection in Annex 5.

Analysis

Two separate analyses were carried out:
1. **Comparison of all readers**
2. **Comparison of readers who routinely read sprat from 3.a (Danish and Swedish readers)**

The estimated age data was used to analyse the agreement between readers by means of the traditional procedures:

     - Average percentage agreement (nmodal age/ntotal*100)
     - Coefficient of variation (CV) (Standard deviation/average*100)
     - Bias plots and tests

As the calculations of both CV and APE poses 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. An index of average percentage error (APE) was also calculated as this method is not independent of fish age and thus provides a better estimate of precision.

An age error matrix (AEM) was 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 column is 1, which equals 100%.

The "alldistances" dataset from WebGR was used to establish growth curves. For each otolith and reader, the distance between two consecutive annotations was added to the sum of the previous distances and the distances cumulated from centre point to the outermost annotated wr. Thus a growth curve for each individual otolith and reader was compiled. Age data provides information on whether the age readers agree in age estimates while the growth plot can be used as a visual reference to identify more specifically where the disagreements are.

Results

1. **Comparison of all readers**

The overall percentage agreement (PA) between all readers is 80% (Table 1), PA decreases with an increase in age. The co-efficient of variation (CV) is 22% (Table 2) and the average percentage error (APE) is 16%. Overall, the relative bias is slightly negative and apparent mostly at the older ages (2, 3 and 4) (Table 3). Two of the Norwegian readers and the German reader have a tendency to underestimate in comparison to modal age while one of the Danish readers and the two Swedish readers appear to overestimate in comparison to modal age (Figure 1).

Table 1. Percentage agreement for each reader by age based on modal age for all readers

modalAge	1_GBR1	2_DNK1	3_SWE1	4_SWE3	5_NOR2	6_NOR1	7_IRL1	8_DEU1	10_NOR3	12_DNK2	All
0	100	100	100	100	100	100	100	100	100	50	95
1	52	98	98	100	97	97	83	93	93	84	89
2	82	88	85	79	60	20	60	71	82	76	78
3	56	88	75	75	58	0	83	50	62	62	62
4	17	100	67	67	0	0	100	17	50	83	56
Weighted mean	61.5	93.3	88.2	87.1	82.1	63.5	81.7	74.1	82	77.1	**79.6 %**

Table 2. Coefficient of variation for each reader by age based on modal age for all readers

modalAge	1_GBR1	2_DNK1	3_SWE1	4_SWE3	5_NOR2	6_NOR1	7_IRL1	8_DEU1	10_NOR3	12_DNK2	CV_ALL
0	-	-	-	-	-	-	-	-	-	-	-
1	41	15	15	0	18	18	40	28	26	46	21.4
2	27	16	21	24	34	37	34	32	27	25	19.2
3	22	11	18	14	20	36	14	24	26	31	24.9
4	42	0	12	12	0	0	0	55	16	10	28
Weighted Mean	32.5	13.5	17	10.9	22.2	25.7	30.8	26.8	24.9	36.4	**21.7 %**

Table 3. Relative bias values for each reader by age based on modal age for all readers, red values indicate a negative bias and black values a positive bias.

modalAge	1_GBR1	2_DNK1	3_SWE1	4_SWE3	5_NOR2	6_NOR1	7_IRL1	8_DEU1	10_NOR3	12_DNK2	All
0	0	0	0	0	0	0	0	0	0	0.5	0.05
1	0.55	0.02	0.02	0	0.03	0.03	0.03	-0.07	0.02	0.16	0.08
2	-0.09	0.12	0.18	0.18	-0.4	-0.8	-0.4	-0.32	-0.09	0.21	-0.14
3	-0.31	0.12	0.31	0.25	-0.42	-1.58	-0.17	-0.38	-0.06	0.69	-0.15
4	-1.5	0	0.33	0.33	-1	-2	0	-1.5	-0.5	0.17	-0.57
Weighted Mean	0.06	0.07	0.14	0.12	-0.25	-0.62	-0.06	-0.2	-0.02	0.27	**-0.06**

Table 4. Inter-reader and modal age bias tests for all readers ("_" no sign of bias (p>0.05); "*" possibility of bias (0.01<p<0.05); "**" certainty of bias (p<0.01)

	1_GBR1	2_DNK1	3_SWE1	4_SWE3	5_NOR2	7_IRL1	8_DEU1	10_NOR3	12_DNK2	6_NOR1
1_GBR1	NA	-	-	-	**	**	**	-	-	**
2_DNK1	-	NA	-	-	**	-	**	*	**	**
3_SWE1	-	-	NA	-	**	*	**	**	*	**
4_SWE3	-	-	-	NA	**	*	**	**	*	**
5_NOR2	**	**	**	**	NA	-	-	*	**	**
7_IRL1	**	-	*	*	-	NA	-	-	**	**
8_DEU1	**	**	**	**	-	-	NA	**	**	**
10_NOR3	-	*	**	**	*	-	**	NA	**	**
12_DNK2	-	**	*	*	**	**	**	**	NA	**
6_NOR1	**	**	**	**	**	**	**	**	**	NA
modalAge	-	*	**	**	*	-	**	-	**	**

Figure 1. Age bias plots for all readers
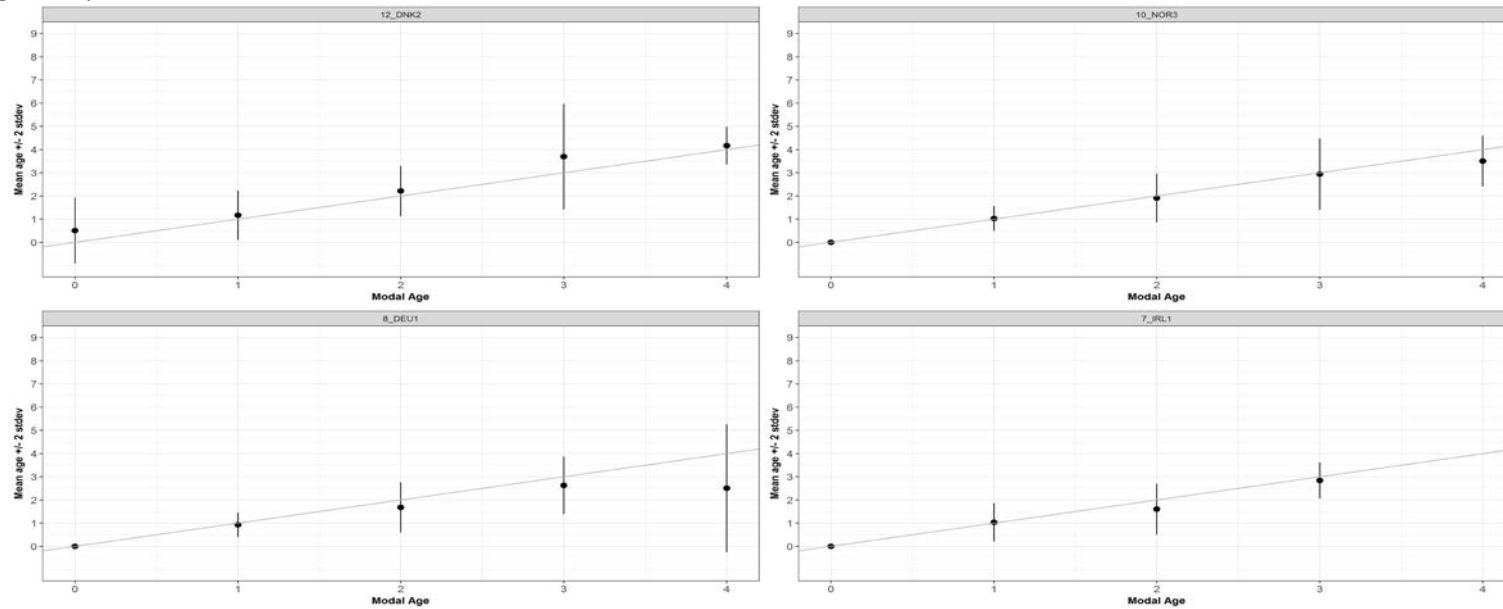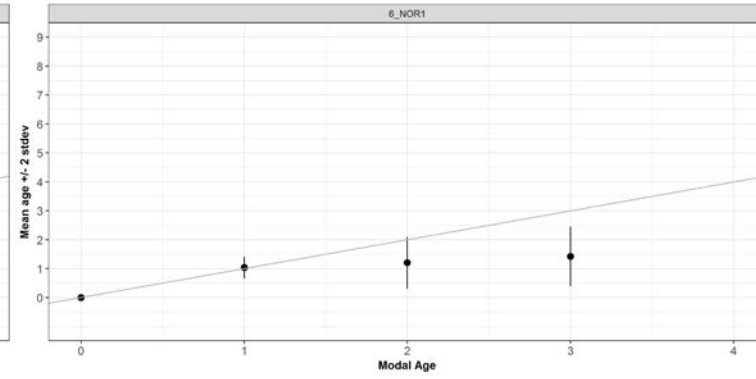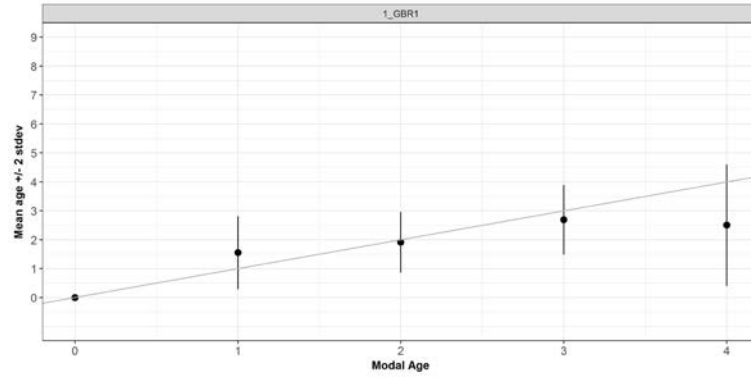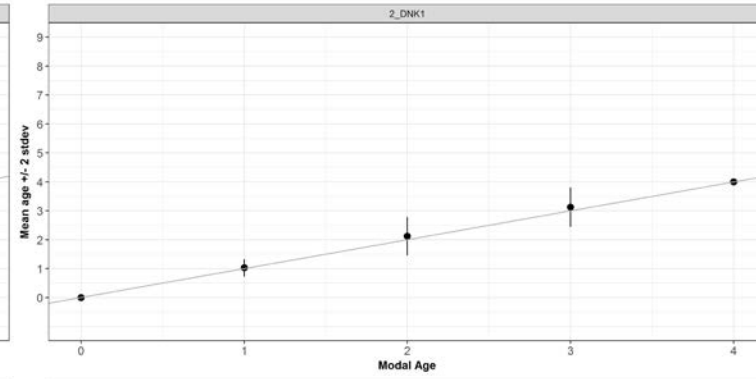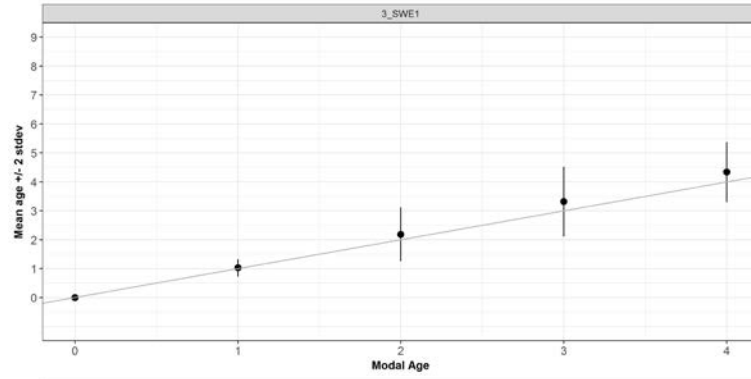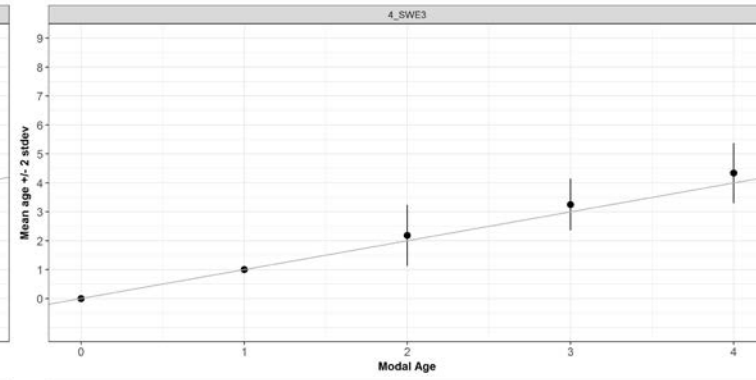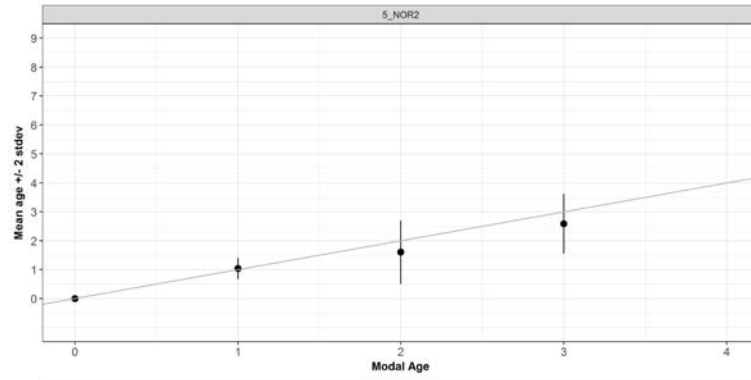
2. Comparison of Danish and Swedish readers

When only those readers who routinely read sprat from 3.a were included in the analysis the overall percentage agreement increased to 91% (Table 5), the coefficient of variation decreased to 8% (Table 6) and the average percentage error decreased to 6%. The overall relative bias is slightly positive (Table 7). Both the growth plot (Figure 2) and the age bias plots (Figure 3) indicate that one of the Danish readers has a tendency to estimate the fish to be older than the other readers.

Table 5. Percentage agreement for each reader by age based on modal age for Danish and Swedish readers

modalAge	2_DNK1	3_SWE1	4_SWE3	12_DNK2	All
0	100	100	100	50	88
1	100	98	100	86	96
2	100	93	86	90	92
3	94	88	82	76	85
4	71	100	100	71	86
5	0	100	67	67	58
Weighted mean	94	95.1	91.9	83.1	**91%**

Table 6. CV for each reader by age based on modal age for Danish and Swedish readers

modalAge	2_DNK1	3_SWE1	4_SWE3	12_DNK2	CV_ALL
0	-	-	-	-	-
1	0	15	0	46	7.3
2	0	13	19	16	7.1
3	8	12	14	18	8.1
4	13	0	0	29	8.8
5	0	0	27	12	15.3
Weighted Mean	2.3	12.1	8.7	32.2	**7.7 %**

Table 7. Relative bias values for each reader by age based on modal age for Danish and Swedish readers, red values indicate a negative bias and black values a positive bias.

modalAge	2_DNK1	3_SWE1	4_SWE3	12_DNK2	All
0	0	0	0	0.5	0.12
1	0	0.02	0	0.14	0.04
2	0	0	0	0.03	0.01
3	-0.06	0	0.06	0.29	0.07
4	-0.29	0	0	0.29	0
5	-1	0	-0.67	-0.33	-0.5
Weighted Mean	-0.06	0.01	-0.01	0.14	**0.02**

Table 8. Inter-reader and modal age bias tests for Danish and Swedish readers ("_" no sign of bias (p>0.05); "*" possibility of bias (0.01<p<0.05); "**" certainty of bias (p<0.01)

	2_DNK1	3_SWE1	4_SWE3	12_DNK2
2_DNK1	NA	-	-	**
3_SWE1	-	NA	-	*
4_SWE3	-	-	NA	*
12_DNK2	**	*	*	NA
modalAge	*	-	-	*

The growth plot (Figure 2) shows that there are differences as to how the readers are interpreting the wr's. Firstly, the Swedish readers are annotating the end of the wr as opposed to the Danish readers who are annotating the beginning of the wr. Secondly, overlap is apparent between the Swedish readers at wr 2 and the Danish readers at wr 3, meaning that in some examples what the Swedish readers interpret to be wr 2 the Danish readers may be interpreting to be wr 3. At wr 3 and 4 this is even more apparent and most notably for reader 12_DNK2 who also annotates a higher number of wr's. This supports the results from the relative bias values in Table 7.

The age error matrix (Table 9) shows that the proportions of fish aged in agreement with modal ages 0-2 is high (88 – 92%). There were only 2 fish with modal age 0 in the sample set. For modal ages 3 and 4 it is 85% and 86% respectively. The slight tendency to overestimate compared to modal age is apparent.
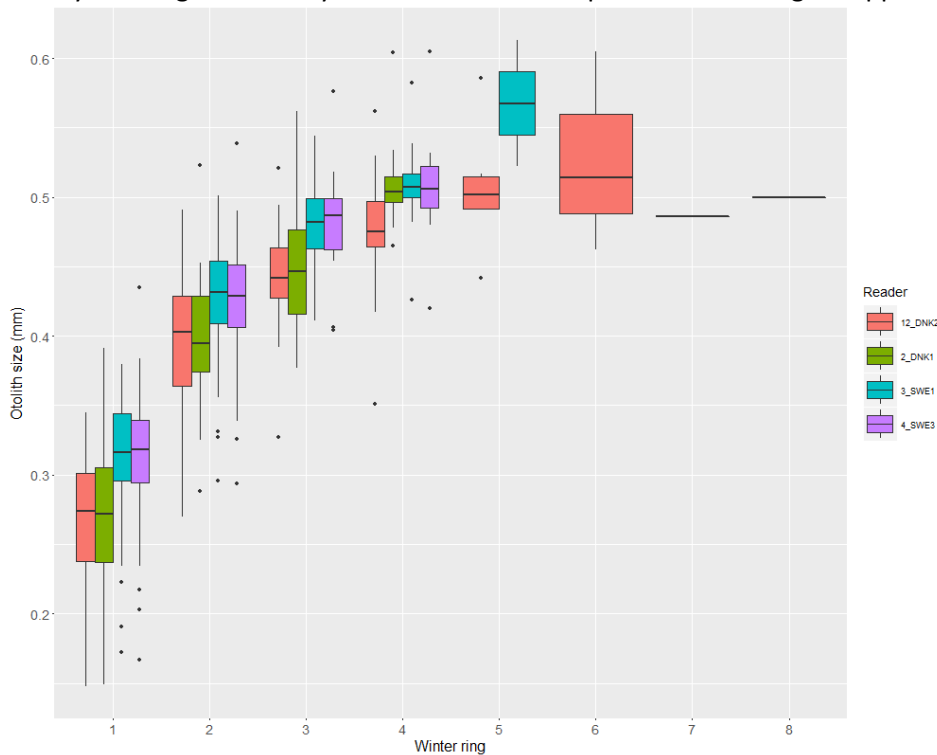
Figure 2. Plot of average distance from the centre to the beginning of winter rings 1-7 and the edge for all readers in the 3.a exchange. The boxes represent the mean, upper and lower box boundaries of the interquartile range, whiskers represent the minimum and maximum values and the dots represent the outliers.

Table 9. Age error matrix on readers who provide ages for stock assessment purposes of 3.a sprat (numbers in bold indicate the proportion in agreement with modal age, those in red indicates underestimation in comparison to modal age while those in black indicate overestimation in comparison to modal age).

Modal Age	0	1	2	3	4	5
Age 0	**0.88**	0.01	0	0	0	0
Age 1	0.12	**0.96**	0.03	0	0	0
Age 2	0	0.02	**0.92**	0.04	0	0
Age 3	0	0.01	0.04	**0.85**	0.11	0.08
Age 4	0	0	0	0.09	**0.86**	0.33
Age 5	0	0	0	0.01	0	**0.58**
Age 7	0	0	0	0	0.04	0
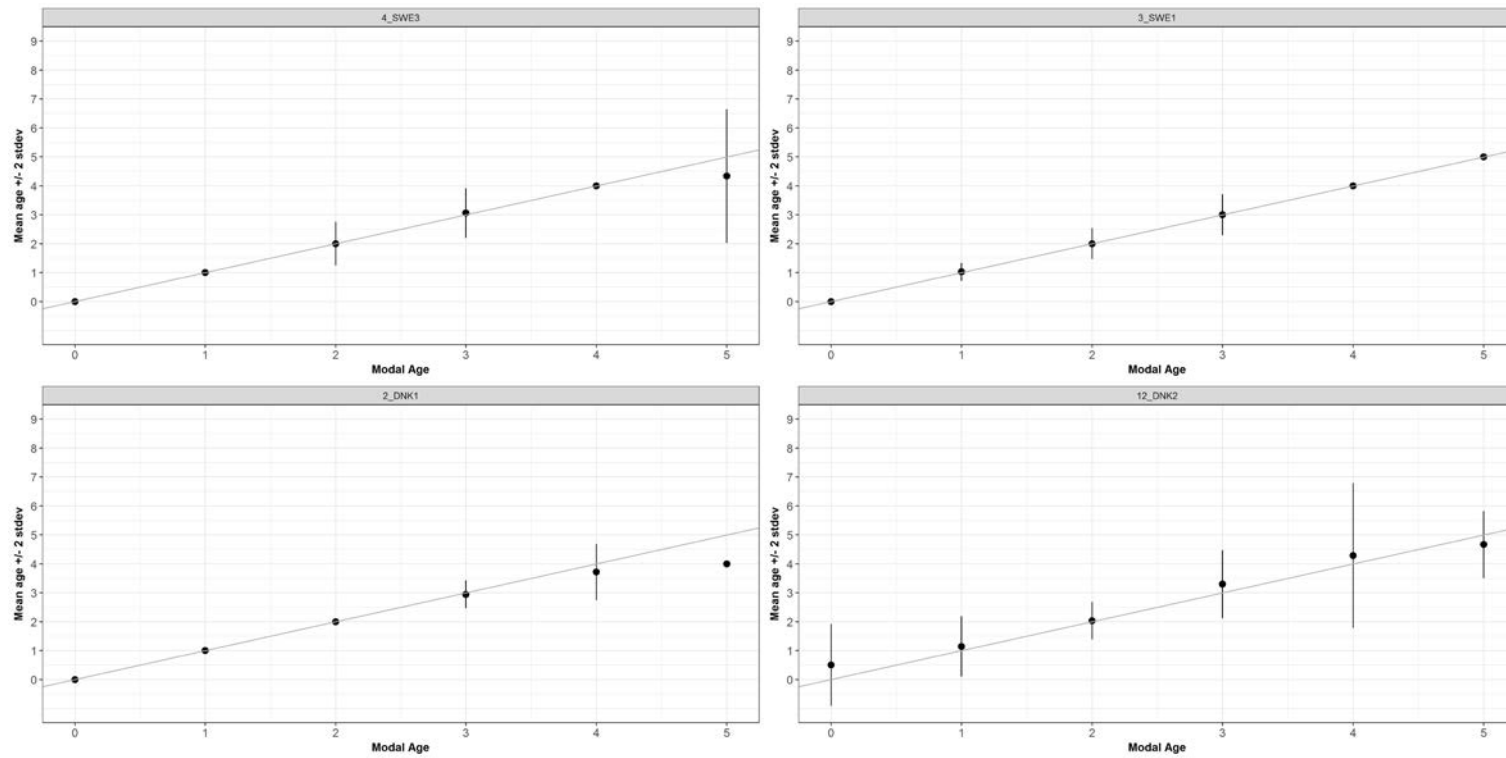
Figure 3 Age bias plots for Danish and Swedish readers

Conclusion

Overall the level of agreement between readers who provide age data for assessment purposes for 3.a sprat is high (percentage agreement 91% and CV 8%). These results are a huge improvement on the WKARSPART exercise where the percentage agreement was just 68% and CV 22% (based on only 45 samples). For the 3.a stock the 0 and 1 age groups from the surveys are used as indicators of the incoming year classes and based on these results the agreement at these ages is high. It should be noted that there are only 2 fish with modal age 0 in the sample set.

This exchange is a more reliable test of reader performance and agreement for 3.a sprat compared to the workshop exercise. Comparison of readers performance across the two exercises is difficult as not all readers who took part in this exchange were present at the workshop and not all readers who completed the workshop exercise were experienced in ageing 3.a sprat (even though they are considered advanced readers for their own stock). There is a slight tendency for ages to be overestimated in comparison to modal age but an examination of the annotated images shows there to be no systematic ageing errors. There is a much higher level of fragmentation and less contrast between the growth zones in sprat otoliths from this area In comparison to sprat otoliths from the North Sea and Celtic Seas Ecoregion which means that they can be difficult to read and if false annuli are counted this can lead to overestimation of age. The reader who is showing the most bias did not attend the WKARSPRAT, 2016 where there was much discussion around the difficulties in interpreting the opaque and translucent zones seen in otoliths from 3.a sprat. The readers of this exercise followed the updated age reading protocol which was compiled at the WKARSPRAT.

Please refer to the WKARSPRAT 2016 report for more information and references herein:

ICES (2016) Report of the Workshop on age estimation of sprat (*Sprattus sprattus*) (WKARSPRAT). ICES CM 2016/SSGIEOM:19

Table 10. Data overview including modal age and statistics per sample based on all readers in the 3.a exercise

image	length	capture_date	1_GBR1	2_DNK1	3_SWE1	4_SWE3	5_NOR2	6_NOR1	7_IRL1	8_DEU1	10_NOR3	12_DNK2	ModalAge	PA	CV
6698256.jpg	89	18/01/2013	1	1	1	1	1	NA	2	1	2	1	1	78	36
6698257.jpg	129	18/01/2013	3	3	3	3	2	1	3	3	3	3	3	80	25
6698258.jpg	137	18/01/2013	3	3	3	3	2	1	3	3	3	3	3	80	25
6698259.jpg	137	18/01/2013	2	3	3	3	1	1	2	2	2	3	2	40	36
6698260.jpg	139	18/01/2013	3	3	3	3	3	2	3	3	3	3	3	90	11
6698261.jpg	126	18/01/2013	3	3	3	3	2	2	3	3	3	3	3	80	15
6698262.jpg	132	18/01/2013	3	4	5	3	3	1	2	3	4	5	3	40	38
6698263.jpg	125	18/01/2013	2	3	3	3	3	2	3	3	3	3	3	80	15
6698264.jpg	134	18/01/2013	2	3	4	4	2	1	3	2	3	4	3	30	37
6698268.jpg	130	18/01/2013	3	4	4	4	3	2	4	3	4	4	4	60	20
6698269.jpg	145	18/01/2013	2	4	4	4	3	1	2	2	3	7	3	20	53
6698270.jpg	135	18/01/2013	2	2	3	3	2	2	2	2	2	4	2	70	29
6698280.jpg	125	18/01/2013	2	3	4	4	2	1	2	2	4	3	2	40	39
6698281.jpg	132	18/01/2013	3	3	3	3	3	2	3	2	3	3	3	80	15
6698282.jpg	129	18/01/2013	3	3	3	3	3	2	3	3	3	3	3	90	11
6932318.jpg	102	10/06/2014	1	1	1	1	1	1	1	1	1	1	1	100	0
6932319.jpg	105	10/06/2014	2	1	1	1	1	1	1	1	1	1	1	90	29
6932320.jpg	85	10/06/2014	3	1	1	1	1	1	1	1	1	3	1	80	60
6932321.jpg	87	10/06/2014	3	1	1	1	1	1	2	1	1	1	1	80	52
6932322.jpg	90	10/06/2014	2	1	1	1	1	1	1	1	1	1	1	90	29
6932323.jpg	80	10/06/2014	2	1	1	1	1	1	0	1	1	1	1	80	47
6932324.jpg	84	10/06/2014	2	1	1	1	1	1	1	1	1	1	1	90	29
6932325.jpg	81	10/06/2014	1	1	1	1	1	1	1	1	1	1	1	100	0
6941185.jpg	75	05/07/2014	2	1	1	1	1	1	0	0	0	0	1	50	96
7187385.jpg	149	15/10/2015	4	3	4	3	3	1	3	4	5	5	3	40	34
7187386.jpg	120	15/10/2015	2	1	1	1	2	1	1	1	1	1	1	80	35
7187387.jpg	116	15/10/2015	2	1	1	1	1	1	2	1	2	2	1	60	37
7187388.jpg	110	15/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0

7187393.jpg	107	15/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7187394.jpg	100	15/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7188165.jpg	100	20/10/2015	2	1	1	1	1	1	1	1	1	1	1	90	29
7188166.jpg	106	20/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7188167.jpg	110	20/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7188168.jpg	115	20/10/2015	2	1	1	1	1	1	1	1	1	1	1	90	29
7188169.jpg	120	20/10/2015	2	1	1	1	1	1	1	1	1	1	1	90	29
7188170.jpg	127	20/10/2015	2	1	2	1	NA	1	1	NA	1	3	1	62	50
7188171.jpg	103	20/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7188172.jpg	106	20/10/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7188173.jpg	110	20/10/2015	2	1	1	1	1	1	1	1	1	1	1	90	29
7188174.jpg	115	20/10/2015	2	1	1	1	1	NA	1	1	1	1	1	89	30
7190462.jpg	138	24/09/2015	2	3	3	3	2	1	1	2	2	3	2	40	36
7190468.jpg	110	24/09/2015	1	1	1	1	1	1	1	NA	1	1	1	100	0
7190469.jpg	115	24/09/2015	2	1	1	1	1	2	1	1	1	1	1	80	35
7190470.jpg	127	24/09/2015	2	3	3	3	2	1	3	2	2	3	3	50	29
7190486.jpg	95	24/09/2015	2	1	1	1	1	1	1	1	1	2	1	80	35
7190487.jpg	130	24/09/2015	2	2	2	2	1	1	1	2	1	2	2	60	32
7190488.jpg	101	24/09/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7190495.jpg	118	24/09/2015	1	1	1	1	1	1	1	1	1	1	1	100	0
7216509.jpg	73	14/12/2015	0	0	0	0	0	0	0	0	0	0	0	100	-
7216510.jpg	78	14/12/2015	0	0	0	0	0	0	0	0	0	1	0	90	-
7216512.jpg	98	14/12/2015	1	1	1	1	1	1	NA	1	1	2	1	89	30
7216513.jpg	95	14/12/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
7216514.jpg	96	14/12/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
7216515.jpg	102	14/12/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
7216516.jpg	102	14/12/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
7216517.jpg	103	14/12/2015	2	1	1	1	NA	NA	NA	0	1	1	1	71	58
Com'15_N_29.jpg	120	26/10/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
Com'15_N_30.jpg	135	26/10/2015	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
Com'15_N_31.jpg	130	26/10/2015	0	2	2	2	NA	NA	NA	0	2	2	2	71	68
Com'15_N_32.jpg	140	26/10/2015	3	3	3	3	NA	NA	NA	3	3	4	3	86	12

Com'15_N_33.jpg	115	26/10/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
Com'15_N_41.jpg	120	26/10/2015	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
Com'15_N_42.jpg	140	26/10/2015	2	3	2	2	NA	NA	NA	1	2	3	2	57	32
Com'15_N_43.jpg	150	26/10/2015	2	3	3	3	NA	NA	NA	2	2	4	3	43	28
Com'15_N_44.jpg	145	26/10/2015	1	2	2	2	NA	NA	NA	2	2	2	2	86	20
Com'15_N_45.jpg	155	26/10/2015	2	4	4	4	NA	NA	NA	3	3	4	4	57	23
Com'15_N_46.jpg	140	26/10/2015	2	2	2	2	NA	NA	NA	1	1	2	2	71	28
Com'15_N_56.jpg	150	26/10/2015	2	4	4	4	NA	NA	NA	3	3	4	4	57	23
Com'15_N_57.jpg	160	26/10/2015	1	4	4	4	NA	NA	NA	2	3	4	4	57	39
Com'15_N_58.jpg	135	26/10/2015	1	2	2	2	NA	NA	NA	2	1	3	2	57	37
Com'15_N_59.jpg	130	26/10/2015	1	2	2	2	NA	NA	NA	NA	1	3	2	50	41
IBTS'15_S_34.jpg	135	28/08/2015	2	2	1	1	NA	NA	NA	0	1	2	1	43	59
IBTS'15_S_35.jpg	115	28/08/2015	3	1	1	1	NA	NA	NA	1	1	1	1	86	59
IBTS'15_S_36.jpg	130	28/08/2015	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_1.jpg	115	27/01/2016	2	2	2	2	NA	NA	NA	2	2	1	2	86	20
IBTS'16_N_2.jpg	115	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_20.jpg	100	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_21.jpg	70	27/01/2016	2	2	2	2	NA	NA	NA	1	2	2	2	86	20
IBTS'16_N_22.jpg	80	27/01/2016	2	2	2	2	NA	NA	NA	1	2	2	2	86	20
IBTS'16_N_23.jpg	125	27/01/2016	2	2	2	1	NA	NA	NA	1	2	2	2	71	28
IBTS'16_N_24.jpg	75	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_3.jpg	125	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_39.jpg	85	27/01/2016	2	2	2	2	NA	NA	NA	1	2	2	2	86	20
IBTS'16_N_4.jpg	100	27/01/2016	2	2	2	3	NA	NA	NA	2	2	2	2	86	18
IBTS'16_N_40.jpg	120	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_41.jpg	120	27/01/2016	3	2	2	2	NA	NA	NA	2	2	2	2	86	18
IBTS'16_N_5.jpg	120	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_N_6.jpg	90	27/01/2016	NA	1	1	1	NA	NA	NA	1	1	1	1	100	0
IBTS'16_S_52.jpg	105	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_S_53.jpg	135	27/01/2016	3	3	3	4	NA	NA	NA	2	2	3	3	57	24
IBTS'16_S_54.jpg	125	27/01/2016	2	3	3	4	NA	NA	NA	2	2	3	3	43	28
IBTS'16_S_80.jpg	130	27/01/2016	3	2	2	3	NA	NA	NA	NA	2	2	2	67	22

IBTS'16_S_82.jpg	140	27/01/2016	3	4	5	5	NA	NA	NA	4	4	5	4	43	18
IBTS'16_S_83.jpg	125	27/01/2016	2	2	3	2	NA	NA	NA	2	2	2	2	86	18
IBTS'16_S_86.jpg	85	27/01/2016	1	1	1	1	NA	NA	NA	1	1	1	1	100	0
IBTS'16_S_87.jpg	110	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
IBTS'16_S_88.jpg	115	27/01/2016	2	2	2	2	NA	NA	NA	1	1	2	2	71	28
IBTS'16_S_89.jpg	135	27/01/2016	4	4	5	5	NA	NA	NA	0	4	4	4	57	46
IBTS'16_S_90.jpg	120	27/01/2016	2	2	2	2	NA	NA	NA	1	2	2	2	86	20
IBTS'16_S_91.jpg	105	27/01/2016	2	2	2	2	NA	NA	NA	2	2	2	2	100	0
Means (CV & PA)	-	-	-	-	-	-	-	-	-	-	-	-	-	**80%**	**22%**
Total read	-	-	99	100	100	100	50	49	50	96	100	100	-	-	-
Total NOT read	-	-	1	0	0	0	50	51	50	4	0	0	-	-	-

Table 11. Data overview including modal age and statistics per sample based on Danish and Swedish readers in the 3.a exercise

image	length	capture_date	2_DNK1	3_SWE1	4_SWE3	12_DNK2	modalAge	percent_agree	CV
6698256.jpg	89	18/01/2013	1	1	1	1	1	100	0
6698257.jpg	129	18/01/2013	3	3	3	3	3	100	0
6698258.jpg	137	18/01/2013	3	3	3	3	3	100	0
6698259.jpg	137	18/01/2013	3	3	3	3	3	100	0
6698260.jpg	139	18/01/2013	3	3	3	3	3	100	0
6698261.jpg	126	18/01/2013	3	3	3	3	3	100	0
6698262.jpg	132	18/01/2013	4	5	3	5	5	50	23
6698263.jpg	125	18/01/2013	3	3	3	3	3	100	0
6698264.jpg	134	18/01/2013	3	4	4	4	4	75	13
6698268.jpg	130	18/01/2013	4	4	4	4	4	100	0
6698269.jpg	145	18/01/2013	4	4	4	7	4	75	32
6698270.jpg	135	18/01/2013	2	3	3	4	3	50	27
6698280.jpg	125	18/01/2013	3	4	4	3	4	50	16
6698281.jpg	132	18/01/2013	3	3	3	3	3	100	0

6698282.jpg	129	18/01/2013	3	3	3	3	3	100	0
6932318.jpg	102	10/06/2014	1	1	1	1	1	100	0
6932319.jpg	105	10/06/2014	1	1	1	1	1	100	0
6932320.jpg	85	10/06/2014	1	1	1	3	1	75	67
6932321.jpg	87	10/06/2014	1	1	1	1	1	100	0
6932322.jpg	90	10/06/2014	1	1	1	1	1	100	0
6932323.jpg	80	10/06/2014	1	1	1	1	1	100	0
6932324.jpg	84	10/06/2014	1	1	1	1	1	100	0
6932325.jpg	81	10/06/2014	1	1	1	1	1	100	0
6941185.jpg	75	05/07/2014	1	1	1	0	1	75	67
7187385.jpg	149	15/10/2015	3	4	3	5	3	50	26
7187386.jpg	120	15/10/2015	1	1	1	1	1	100	0
7187387.jpg	116	15/10/2015	1	1	1	2	1	75	40
7187388.jpg	110	15/10/2015	1	1	1	1	1	100	0
7187393.jpg	107	15/10/2015	1	1	1	1	1	100	0
7187394.jpg	100	15/10/2015	1	1	1	1	1	100	0
7188165.jpg	100	20/10/2015	1	1	1	1	1	100	0
7188166.jpg	106	20/10/2015	1	1	1	1	1	100	0
7188167.jpg	110	20/10/2015	1	1	1	1	1	100	0
7188168.jpg	115	20/10/2015	1	1	1	1	1	100	0
7188169.jpg	120	20/10/2015	1	1	1	1	1	100	0
7188170.jpg	127	20/10/2015	1	2	1	3	1	50	55
7188171.jpg	103	20/10/2015	1	1	1	1	1	100	0
7188172.jpg	106	20/10/2015	1	1	1	1	1	100	0
7188173.jpg	110	20/10/2015	1	1	1	1	1	100	0
7188174.jpg	115	20/10/2015	1	1	1	1	1	100	0
7190462.jpg	138	24/09/2015	3	3	3	3	3	100	0
7190468.jpg	110	24/09/2015	1	1	1	1	1	100	0
7190469.jpg	115	24/09/2015	1	1	1	1	1	100	0
7190470.jpg	127	24/09/2015	3	3	3	3	3	100	0
7190486.jpg	95	24/09/2015	1	1	1	2	1	75	40
7190487.jpg	130	24/09/2015	2	2	2	2	2	100	0

7190488.jpg	101	24/09/2015	1	1	1	1	1	100	0
7190495.jpg	118	24/09/2015	1	1	1	1	1	100	0
7216509.jpg	73	14/12/2015	0	0	0	0	0	100	-
7216510.jpg	78	14/12/2015	0	0	0	1	0	75	-
7216512.jpg	98	14/12/2015	1	1	1	2	1	75	40
7216513.jpg	95	14/12/2015	1	1	1	1	1	100	0
7216514.jpg	96	14/12/2015	1	1	1	1	1	100	0
7216515.jpg	102	14/12/2015	1	1	1	1	1	100	0
7216516.jpg	102	14/12/2015	1	1	1	1	1	100	0
7216517.jpg	103	14/12/2015	1	1	1	1	1	100	0
Com'15_N_29.jpg	120	26/10/2015	1	1	1	1	1	100	0
Com'15_N_30.jpg	135	26/10/2015	2	2	2	2	2	100	0
Com'15_N_31.jpg	130	26/10/2015	2	2	2	2	2	100	0
Com'15_N_32.jpg	140	26/10/2015	3	3	3	4	3	75	15
Com'15_N_33.jpg	115	26/10/2015	1	1	1	1	1	100	0
Com'15_N_41.jpg	120	26/10/2015	1	1	1	1	1	100	0
Com'15_N_42.jpg	140	26/10/2015	3	2	2	3	3	50	23
Com'15_N_43.jpg	150	26/10/2015	3	3	3	4	3	75	15
Com'15_N_44.jpg	145	26/10/2015	2	2	2	2	2	100	0
Com'15_N_45.jpg	155	26/10/2015	4	4	4	4	4	100	0
Com'15_N_46.jpg	140	26/10/2015	2	2	2	2	2	100	0
Com'15_N_56.jpg	150	26/10/2015	4	4	4	4	4	100	0
Com'15_N_57.jpg	160	26/10/2015	4	4	4	4	4	100	0
Com'15_N_58.jpg	135	26/10/2015	2	2	2	3	2	75	22
Com'15_N_59.jpg	130	26/10/2015	2	2	2	3	2	75	22
IBTS'15_S_34.jpg	135	28/08/2015	2	1	1	2	2	50	38
IBTS'15_S_35.jpg	115	28/08/2015	1	1	1	1	1	100	0
IBTS'15_S_36.jpg	130	28/08/2015	2	2	2	2	2	100	0
IBTS'16_N_1.jpg	115	27/01/2016	2	2	2	1	2	75	29
IBTS'16_N_2.jpg	115	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_20.jpg	100	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_21.jpg	70	27/01/2016	2	2	2	2	2	100	0

IBTS'16_N_22.jpg	80	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_23.jpg	125	27/01/2016	2	2	1	2	2	75	29
IBTS'16_N_24.jpg	75	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_3.jpg	125	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_39.jpg	85	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_4.jpg	100	27/01/2016	2	2	3	2	2	75	22
IBTS'16_N_40.jpg	120	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_41.jpg	120	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_5.jpg	120	27/01/2016	2	2	2	2	2	100	0
IBTS'16_N_6.jpg	90	27/01/2016	1	1	1	1	1	100	0
IBTS'16_S_52.jpg	105	27/01/2016	2	2	2	2	2	100	0
IBTS'16_S_53.jpg	135	27/01/2016	3	3	4	3	3	75	15
IBTS'16_S_54.jpg	125	27/01/2016	3	3	4	3	3	75	15
IBTS'16_S_80.jpg	130	27/01/2016	2	2	3	2	2	75	22
IBTS'16_S_82.jpg	140	27/01/2016	4	5	5	5	5	75	11
IBTS'16_S_83.jpg	125	27/01/2016	2	3	2	2	2	75	22
IBTS'16_S_86.jpg	85	27/01/2016	1	1	1	1	1	100	0
IBTS'16_S_87.jpg	110	27/01/2016	2	2	2	2	2	100	0
IBTS'16_S_88.jpg	115	27/01/2016	2	2	2	2	2	100	0
IBTS'16_S_89.jpg	135	27/01/2016	4	5	5	4	5	50	13
IBTS'16_S_90.jpg	120	27/01/2016	2	2	2	2	2	100	0
IBTS'16_S_91.jpg	105	27/01/2016	2	2	2	2	2	100	0
Means (CV and PA)	-	-	-	-	-	-	-	**91**	**8**
Total read	-	-	100	100	100	100	-	-	-
Total NOT read	-	-	0	0	0	0	-	-	-