

Effect of meshsize on Catch composition in Beamtrawl fishery

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Summary

The Dutch Product Board asked Wageningen IMARES to set up a cooperative research project on the effects of mesh size on sole and plaice catches in the beam trawl fishery. There have been discussions in the North Sea RAC on the minimum mesh size in the beam trawl fishery: arguments were raised to increase the minimum mesh size from 80 to 90 mm, in order to decrease the amount of plaice discards. Dutch fisheries representatives fear that by increasing the minimum mesh size, fishers will lose a lot of marketable sole which will not be compensated by higher catches on the long term. Moreover, fishers do not expect a significant decrease of plaice discards: in their view the discards consist of plaice just smaller than the marketable size (25-27 cm). Increasing the minimum mesh size from 80 to 90 mm will not affect the number of plaice caught from that size category.

There were two research questions:

1. What is the effect of using 70, 80, or 90 mm mesh sizes on catch composition of sole and plaice in the beam trawl fishery on the short term?
2. Can the data collected give an indication of the usability of the selectivity parameters of the beam trawl net, which are currently used in science?

Six beam trawl vessels participated in this project. Four of these vessels used a beam trawl with v-nets and tickler chains, two vessels fished with chain mats. The experimental nets used during the measurements were produced out of one material. The measurements were carried out in different areas in the southern North Sea and in each season. Beside using different nets, the fishers did not change their fishing behaviour. In the research weeks, during two days catch composition was measured in 70, 80 and 90 mm mesh sizes. In periods of 24 hours, about 9 hauls were carried out with either 70 and 80 mm mesh sizes on each side, or 90 and 80 mm on each side. After every haul, the catch on both sides (from both mesh sizes) were processed separately. Numbers by size category of both plaice and sole were counted or estimated. In total, catches from 434 hauls were sampled.

Before and after every series of hauls, the average mesh size was measured with the OMEGA meter, using a 125 N pulling force. Using the OMEGA meter, objective measurements of mesh sizes are obtained. Using the wedge (Dutch: "schiel"), the mesh size is influenced by how hard the person handling the tool pushes it in to the mesh. Figure 5 illustrates how this can affect mesh size measurements.

For each haul and mesh size, the amount of sole and plaice by size category were expressed as numbers by hectare. A Generalized Linear Model (GLM) was used to establish the relationship between amount of fish caught and mesh size. The main results are presented in figure 6 (sole) and 8 (plaice), a '*' represents significant differences with the 80 mm catch. The results were expressed as absolute numbers per hectare (left panels); and as relative numbers per hectare – compared to the numbers per hectare in the 80 mm catch (right panels).

The results show that increasing mesh sizes from 80 to 90 mm would lead to a direct loss of about 50% of undersized sole and 32-47% of marketable sole (24-30 cm) (figure 6). The amount of plaice

discards is not lower than in 80 mm. With 70 mm, significant amounts of marketable plaice are lost, and apparently more plaice discards are caught. Catches of sole from 21-27 cm are higher in 70 mm compared to 80 mm. For other sole size categories there are no significant differences between 70 and 80 mm.

Selectivity of the gear was analyzed using numbers per hectare by cm class, based on data collected in 9 of the trips. It appeared that the differences in the relative cumulative catch composition with 70, 80 and 90 mm were too similar to be able to calculate a selectivity parameter (figure 13). Probably these similarities are due to the fact that the hauls in this experiment were relatively long (1.5-2 hours) which led to full nets, causing more difficulties for smaller fish to escape the net. It was not possible to get an indication of the usability of the selectivity parameters of the beam trawl net, which are currently used in science.

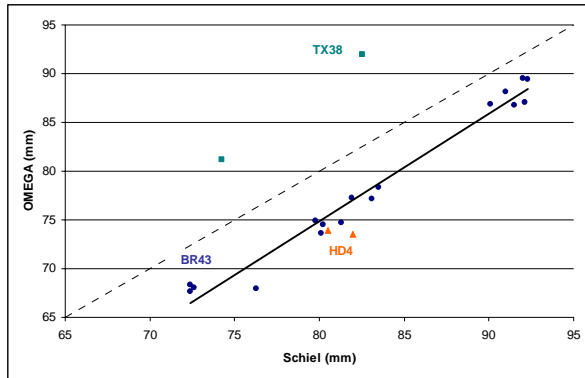


Figure 5. Comparison of the results of mesh size measurements with the OMEGA meter (y-axis) and wedge (x-axis). Without a difference between methods, the points would be positioned on the dotted line. Data from three vessels: BR43 (●), HD4 (▲) and TX38 (◻). The trendline is based on data from the BR43 only.

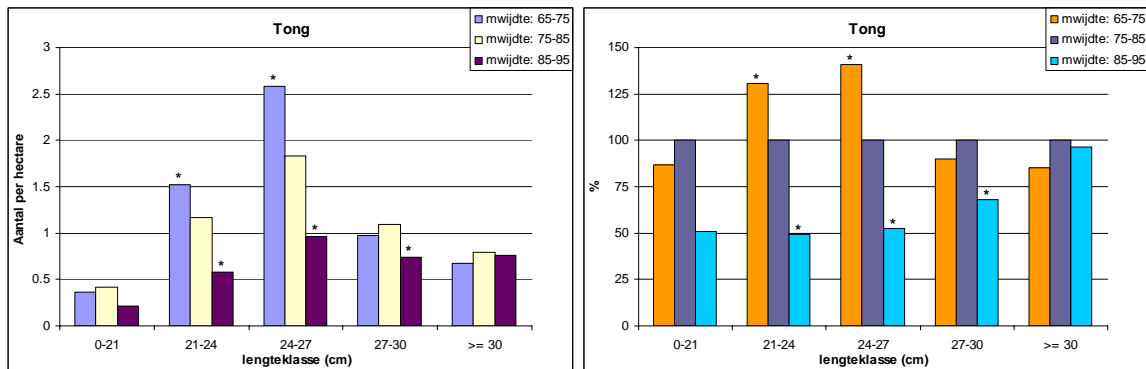


Figure 6. Difference in numbers of sole in 70, 80 and 90 mm mesh size. Left: absolute numbers per hectare. Right: expressed in percentages: the numbers per hectare in 80 mm are set at 100% and the numbers per hectare in 70 and 90 mm are expressed as a percentage compared to 100 % in 80 mm. Differences are significant when a star (*) is placed above the bar.

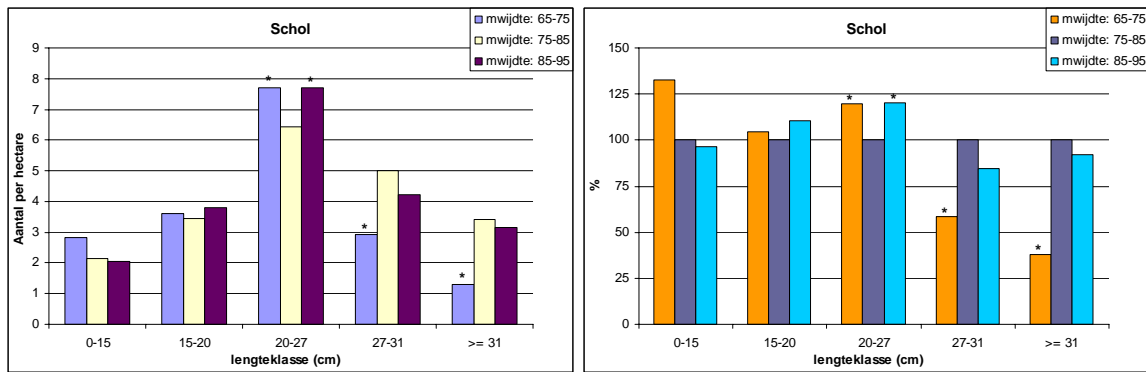


Figure 8. Difference in numbers of plaice in 70, 80 and 90 mm mesh size. Left: absolute numbers per hectare. Right: expressed in percentages: the numbers per hectare in 80 mm are set at 100% and the numbers per hectare in 70 and 90 mm are expressed as a percentage compared to 100 % in 80 mm. Differences are significant when a star (*) is placed above the bar.

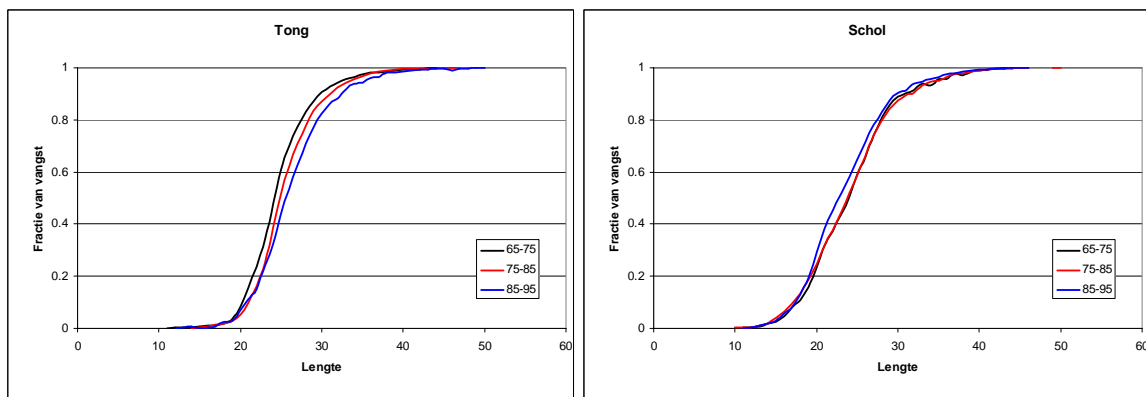


Figure. 13 Cumulated relative catch composition in 70, 80 and 90 mm mesh sizes, for sole (left) and plaice (right). The lines show overlap for small and large fish, while theoretically they should show a shift from left (70 mm) to right (90 mm).