SmartDots Summary Report for the 2022 Western Baltic Cod (cod.27.22-24) age reading exchange (ID 412)

Co-ordination and analysis by Julie Coad Davies, DTU Aqua Denmark

1 Summary

This small exchange was held in preparation for WGBFAS 2022 to check the level of agreement and bias between age readers providing age data for stock assessment of cod.27.22-24. 100 images of sectioned otoliths from samples collected in ICES SD 22 and 23 across the four quarters of 2021 were taken at DTU Aqua (Denmark) and uploaded to SmartDots. Readers were provided with instructions to annotate all images, provide an age estimate and a quality score for their age estimation. The reporting module in SmartDots was used to run a standardised analysis of age reader comparison and extract a template for a full report and summary report. Results were provided to The ICES Baltic Fisheries Assessment Working Group (WGBFAS) 2022.

Based on the 3 readers providing age data for assessment from Denmark, Germany and Sweden the percentage agreement (PA) was 97% with a coefficient of variation (CV) of 8%. This is an improvement on the 2020 results where PA was 91% for sectioned otoliths and 88% for broken otoliths with a respective CV of 17% and 18%. Age reading issues related to counting a translucent zone (TZ) at the edge in Q3 or Q4 and correct identification of the first winter ring are generally resolved. In contrast to previous exchanges only images of sectioned otoliths were provided for the readers to annotate after results from previous exchanges (2019, 2020) indicated this to be a more reliable age reading method. The material has been made available for training new age readers for this stock.

A series of age reading exchanges (2019, 2020 and 2022) and cooperation between the age reading labs providing age data for stock assessment, the stock assessor and stock coordinator for cod.27.22-24 has resulted in improved reader calibration and consequently data quality for cod.27.22-24.

2 Overview of samples and advanced readers

Table 1: Overview of samples used for the 2022 Western Baltic Cod age reading exchange. The modal age range for all samples is 0-6.

Year	ICES area	Strata	Quarter	Number of samples	Modal age range	Length range
2021	27.3.b.23	cod.27.22-24	1	10	2-5	270-670 mm
2021	27.3.b.23	cod.27.22-24	3	2	5	730-750 mm
2021	27.3.b.23	cod.27.22-24	4	34	1-5	260-740 mm
2021	27.3.c.22	cod.27.22-24	1	26	1-6	150-830 mm
2021	27.3.c.22	cod.27.22-24	2	8	3-6	680-940 mm
2021	27.3.c.22	cod.27.22-24	3	6	2-5	390-820 mm
2021	27.3.c.22	cod.27.22-24	4	14	0-5	150-810 mm

Table 2: Overview of advanced readers.

Reader code	Expertise
R01 DE	Advanced
R02 DK	Advanced
R03 SE	Advanced

3 Results

Table 3: Age reading table presents the number of readings made per expert reader for each modal age.

Modal age	R01 DE	R02 DK	R03 SE	total
0	3	3	2	**8**
1	21	20	21	**62**
2	34	34	35	**103**
3	14	14	14	**42**
4	1	1	1	**3**
5	23	24	24	**71**
6	2	2	2	**6**
Total	**98**	**98**	**99**	**295**

Table 4: 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	R01 DE	R02 DK	R03 SE	all
0	-	-	-	**-**
1	0 %	21 %	0 %	**12 %**
2	9 %	12 %	0 %	**9 %**
3	9 %	0 %	0 %	**5 %**
4	-	-	-	**0 %**
5	4 %	0 %	6 %	**4 %**
6	0 %	0 %	0 %	**0 %**
Weighted Mean	**6 %**	**9 %**	**1 %**	**8 %**

Table 5: 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	R01 DE	R02 DK	R03 SE	all
0	100 %	67 %	100 %	**88 %**
1	100 %	95 %	100 %	**98 %**
2	97 %	94 %	100 %	**97 %**
3	93 %	100 %	100 %	**98 %**
4	100 %	100 %	100 %	**100 %**
5	96 %	100 %	92 %	**96 %**
6	100 %	100 %	100 %	**100 %**
Weighted Mean	**97 %**	**96 %**	**98 %**	**97 %**

Table 6: 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.

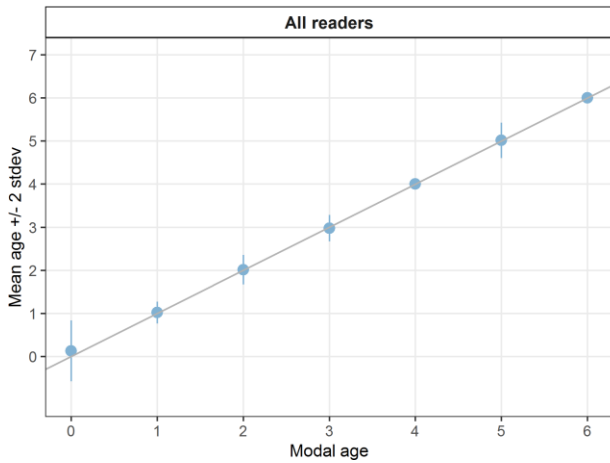| Modal age	R01 DE	R02 DK	R03 SE	all
0	0.00	0.33	0.00	**0.11**
1	0.00	0.05	0.00	**0.02**
2	-0.03	0.06	0.00	**0.01**
3	-0.07	0.00	0.00	**-0.02**
4	0.00	0.00	0.00	**0.00**
5	-0.04	0.00	0.08	**0.01**
6	0.00	0.00	0.00	**0.00**
Weighted Mean	**-0.03**	**0.04**	**0.02**	**0.01**

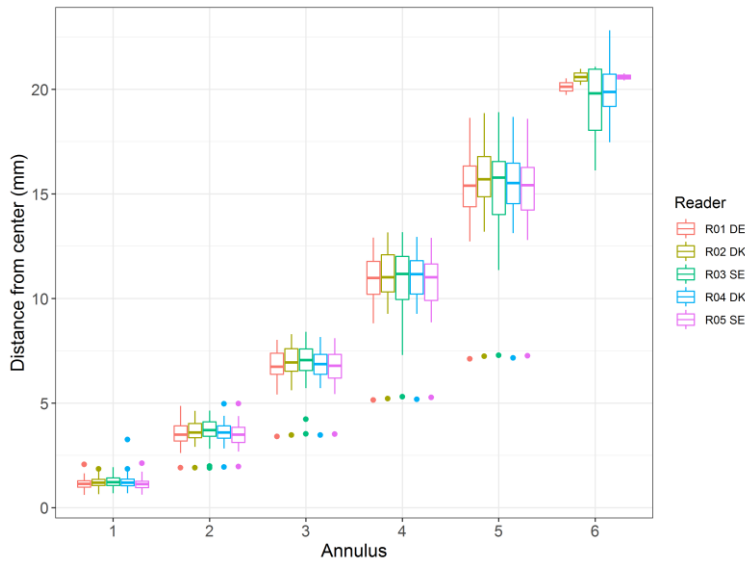**Figure 1:** Age bias plot for advanced readers.

Figure 2: Plot of average distance from the centre to the winter rings for advanced readers. The boxes represent the median, upper and lower box boundaries of the interquartile range, whiskers extend no further than 1.5 * IQR (where IQR is the inter-quartile range) from the box boundary. Data beyond the end of the whiskers are represent outlers and are plotted individually.

Table 7: Age error matrix (AEM) for cod.27.22-24. The AEM shows the proportional distribution of age readings for each modal age.

	Read age							
Modal_age	0	1	2	3	4	5	6	Total
0	**0.88**	0.12	-	-	-	-	-	1
1	-	**0.98**	0.02	-	-	-	-	1
2	-	0.01	**0.97**	0.02	-	-	-	1
3	-	-	0.02	**0.98**	-	-	-	1
4	-	-	-	-	**1.00**	-	-	1
5	-	-	-	-	0.01	**0.96**	0.03	1
6	-	-	-	-	-	-	**1.00**	1