

# Report of the 2018 Norway Pout (*Trisopterus esmarkii*) age reading exchange

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## 1 Executive summary

In 2015 a preliminary age reading exchange took place between the primary age readers of Norway pout from DTU Aqua (Denmark) and IMR (Norway) to identify if any age reading issues exist. The samples included in the exchange were from the commercial Norway pout fishery in the North Sea and Skagerrak-Kattegat areas (nop.27.3a4 stock) as age readings from this fishery are used directly in the Norway pout stock assessment to estimate catch, mean weight, maturity and mortality at age. 227 samples were selected from quarter 4, 2014 and quarter 3, 2015 covering the fish length range of Norway pout in the North Sea. Results showed an overall percentage agreement of 72%, with 100% agreement at age 0 and a decrease in agreement with an increase in age. Results showed a tendency for the Norwegian reader to estimate the ages of the fish to be one year older in comparison to the Danish reader. As Norway pout grow very quickly in the first year the centre of the otoliths are highly opaque and this can cause problems when identifying the first winter ring. In addition, subsequent growth zones are much narrower in comparison and the interpretation of growth zones towards edge may also contribute to difficulties in age determination, especially for older fish. The exchange was carried out without the inclusion of otolith images and thus no record of which growth structures the readers identify when determining the age of the fish. These results indicated the need for a full scale exchange to be carried out based on otoliths images and including all age reading laboratories who routinely read Norway pout.

The full scale exchange was initially planned for 2016 and a timetable proposed which would allow for the results to be considered in relation to the 2017 stock assessment and potential InterBenchmark Assessment if required. Due to difficulties with sample collection and the WebGR age reading platform delays were encountered. A revised timetable was proposed in line with the launch of the BETA version of the new age reading tool – SmartDots, making the results available for the Norway pout stock assessment in Spring 2018. The exchange took place from January to March 2018 and 14 readers from seven countries participated (Scotland, UK, France, Norway, Denmark, Netherlands and Germany). Different methods are applied for age determination of this species; whole, broken and sectioned otoliths and images were provided of samples prepared using each method. Samples were collected during the 2016 Q3 IBTS and 2014 Q4 commercial fishing trips from ICES area 27.4.a. covering the length range of the fish and considered adequately representative of the stock.

Results based on sectioned otoliths were exceptional with an overall percentage agreement based on modal age of 99% and an average CV of 3%. For the whole and broken otoliths the average percentage agreement based on modal age is 82%, with an average CV of 20%. There is a slight tendency for some readers to overestimate the age at modal age 0 and 1 and underestimate in comparison to modal age 2. The bias that existed between the primary readers from Norway and Denmark in 2016 is still apparent. These results are based only on those readers who provide age data for assessment purposes.

## 2 Overview of samples and readers

**Table 1:** Overview of samples used for Norway Pout exchange - whole and broken otoliths (SmartDots event ID 74).

ICES area	Year	Quarter	Number of samples	Modal age range	Length range
27.4.a	2014	4	58	0-2	90-185 mm

**Table 2:** Overview of samples used for the Norway Pout exchange - sectioned otoliths (SmartDots event ID 77).

ICES area	Year	Quarter	Number of samples	Modal age range	Length range
27.4.a	2016	3	94	0-3	100-190 mm
27.4.b	2016	3	2	0	100 mm

**Table 3:** Overview of advanced readers for Norway Pout exchange - whole and broken otoliths (SmartDots event ID 74). Advanced readers are defined as those who provide age data for assessment purposes.

Reader code	Expertise
R01 NO	Advanced
R02 NO	Advanced
R03 DK	Advanced
R04 GB-SCT	Advanced
R05 NO	Advanced
R06 NO	Advanced
R07 DK	Advanced

**Table 4:** Overview of advanced readers for Norway Pout exchange - sectioned otoliths (SmartDots event ID 77). Advanced readers are defined as those who provide age data for assessment purposes.

Reader code	Expertise
R01 DE	Advanced
R02 DE	Advanced
R03 GB	Advanced

### 3 Results overview

#### 3.1 Norway Pout exchange - whole and broken otoliths (SmartDots event ID 74)

##### 3.1.1 CV table

**Table 5:** 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. (Whole and broken otoliths - SmartDots event ID 74)

Modal age	R01 NO	R02 NO	R03 DK	R04 GB-SCT	R05 NO	R06 NO	R07 DK	All
0	-	-	-	-	-	-	-	-
1	21 %	0 %	0 %	0 %	44 %	21 %	32 %	10 %
2	18 %	15 %	36 %	46 %	21 %	11 %	0 %	28 %
<b>Weighted Mean</b>	<b>14 %</b>	<b>6 %</b>	<b>14 %</b>	<b>17 %</b>	<b>23 %</b>	<b>11 %</b>	<b>11 %</b>	<b>20 %</b>

##### 3.1.2 PA table

**Table 6:** 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. (Whole and broken otoliths - SmartDots event ID 74)

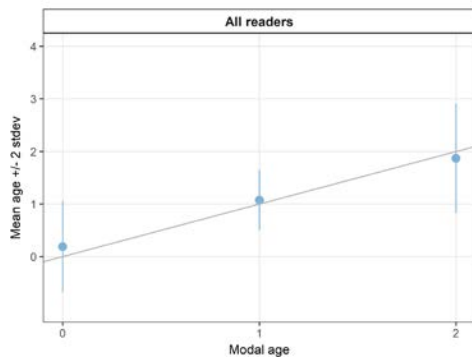
Modal age	R01 NO	R02 NO	R03 DK	R04 GB SCT	R05 NO	R06 NO	R07 DK	All
0	100 %	100 %	100 %	88 %	44 %	100 %	47 %	83 %
1	95 %	100 %	100 %	100 %	80 %	95 %	84 %	94 %
2	86 %	91 %	36 %	27 %	64 %	95 %	100 %	71 %
<b>Weighted Mean</b>	<b>93 %</b>	<b>97 %</b>	<b>76 %</b>	<b>69 %</b>	<b>64 %</b>	<b>97 %</b>	<b>80 %</b>	<b>82 %</b>

##### 3.1.3 Relative bias table

**Table 7:** 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. (Whole and broken otoliths - SmartDots event ID 74)

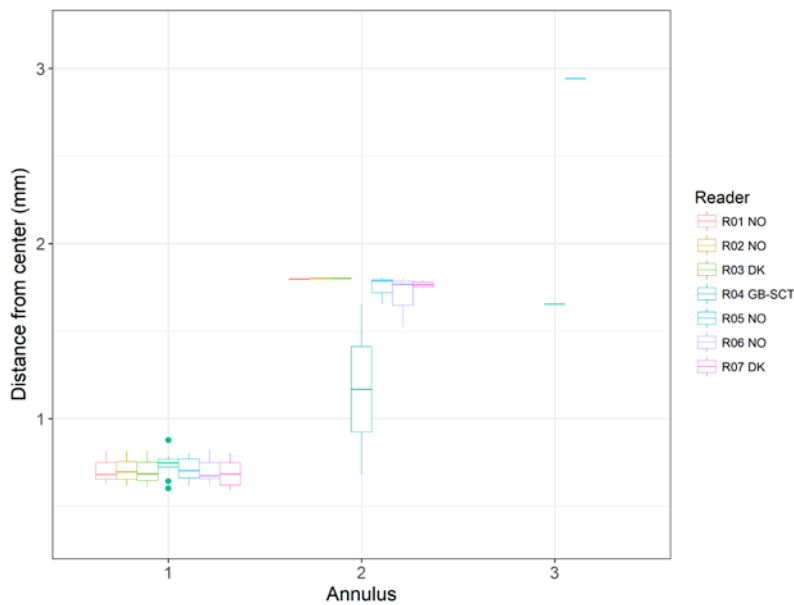
Modal age	R01 NO	R02 NO	R03 DK	R04 GB SCT	R05 NO	R06 NO	R07 DK	All
0	0.00	0.00	0.00	0.12	0.62	0.00	0.60	0.19
1	0.05	0.00	0.00	0.00	0.25	0.05	0.16	0.07
2	0.05	-0.09	-0.64	-0.55	0.36	-0.05	0.00	-0.13
<b>Weighted Mean</b>	<b>0.04</b>	<b>-0.03</b>	<b>-0.24</b>	<b>-0.18</b>	<b>0.39</b>	<b>0.00</b>	<b>0.22</b>	<b>0.03</b>

### 3.1.4 Bias plot



**Figure 1:** Age bias plot for advanced readers. (Whole and broken otoliths - SmartDots event ID 74)

### 3.1.5 Growth analysis



**Figure 2:** Plot of average distance from the centre to the winter rings for advanced readers (Whole and broken otoliths - SmartDots event ID 74). The boxes represent the median, upper and lower box boundaries of the interquartile range, whiskers represent the minimum and maximum values and the dots represent the outliers. The annotations of R03 DK are in some examples based on images of whole otoliths where the distances between annuli are greater in comparison to the broken otoliths.

## 3.2 Norway Pout exchange - sectioned otoliths (SmartDots event ID 77)

### 3.2.1 CV table

**Table 8:** 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. (Sectioned otoliths - SmartDots event ID 77)

Modal age	R01 DE	R02 DE	R03 GB	All
0	-	-	-	-
1	0 %	0 %	24 %	4 %

2	9 %	0 %	0 %	1 %
3	0 %	0 %	0 %	0 %
<b>Weighted Mean</b>	<b>3 %</b>	<b>0 %</b>	<b>14 %</b>	<b>3 %</b>

### 3.2.2 PA table

**Table 9:** 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. (Sectioned otoliths - SmartDots event ID 77)

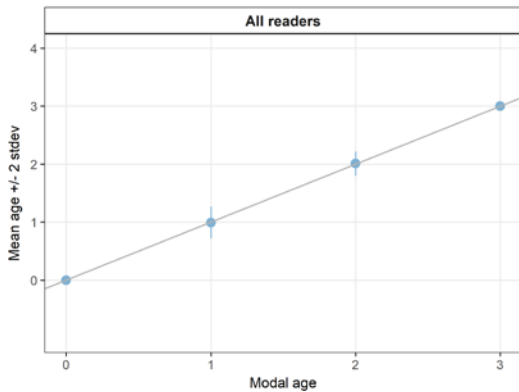
Modal age	R01 DE	R02 DE	R03 GB	All
0	100 %	100 %	100 %	100 %
1	100 %	100 %	95 %	98 %
2	97 %	100 %	100 %	99 %
3	100 %	100 %	100 %	100 %
<b>Weighted Mean</b>	<b>99 %</b>	<b>100 %</b>	<b>97 %</b>	<b>99 %</b>

### 3.2.3 Relative bias table

**Table 10:** 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. (Sectioned otoliths - SmartDots event ID 77)

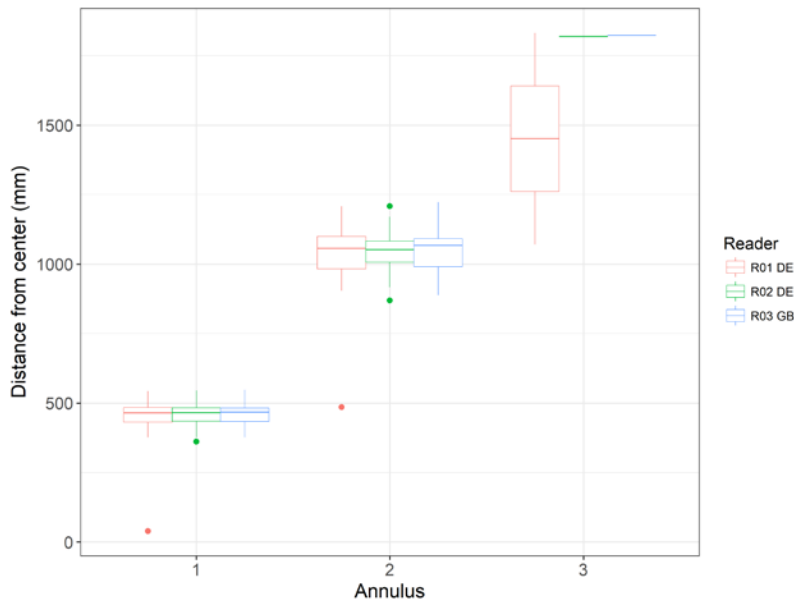
Modal age	R01 DE	R02 DE	R03 GB	All
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
<b>Weighted Mean</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

### 3.2.4 Bias plot



**Figure 3:** Age bias plot for advanced readers. (Sectioned otoliths - SmartDots event ID 77)

### 3.2.5 Growth analysis



**Figure 4:** 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 represent the minimum and maximum values and the dots represent the outliers. (Sectioned otoliths - SmartDots event ID 77)

### 3.2.6 Age error matrix

**Table 11:** Age error matrix (AEM) for stock nop.27.3a4 shows in bold the proportions of fish aged in agreement with modal age for each age group (Whole and broken otoliths - SmartDots event ID 74)

Modal age	0	1	2
Age 0	<b>0.8</b>	-	-
Age 1	0.2	<b>0.9</b>	0.2
Age 2	0.0	0.1	<b>0.7</b>
Age 3	-	0.0	0.1

**Table 12:** Age error matrix (AEM) for stock nop.27.3a4 shows in bold the proportions of fish aged in agreement with modal age for each age group (Sectioned otoliths - SmartDots event ID 77)

Modal age	0	1	2	3
Age 0	<b>1</b>	0	-	-
Age 1	-	<b>1</b>	-	-
Age 2	-	0	<b>1</b>	-
Age 3	-	-	0	<b>1</b>

## 4 Conclusion

Overall there is a high level of agreement between readers of the Norway Pout - nop.27.3a4 stock. The agreement is higher between the countries who read sectioned otoliths (Germany and UK-England) compared to those who read whole (Denmark) and broken otoliths (Denmark, Norway and UK-Scotland). This can be partly attributed to one Norwegian and one Danish reader who occasionally overestimate in comparison to modal age 0 and 1 with the identification of the first winter ring being problematic. At modal age 2 there is a stronger tendency for readers to underestimate in comparison to modal age with the exception of the Norwegian reader who continues to overestimate. Most variability is seen in the annotations of the broken otoliths which is the preferred method. It should be noted that the image quality of the sectioned otoliths is much higher. The AEM's show that there is a difference of just one year when comparing the readers estimates to modal age.