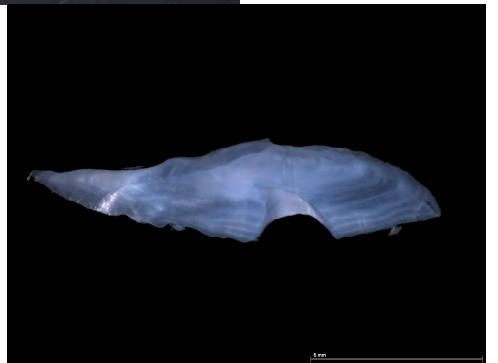
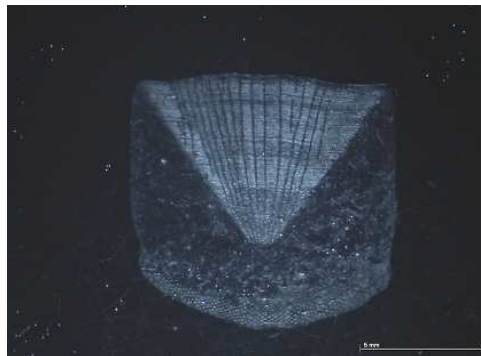


Report of the Seabass
 (*Dicentrarchus labrax*)
 Otolith and Scale Exchange
 Scheme 2011



Mahé, K., Holmes, A., Huet, J., Sévin, K., Elleboode, R., 2012. Report of the Seabass (*Dicentrarchus labrax*) Otolith and Scale Exchange Scheme 2011, 16 pp.

Table of contents

1. Introduction	4
2. Participants	4
3. Sampling collection	4
4. Reading procedure	6
5. Results	7
5.1. Precision.....	7
5.2. Relative bias (Accuracy)	8
5.3. Age reading quality.....	8
6. Executive Summary.....	10
7. References	12
8. Appendix 1 : Details results of Seabass from ICES VIId	13



1. Introduction

The Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS) meeting in 2011 recommended a small exchange :

"7.2.1.1.6 Seabass (*Dicentrarchus labrax*) and *Sparidae* spp. There has never been an exchange of fish scales for age calibration. Several institutes currently used scales for routine age reading of species such as seabass, and seabream. Scales are used for age determination of *Sparidae* spp. in the Mediterranean. A comprehensive exchange is recommended to identify if there are any issues using scales for age determination. The exchange will be organised during 2011. The coordinator will identify which species are currently being read using scales and will incorporate a maximum of five of these species in the exchange."

2 countries took part in this exchange :

- ❖ France
- ❖ UK England

The objectives of the exchange were:

- ❖ to investigate the levels of agreement on age readings
- ❖ to analyse the relative differences between age readers and techniques

2. Participants

4 readers participated in this exchange.

Table 1 : List of the readers.

Name	Country	Institute
Alison Holmes	UK England	CEFAS
Jerome Huet	France	IFREMER
Karine Sévin	France	IFREMER
Romain Elleboode	France	IFREMER

3. Sampling collection

A total of 155 fish was sampled on board French research vessels (Gwen-Drez and Thalassa) during 2 international surveys :

- ❖ 123 fish from 24 October to 28 November 2010 from Channel Ground Fish Survey (CGFS)
- ❖ 32 fish from 05 to 20 January 2011 from International Bottom Trawl Survey (IBTS)



The length range of fish was between 17 and 74 cm, with a mean-length at 46.99 cm (Fig. 1).

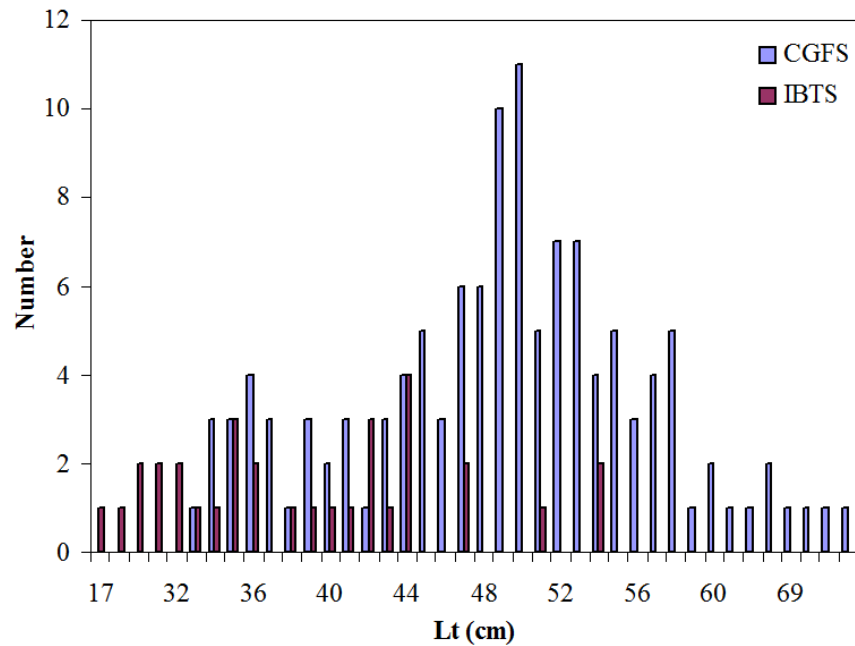


Figure 1 : Histograms of the samples.

For each fish, the *Sagittae* otoliths and few scales were used to compare the age estimation between the both calcified pieces.

The scales are most probably the easiest structures to remove. However, it is very important to choose carefully the removal area in order to avoid regenerated scales. For seabass, the scales are removed under the pectoral fin, an area where regeneration is less frequent and where few visible traces are left for the future commercialisation of the fish (Fig. 2; Mahé *et al.*, 2009).



Figure 2 : Removal of scales under the pectoral fin (removal area in red) for seabass (images : IFREMER ; In Mahé *et al.*, 2009).

Among the sampled scales, the regenerated ones were sorted in order to keep only the readable scales which are the ones where there is a succession of rings starting from the *nucleus* (Fig. 3).

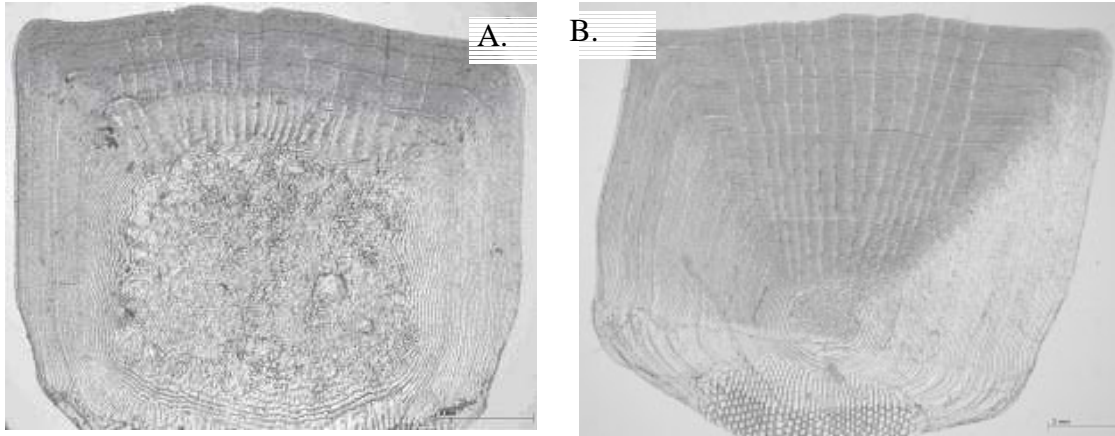


Figure 3 : Difference between a regenerated scale (A.) which does not enable all the growth rings to be seen and a non regenerated scale (B.). The scales are from the same individual (images : Jérôme Huet, IFREMER ; *In Mahé et al., 2009*).

For each otolith, 2 images of otolith section were used in this exchange under reflected and transmitted light.

4. Reading procedure

Date of birth is conventionally attributed to the 1st of January. One *annulus* consists of one opaque and one translucent zone. For age estimation, translucent zones are counted.

Each reader must complete the column of age reading quality such as :

AQ1: Easy to age with high precision.

If a scale of 1-100 is applied, where 100 represents the highest readers confidence in age reading and 1 indicates no confidence in the age reading. Age quality 1 (AQ1), will apply to approximately the top 25 % of the possible quality ratings. AQ1 is an indication that the age data is considered reliable for stock assessment.

AQ2: Normal quality.

Age quality 2 (AQ2), will apply approximately to age readings comprised between 25 and 75 percentiles of possible quality ratings. AQ2 is an indication that the age data is sufficiently reliable to be used for stock assessment purposes but an improvement is required.

AQ3: Difficult to age with acceptable precision.

Age quality 3 (AQ3), will apply to approximately the lowest 25 % of the possible quality ratings. AQ3 is an indication that there are serious concerns about the reliability of the age data and/or its value to stock assessment WGs.

5. Results

The spreadsheet (Eltink, 2000) has been completed according to instructions contained in the Guidelines and Tools for Age Reading Comparisons by Eltink *et al.* (2000). Modal ages were calculated for each otolith read, with percentage agreement, mean age and precision coefficient of variation as a definition :

- ❖ percentage agreement = $100 \times (\text{no. of readers agreeing with modal age} / \text{total no. of readers})$.
- ❖ precision c. v. = $100 \times (\text{standard deviation of age readings} / \text{mean of age readings})$.

Age estimation of 155 fish was realised from otoliths and scales by 4 readers.

5.1. Precision¹

The analyse presented the results of 8 readers (4 reading otoliths and 4 reading scales). Mean precision of age estimate for individual fish were Coefficient of Variation (CV) of 13.1% and percent agreement to modal age of 54.1% (Tab. 2). Among 155 fish, only 2 were read with 100% agreement (1.3%) and thus a CV of 0%. There were variations in precision of age estimate between individual fish, with a CV ranging from 0 to 42.36% and a percent agreement range from 25 to 100% (Tab. 2). Appendix 1 examined the readings of individuals at each modal age and summarised the number of otoliths read, the precision CV, percentage agreement for both calcified pieces.

Table 2 : Precision of readings from otoliths, from scales and from both calcified pieces.

Used calcified pieces	Number of readers	Percentage of Agreement (range)	CV (range)	Number of fish with 100% of agreement
Otolith	4	60.1% (0-100%)	12% (0-52%)	10
Scale	4	62.3% (25-100%)	12% (0-38%)	14
Both	8	54.1% (25-100%)	13.1 (0-42%)	2

Precision of Age estimation from the otolith was very close to precision from the scale with the same sampling and readers group.

¹ Precision is defined as the variability in the age readings. The precision's errors in age readings are better described by the coefficient of variation (CV) by age group. This measure of precision is independent of the closeness to the true age (ICES, 2007).

5.2. Relative bias (Accuracy)²

The minimal requirement for age reading's consistency is the absence of bias among readers and through the time. The hypothesis of an absence of bias between two readers or between a reader and the modal age estimated can be tested non-parametrically with a one-sample Wilcoxon signed rank test (Tab. 3).

Table 3 : Inter-reader bias test and reader against modal age bias test (-: no sign of bias ($p>0.05$); *: possibility of bias ($0.01<p<0.05$); **: certainty of bias ($p<0.01$)) (yellow reader : readings from otoliths ; grey reader : readings from scales).

	France KS-k	England AH	France RE-o	France JH-o	France KS	England A	France RE	France JH
	Reader 1	Reader 2	Reader 3	Reader 4	Reader 5	Reader 6	Reader 7	Reader 8
Reader 1								
Reader 2	**							
Reader 3	**	**						
Reader 4	**	**	—					
Reader 5	—	*	**	**				
Reader 6	**	**	—	—	**			
Reader 7	**	**	**	—	**	*		
Reader 8	**	**	—	—	**	—	*	
MODAL age	**	**	—	**	**	—	**	—

After the modal age of 10 years, the distribution of the age reading differences between MODAL age and observed age showed important differences from 2 to 10 years (Appendix 1).

It should be noted that there were certainty of bias among readings from otoliths (reader 1 to reader 4, Tab. 3) and from scales (reader 5 to reader 8, Tab. 3) and modal age. Moreover, for 2 readers, there are certainty of bias between the readings from different calcified pieces of the same fish (Readers 2-6; Readers 3-7).

5.3. Age reading quality

Age reading quality was estimated by 2 readers. The table 4 presented the image number by the level of Age reading quality for each reader and all readers by type of calcified piece. 106 images (34%) of otoliths and 34 images of scales (11%) were classified in the level AQ3 corresponding to difficult to age with acceptable precision. Reasons of this problem were different whether otoliths or scales are used. Reader 4 did not read the otolith and so it was his first time to work on the otolith. In contrary, all readers noted that it was very difficult to estimate the age from only 1 image of scale because it was not possible to obtain the same quality on the whole surface of the scale.

² In absence of calcified structures of known age, the age readings can be compared to modal age, which is defined as the age determined for an individual structure whose most of the readers have a preference. Relative bias can be defined as a systematic over- or underestimation of age compared to the modal age. The age reading comparisons to modal age provide a low estimate of relative bias compared to absolute bias, when most readers have a similar serious bias in age reading (ICES, 2007).

Table 4 : Level of Age reading quality by readers and all readers according to the type of the used calcified pieces (otolith or scale) of seabass (*Dicentrarchus labrax*).

level of Quality	Reader 2 (otolith)	Reader 4 (otolith)	Reader 6 (scale)	Reader 8 (scale)	All readers (otolith)	All readers (scale)
AQ1	118	3	77	38	121 (39%)	115 (37%)
AQ2	32	50	60	100	82 (26%)	160 (52%)
AQ3	4	102	17	17	106 (34%)	34 (11%)

It was noted that on 4 readers, 2 used transmitted light for the otoliths and 2 readers used reflected light. There was no preference to the type of light.

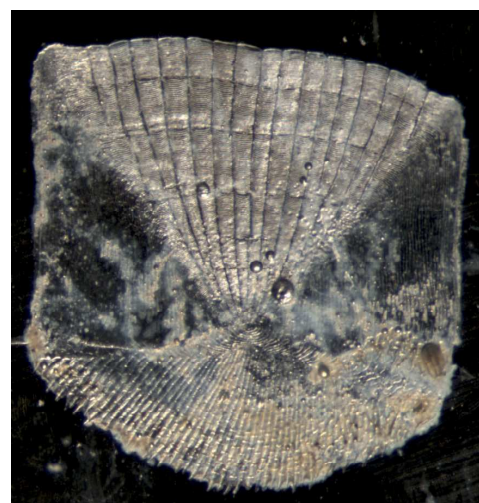


6. Executive Summary

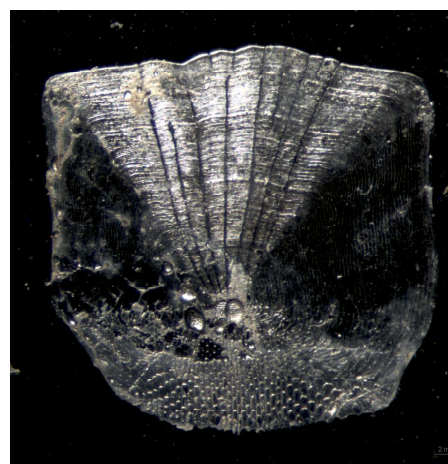
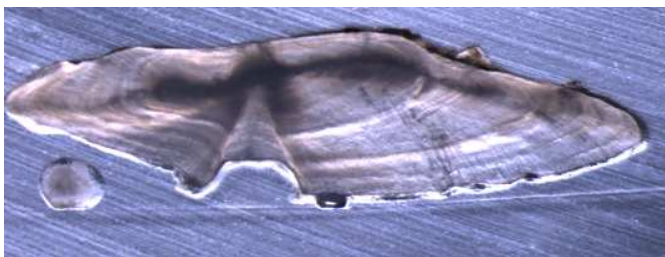
For seabass (*Dicentrarchus labrax*), Otolith and Scale Exchange Scheme 2011 was the first exchange. A total of 155 fish from Eastern English Channel (ICES area : VIId) was sampled on-board French research vessels (Gwen-Drez and Thalassa) during 2 international surveys (Channel Ground Fish Survey and International Bottom Trawl Survey). The length range of the fish was between 17 and 74 cm, with a mean length at 46.99 cm. For each fish, the *Sagittae* otoliths and few scales were used to compare the age estimation between both calcified pieces.

4 readers were participated from UK England (1 reader) and France (3 readers). Only images were used during this exchange. There were noted by the readers that it was very difficult to obtain an image of the scale with the same quality on its whole surface. On 4 readers, 2 readers used transmitted light for the otoliths and 2 readers used reflected light. There was no preference to the type of light.

The analyses did not show a high mean precision of age estimate for individual fish with Coefficient of Variation (CV) of 13.1% and percent agreement to modal age of 54.1%. Among 155 fish, only 2 were read with 100% agreement (1.3%) and thus a CV of 0% :



Age estimated to 5 years by all readers from the scales and from the otoliths. Seabass was sampled 28 January 2011 in the Eastern English Channel (VIId) during the International Bottom Trawl Survey. This is a male of 33 cm TL.



Age estimated to 5 years by all readers from the scales and from the otoliths. Seabass was sampled 28 January 2011 in the Eastern English Channel (VIId) during the International Bottom Trawl Survey. This is a male of 42 cm TL.

During this exchange, 2 different calcified pieces (otolith and scale) from the same sampling were analysed. The results showed the same precision of age estimation from the otolith (percent agreement = 60.1 ; CV = 12) or the scale (percent agreement = 62.3 ; CV = 12). However, this exchange showed that the age estimation from the otoliths was different than this from the scales.

7. References

Eltink, A. T. G. W., Newton, A. W., Morgado, C., Santamaria, M. T. G., Modin, J., 2000. Guidelines and Tools for Age Reading. (PDF document version 1.0 October 2000) Internet : <http://www.efan.no>

Eltink, A. T. G. W., 2000. Age reading comparisons. (MS Excel workbook version 1.0 October 2000) Internet : <http://www.efan.no>

ICES. 2007. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS), 5–9 March 2007, Valetta, Malta. ACFM:09. 115p.

Mahé, K., Bellail, R., Dufour, J.L., Boiron-Leroy, A., Diméet, J., Duhamel, E., Elleboode, R., Félix, J., Grellier, P., Huet, J., Labastie, J., Le Roy, D., Lizaud, O., Manten, M.L., Martin, S., Metral, L., Nédelec, D., Vérin, Y., Badts, V., 2009, Synthèse française des procédures d'estimation d'âge, Rapport Ifremer, 78pp.



8. Appendix 1 : Details results of Seabass from ICES VIId

The number of age readings, the coefficient of variation (CV), the percentage of agreement and the RELATIVE bias are presented by MODAL age for each age reader and for all readers combined. A weighted mean CV and a weighted mean percent agreement are given by reader and all readers combined. The CV's by MODAL age for each individual age reader and all readers combined indicate the precision in age reading by MODAL age. The weighted mean CV's over all MODAL age groups combined indicate the precision in age reading by reader and for all age readers combined.

Seabass scale and otolith Exchange 2011 (VIId)

NUMBER OF AGE READINGS										
MODAL age	France KS-Reader 1	England K-Reader 2	AFrance RE-Reader 3	France RE-Reader 4	France JH-o-Reader 5	France KS K-Reader 6	England A-Reader 7	France RE-Reader 8	France JH-Reader 8	TOTAL
0	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	3	3	3	3	3	3	3	3	3	24
4	15	15	15	15	15	14	15	15	15	119
5	28	27	28	28	28	27	28	28	28	222
6	21	20	21	21	21	21	21	21	21	167
7	20	19	20	19	20	20	20	20	20	158
8	28	28	28	28	28	28	28	28	28	224
9	14	13	13	14	13	12	13	13	13	105
10	8	8	8	8	8	8	8	8	8	64
11	6	6	6	6	6	6	6	6	6	48
12	5	5	5	5	5	5	5	5	5	40
13	3	3	3	3	3	3	3	3	3	24
14	1	1	1	1	1	1	1	1	1	8
15	2	2	2	2	2	2	2	2	2	16
16	1	1	1	1	1	1	1	1	1	8
17	-	-	-	-	-	-	-	-	-	-
Total	0.37	155	151	154	154	154	151	154	154	1227

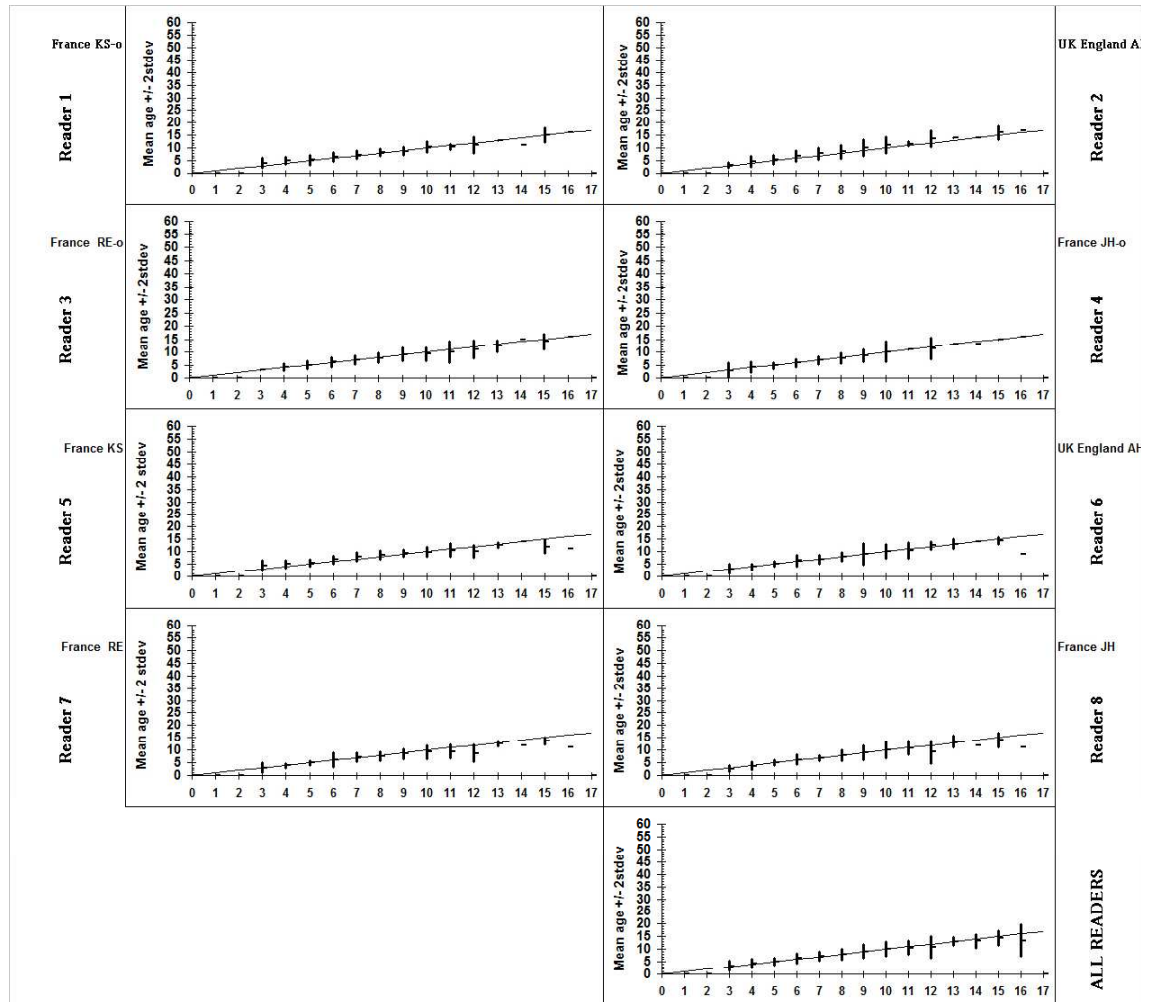
COEFFICIENT OF VARIATION (CV)										
MODAL age	France KS-Reader 1	England K-Reader 2	AFrance RE-Reader 3	France RE-Reader 4	France JH-o-Reader 5	France KS K-Reader 6	England A-Reader 7	France RE-Reader 8	France JH-Reader 8	ALL Readers
0	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	25%	17%	0%	57%	27%	33%	33%	22%	25.2%	25.2%
4	14%	23%	18%	25%	17%	15%	11%	22%	19.1%	19.1%
5	18%	17%	17%	12%	15%	12%	9%	11%	12.3%	12.3%
6	13%	17%	15%	13%	13%	18%	24%	16%	14.7%	14.7%
7	12%	15%	12%	11%	12%	13%	12%	8%	11.2%	11.2%
8	9%	16%	13%	13%	11%	11%	12%	14%	10.7%	10.7%
9	9%	15%	14%	14%	8%	24%	12%	15%	12.7%	12.7%
10	10%	14%	14%	20%	10%	14%	15%	16%	12.1%	12.1%
11	5%	4%	20%	0%	13%	16%	15%	12%	11.0%	11.0%
12	15%	12%	16%	18%	12%	7%	19%	25%	17.1%	17.1%
13	0%	0%	9%	0%	5%	8%	5%	9%	6.1%	6.1%
14	-	-	-	-	-	-	-	-	-	-
15	9%	9%	10%	0%	12%	5%	5%	10%	9.9%	9.9%
16	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-
Weighted mean	0.37	12.2%	15.5%	14.3%	14.3%	12.5%	14.2%	13.6%	14.1%	13.1%
RANKING		1	8	7	6	2	5	3	4	

PERCENTAGE AGREEMENT										
MODAL age	France KS-Reader 1	England K-Reader 2	AFrance RE-Reader 3	France RE-Reader 4	France JH-o-Reader 5	France KS K-Reader 6	England A-Reader 7	France RE-Reader 8	France JH-Reader 8	ALL
0	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	33%	67%	100%	33%	33%	33%	33%	67%	50%	50%
4	20%	40%	67%	53%	40%	86%	80%	47%	54%	54%
5	54%	63%	68%	71%	46%	78%	79%	71%	66%	66%
6	43%	50%	48%	67%	43%	57%	62%	52%	53%	53%
7	60%	42%	75%	58%	35%	35%	55%	70%	54%	54%
8	71%	68%	61%	46%	57%	75%	46%	61%	61%	61%
9	86%	31%	38%	29%	69%	25%	38%	31%	44%	44%
10	88%	25%	13%	38%	50%	25%	13%	50%	38%	38%
11	50%	33%	67%	100%	50%	17%	33%	50%	50%	50%
12	40%	40%	60%	20%	20%	80%	0%	20%	35%	35%
13	100%	0%	67%	100%	67%	33%	67%	0%	54%	54%
14	0%	100%	0%	0%	100%	100%	0%	0%	38%	38%
15	0%	50%	50%	100%	0%	50%	0%	50%	38%	38%
16	100%	0%	100%	100%	0%	0%	0%	0%	38%	38%
17	-	-	-	-	-	-	-	-	-	-
Weighted mean	0.37	56.77%	49.01%	59.09%	56.49%	46.75%	57.62%	53.25%	54.55%	54.20%
RANKING		3	7	1	4	8	2	6	5	

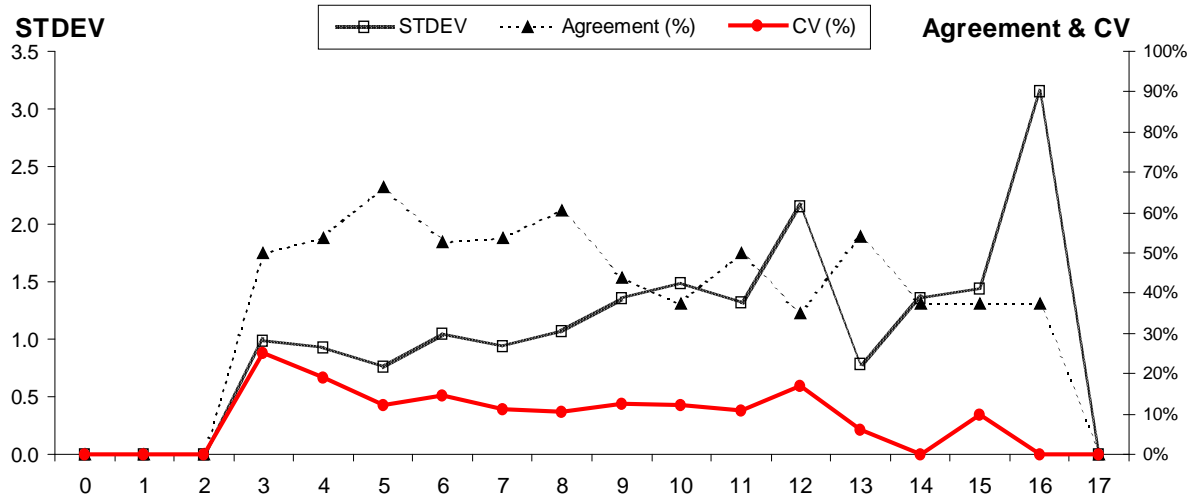
RELATIVE BIAS										
MODAL age	France KS-Reader 1	England K-Reader 2	AFrance RE-Reader 3	France RE-Reader 4	France JH-o-Reader 5	France KS K-Reader 6	England A-Reader 7	France RE-Reader 8	France JH-Reader 8	ALL
0	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	1	0	0	0	1	0	0	0	0	0
4	1	1	0	0	1	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	1	0	0	1	0	0	0	0	0
7	0	1	0	0	1	0	0	0	0	0
8	0	1	0	0	1	0	-1	0	0	0
9	0	1	0	0	0	0	-1	0	0	0
10	0	1	-1	0	0	0	-1	0	0	0
11	-1	1	-1	0	-1	-1	-2	0	0	0
12	-1	2	-1	-1	-2	0	-3	-3	-1	-1
13	0	1	-1	0	0	0	0	0	0	0
14	-3	0	1	-1	0	0	-2	-2	-1	-1
15	0	1	-1	0	-3	-1	-2	-1	-1	-1
16	0	1	0	0	-5	-7	-5	-5	-3	-3
17	-	-	-	-	-	-	-	-	-	-
Weighted mean	0.37	0.27	0.72	-0.16	-0.25	0.32	-0.11	-0.44	-0.21	0.04
RANKING		3	7	1	4	8	2	6	5	

Overall ranking									
	France KS-Reader 1	England K-Reader 2	AFrance RE-Reader 3	France RE-Reader 4	France JH-o-Reader 5	France KS K-Reader 6	England A-Reader 7	France RE-Reader 8	France JH-Reader 8
Ranking Coefficient of Variation	1	8	7	6	2	5	3	4	
Ranking Percentage Agreement	3	7	1	4	8	2	6	5	
Ranking Relative bias	3	7	1	4	8	2	6	5	
OVERALL RANKING	1	8	2	4	7	2	6	4	

In the age bias plots below the mean age recorded +/- 2stdev of each age reader and all readers combined are plotted against the 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.



The coefficient of variation (CV%), percentage of agreement and the standard deviation (STDEV) are plotted against MODAL age. CV is much less age dependent than the standard deviation (STDEV) and the percentage of agreement. CV is therefore a better index for the precision in age reading. Problems in age reading are indicated by relatively high CV's at age.



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.

