

Age determination of Baltic cod 2014

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Material, methods

Scales were collected from 23 Baltic cod, 43-52 cm long. 12 were from area 24 and 11 from area 25. Samples were collected late in 2013 but date of sampling was set to 1. January, in order to set the + growth in 2013 as a whole year. Length and weight were recorded but no other data were collected, i.e. maturity, stomach content, parasites etc.

Scales were pressed in a roller press into soft 0.7 mm thick celluloid plate to obtain a mold of the scale surface. The molds were placed in a micro film reader for age reading. Length at age was back calculated by measuring the distance of the annuli from the centre of the scale, assuming a linear relationship between scale size and fish length.

Results

It was possible to read the age from the scales. Mean back calculated lengths of each age group are shown in tables 1 and 2. A plot of the mean growth of 4, 5, 6 and 7 year old fish is shown in figs. 1 and 2. The mean growth of all age groups is shown in 3 and 4. Mean growth of all fish, 24+25, is shown in fig. 5.

Cod 24										
Age	Mean W. gutted	No.	Mean L.	l1	l2	l3	l4	l5	l6	l7
4	800	1	48	9.7	18.2	32.4	48			
5	787	4	44.8	9.6	15.6	26.4	40.9	44.8		
6	870	5	45.6	8.3	14.9	29.7	38.1	43.1	45.6	
7	900	2	46.5	10	19.7	32	37.8	41.7	44.6	46.5
Sum		12	Avg:	9.4	17.1	30.1	41.2	43.2	45.1	46.5

Cod 25											
Age	Mean W. gutted	No.	Mean L.	l1	l2	l3	l4	l5	l6	l7	
4	900	1	50	7.4	30.4	40.5	50				
5	1025	6	51	8.5	23.9	33.3	42.8	51			
6	1025	2	50	8.3	17.2	28.3	36.1	42.3	50		
7	925	2	49	8.8	26.7	37.1	40.2	42.2	45	49	
Sum:		11	Avg:	8.3	24.6	34.8	42.3	45.2	47.5	49	

Table 1. Age determination of Baltic cod from 24. Length was back calculated from scales, l1, l2, .. l7, show the calculated growth of the year classes. Mean lengths at age of 4-7 year old cod are plotted in fig. 1.

Table 2. Age determination of Baltic cod from 25. Length was back calculated from scales, l1, l2, .. l7, show the calculated growth of the year classes. Mean lengths at age of 4-7 year old cod are plotted in fig. 2.

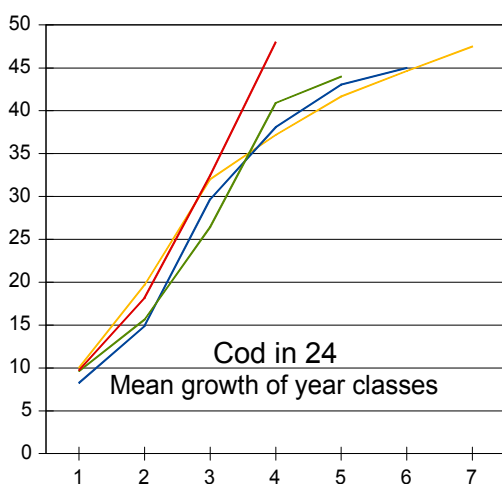


Fig. 1. Plot of the mean growth of 4, 5, 6 and 7 years old cod, back calculated from scales. Data are from table 1.

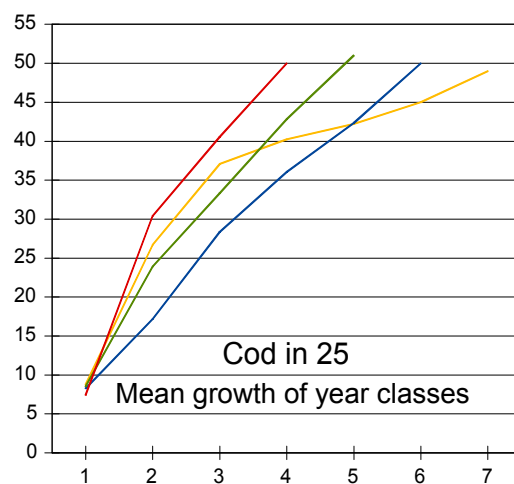


Fig. 2. Plot of the mean growth of 4, 5, 6 and 7 years old cod, back calculated from scales. Data are from table 2.

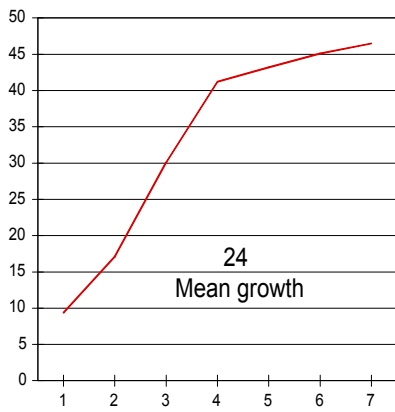


Fig. 3. Mean growth of all age classes in area 24.

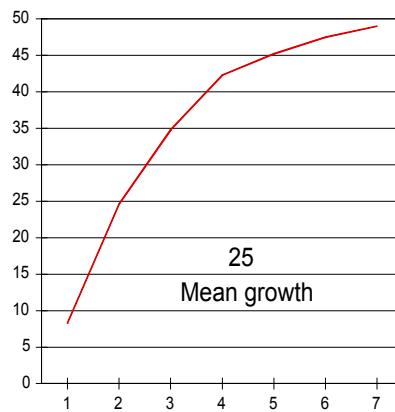


Fig. 4. Mean growth of all age classes in area 25.

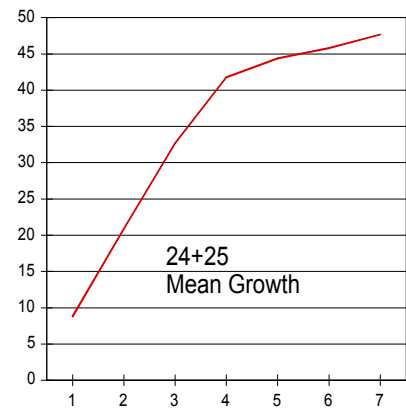


Fig. 5. Mean growth of all fish.

Comparison with samples taken in 2010

Below are scale analysis from 2010 (Jon Kristjánsson 2010). The mean growth is slower now than in 2010, back calculated length at age 3 was 30.1 and 34.8 in areas 24 and 25 respectively.

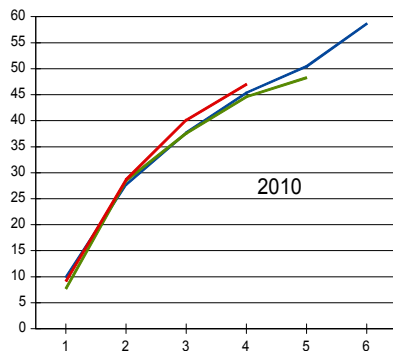


Fig. 6. Plot of the mean growth of 4, 5 and 6 years old cod in 2010, back calculated from scales. Data are from table 3.

Age	Mean weight	Year class	No.	Mean length	l ₁	l ₂	l ₃	l ₄	l ₅	l ₆	l ₇
Years	kg			cm	cm	cm	cm	cm	cm	cm	cm
4	0.86	2006	1	47	9	29	40	47			
5	0.96	2005	7	48	8	28	38	45	48		
6	1.80	2004	3	59	10	28	38	45	50	59	
7	2.65	2003	4	67	8	21	32	43	50	58	67
Avg					9	26	37	45	50	58	67

Table 3. Age determination of Baltic cod in 2010. Length was back calculated from scales, l₁, l₂, ..l₇, show the calculated growth of the year classes. Mean lengths at age of 4-6 year old cod is plotted in figure 2.

Discussion

Age can be determined from the scales and the growth can be calculated. In these few samples the age reading was simple. Consistence however is unknown; few samples and one reader.

The asymptotic length is less than 50 cm and the growth seems to be slightly slower in area 24 than in area 25 (tables 1 and 2). According to fig. 7, the main bulk of fish in 2014 is below the minimum landing size. As the fish in the samples were large, from 43-52 cm, no information is on the growth of the small fish. They might be older and more slow growing than the big fish as large fish often tend to be cannibals.

It is now doubt that this slow growth and dominance of small fish is a result of selective fishing in combination with lower fishing pressure.

The only remedy is a thin out fishery i.e. smaller mesh and more intensive fishing.

Sad but true, this is the result of the "fish less now and more later" fisheries policy conducted by ICES. Management that depends on growth should be used instead of the obligatory age-structured modelling. (Kolding and van Zwieten 2011).

References

Jón Kristjánsson 2010. Age determination of Baltic cod.

<http://www.mmedia.is/~jonkr/english/BalticAge1.pdf>

Jeppe Kolding & Paul A.M. van Zwieten 2011. The tragedy of our legacy: how do global management discourses affect small-scale fisheries in the South?

<http://www.tandfonline.com/doi/abs/10.1080/08039410.2011.577798>

Addendum:

Pictures of scales. Year rings are marked with red.

